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STOCK SUMMARY REPORTS FOR COLUMBIA RIVER ANADROMOUS SALMONIDS

VOLUME I: OREGON SUBBASINS BELOW BONNEVILLE DAM FOR THE COORDINATED INFORMATION SYSTEM

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STOCK SUMMARY REPORTS
for
COLUMBIA RIVER ANADROMOUS SALMONIDS

Volume I: Oregon Subbasins below Bonneville Dam

for
THE COORDINATED INFORMATION SYSTEM

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VOLUME I

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PREFACE

An essential component of the effort to rebuild the Columbia Basin's anadromous fish resources is that available information and experience be organized and shared among numerous organizations and individuals. Past experience and knowledge must form the basis for actions into the future. Much of this knowledge exists only in unpublished form in agency and individual files. Even that information which is published in the form of technical and contract reports receives only limited distribution and is often out of print and unavailable after a few years. Only a small fraction of the basin's collective knowledge is captured in permanent and readily available databases (such as the Northwest Environmental Database) or in recognized journals.

State, tribal, and federal fishery managers have recognized these information management problems and have committed to a program, the Coordinated Information System Project, to capture and share more easily the core data and other information upon which management decisions are based. That project has completed scoping and identification of key information needs and development of a project plan. Work performed under the CIS project will be coordinated with and extend information contained in the Northwest Environmental Database. Construction of prototype systems will begin in Phase 3.

This report is one in a series of seven describing the results of the Coordinated Information System scoping and needs identification phase. A brief description of each of these reports follows.

CIS Phase II Products

Phase II Summary Report

This report (Roger 1992) summarizes and integrates the results of the next five reports and relates them to deliverables identified in the Phase II cooperative agreement. Broader issues of organization and operation which are not appropriate for the more focused reports are also discussed. This report should be viewed as an executive summary for the CIS project to date. If one wants a quick overview of the CIS project, this report and the project plan will provide that perspective.

Report on Information Needs

This report (Weber et al. 1992) identifies the core information needed to plan, implement, monitor, and evaluate projects to manage and restore anadromous fish. This information has been organized into various categories and missing items are identified. Prototype testing in Phase 3 will focus on this core information.

Data Catalog Report

This report (O'Connor et al. 1992) might be thought of as a "yellow pages" directory describing relevant numeric data available throughout the basin. An easily searched electronic version will be developed during prototype development and the catalog will be maintained and expanded.

Technical and Administrative Options Report

This report (Allen et al. 1992) describes a process for implementing the CIS and feasible hardware, software, and operational options. Recommendations are made for the prototype and implementation phases of the project.

Library Resource Options Report

This report (Roseberry 1992) describes options for the size and operational features for the non-numeric portion of the CIS. Recommendations are made for the prototype and implementation phases.

Stock Summary Reports

These reports (Olsen et al. 1992; Hymer et al. 1992; Kiefer et al. 1992) are available in five separate volumes for Oregon (2), Washington (2), and Idaho (1). The reports contain basic biologic information on anadromous fish populations in the Columbia Basin. This information will be incorporated into computerized data bases during prototyping and implementation and will be updated annually.

Project Plan

The Project Plan (Roger et al. 1992) is derived directly from recommendations from the above reports. It describes anticipated activities, staff needs, and cost of the project for the testing and implementation phases.

INTRODUCTION

Purpose of the Report.

These volumes update the Stock Assessment Report (SAR) published in 1985 (Howell et al.). They have been enlarged partially in response to Northwest Power Planning Council comments concerning the 1985 report. The volumes are new in their format and an annual updating and refining of their information is anticipated. The volumes include both genetic information such as electrophoretic profiles, and non-genetic information. Non-genetic items include the abundance of populations, number of smolts released or outmigrating, and number of adults caught in the subbasin, etc.

The reports are divided into subbasin chapters composed of sections reporting the species of salmon and steelhead present, and their production type (natural and/or hatchery). Within each subbasin, the species are listed in the following order, if present:

spring chinook
summer chinook
fall chinook
coho
chum
sockeye
summer steelhead
winter steelhead

Within each species, naturally produced fish are listed before hatchery produced fish and early run types before late run types.

It should not be presumed that the geographical scale of these units is of biological significance. The subbasins used were the same as those units defined in the Columbia Basin Subbasin Planning Process. Some agencies chose to summarize data in finer geographic sub-divisions. The use of the word "stock" in the title "Stock Summary Report" refers to these geographic subbasin units, and does not presuppose any evolutionary significance. As in the 1985 SAR, the information varies from specific conclusions based on substantial data, to general statements which have not been verified. The standards established and agreed upon by the contributors may have not yet been met in all categories by the authors.

Desired Qualities in Stock Assessment Data.

These data should be used with caution if used to compare subbasin populations. A description of how **the data** was collected and **summarized** follows in the methods section, and the reader is urged to contact the primary authors for further clarification.

The methods of comparing stock data may vary, but there are certain qualities such data should have. A calibration of the effects the environment has on the traits described would also give analyses more meaning. For example, the environmental influences of temperature, size and timing of release or outmigration, and harvest may all influence the observed age composition of a brood.

Life history differences between stocks should not be artifacts of year-to-year variations in abundance. This is one reason information was reported in the brood year format. Multiple year class data were reported so the magnitude of a trait's temporal variation might be assessed.

Brood Year Format

The brood year format was used in the majority of the standard tables as a way of tracking the progeny of a season's spawners (a cohort). For instance, 1987 brood coho salmon came from adults that spawned in the fall of 1987. As juveniles, these coho might not have migrated until the spring of 1989. The 1987 brood jacks (two year olds) returned and were accounted for in the fall of 1989. The remaining adults returned and were accounted for in 1990. Thus, a 1987 brood year entry in a coho table is in fact current through 1990 returns. Similarly, a complete accounting of a chinook salmon brood may take six years. In such a case, the 1984 brood would be the latest brood fully reportable with 1990 return year data (reporting up to the 1990 run year was mimimum goal for these reports).

Authorship

The views represented in this volume are those of the Oregon Department of Fish and Wildlife (ODFW), and do not necessarily represent the views of other CIS participants. Portions of the information in this report are reported in standard formats developed by the CIS participants. The Columbia River Inter-Tribal Fish Commission provided coordinating services to provide consistency among the five Stock Summary Report volumes. This report includes all data received from the agencies by September 30, 1992.

METHODS

Following Howell et al. 's methodology (1985), published and unpublished anadromous fish data derived from both a literature review and contacts with biologists and hatchery personnel were summarized by subbasin. This report includes all of that information which could be located and fit into a set of standard&d tables. The agencies were free to introduce these tables in the order they found appropriate to the following major text headings:

Geographic Location
(A brief description of the subbasin)
origin
(Source of broodstock or eggs for hatchery stocks, history of hatchery stock introductions)
Distribution
(The distribution of the species in the subbasin)
Production
Adult Life History
Juvenile Life History
Biochemical-Genetic Characteristics
Diseases
References

Ten categories of information based on the Northwest Power Planning Council comments on the 1985 SAR were addressed. A list of the standard tables developed to address these categories, and a key to the two letter codes used to identify them throughout the document, follows at the end of this section.

1. Species and Strain

Maps were used to depict spawning, rearing, and hatchery locations for at least one anadromous species per subbasin. A complete set of these maps may be found in the 1990 Subbasin Production Plans.

2. Timiig of Runs

Charts also developed for the 1990 Subbasin Production Plans were used to depict the freshwater life history of the salmon and steelhead. Peak dates were added when available. Available information that related to adult migration timing (such as jaw tags, radio telemetry, pit tags, freeze brands) was summarized. These timing charts also addressed incubation, rearing, and emergence times.

3. Disease Status and Tolerance

Diseases with management importance, as defmed by the Model Comprehensive Fish Health Protection Program for the Pacific Northwest (Wold et al. 1987), were listed in the standard table coded "TD". These diseases are generally those that restrict stock transfers. In some cases agencies reported more comprehensive lists. Any known subbasin specific information on resistance or treatment response was cited in the text.

4. Stock Size, Stock Recruitment

Accounting for the number of recruits per spawner first requires an estimate of the total number of spawners. Age-specific return data for a series of years is then needed to track the recruits. Standard age composition table code "RN" reports a breakdown of spawner escapement by total age. Age specific estimates of sport catch (code RS), hatchery rack (code RH), and subbasin totals (code RR), were also generated when possible.

In the special case of summer steelhead, the total age assigned may have been the eventual total age of the fish at maturity in the spring. Steelhead needing such a projected total age might include steelhead non-lethally sampled in August at a weir or ladder during the first calendar year of their two year run span. These fish would not be spawning until the following spring. Such data was only reported if it was considered an adequate sample for describing the age composition of the run at maturity.

Estimates of the total number of smolts were included in standard table (code JM) that reports outmigration totals by season and brood year.

5. Freshwater and Ocean Migration Characteristics

Residualism was described in tables of age composition (code AC) that included freshwater age. Anything known about non-anadromous populations existing in sympatry with anadromous forms was discussed in the text.

Ocean and river distribution data are with few exceptions only available from coded wire tags recovered during fisheries not designed to scientifically sample distribution. This report focused on providing a subbasin specific guide to the available coded wire tag groups, including their number and size at release (table code TR). Numerous reports available from the Pacific States Marine Fisheries Commission and the Pacific Salmon Commission detail aspects of time and place of recovery for any coded wire tag code of interest.

6. Survival and Fecundity

Actual measurements of survival by life stage are extremely rare and most subbasin specific data are described in a text format.

Fecundity data are also rare, and infrequently measured even in hatcheries. When such data was available, it was reported in standard table "AF." Fecundity data are usually a measure of total egg take divided by the number of females spawned. Sometimes the total egg take figure itself is based on old fecundity estimates multiplied by the number of females.

The proportion of females in a brood's various age classes are reported in a table coded "AS". The "Total % Female" value in this table is based on the age composition of a brood, weighted by the "% Female" in each age class (unless otherwise stated). For example, if 10% of a coho brood retuned at two years of age, the rest as three year olds, all of the jacks were male, and fifty percent of the adults were female, then:

$$(.10 \times .00) + (.90 \times .50) = .45$$

Forty-five percent of the accounted for brood was female.

The "N" reported in this table is the sum of the fish belonging to the brood that were actually aged and sexed.

7. Age and Size Composition, Lie Stage Timing

The timing of early life stages was reported in charts developed for the Subbasin Production Plans. These charts (coded 'IT) depict the freshwater life history of the salmon and steelhead.

Length was the most universally measured parameter of smolt size. Mean length, range, and sample size basis were displayed for outmigrating smolts (table code SL). Such data may reflect rearing conditions or the timing of outmigration sampling, therefore a reference was included directly in these tables.

The life history trait of freshwater/ocean age combinations was displayed in standard table "AC". In this and other tables, the number of years of freshwater residence is denoted by the number displayed before a decimal point. The balance of the total age in years (usually equivalent to the number of years of saltwater residence) follows the decimal point. Thus a coho jack salmon would be described as a "2.0", a three year adult a "2.1".

The "N" column in the table reports the sum of fish belonging to a brood that were aged. This was a crude measure of confidence, because each of the run years summed could have had a different sampling rate. Note the size of entire brood was reported elsewhere.

Adult length data was displayed utilizing the above freshwater-ocean age specific format. Methods, sample size and standard deviations are also included in standard table code "AL". Because the availability of weight data is rare, no standard tables were developed to report this data.

8. Current Rearing and Release Methods (Hatcheries)

Standard table code "TR", based on a Washington Department of Fisheries format reports most of the information concerning hatchery releases. The use of a uniform set of definitions for the 'Life Stage' at release column proved impossible, both between, and within some states. Each of the states therefore defined the terms they used for this table.

Outplanting was described in the hatchery release table. The reporting of all hatchery releases in the Columbia Basin in a common format, on 8.5 x 11 inch paper led to less detail than is available in the assorted source databases. Further CIS development will likely allow additional detail for this table. For instance in the 'Release Site' field, where presently only the common name of the creek or river of release is listed.

9. Anatomical and Biochemical Traits

A collection of electrophoretic tables from major published works in the Columbia Basin were collected and appear as appendices. These tables were reproduced verbatim, and reflect the nomenclature used by researchers to report allele frequencies at their time of publishing. Efforts have subsequently been made by the American Fisheries Society to standardize the reporting of this type of information. The availability of meristic data was noted for the applicable subbasins.

10. Genetic Variability, Straying

Emigration and immigration were described in a standard table format proposed by Idaho (standard

table codes AE and AI). These tables report the number of carcasses examined for coded wire tags at hatcheries and during spawning ground surveys, the number of tags recovered, and an expanded "total number estimated" based on the numbers reported by PSMPC. Approximately 4,600 individual coded wire tag codes have been released to date in the Columbia River Basin, the bulk of these into Washington and Oregon waters. Harvest recoveries were not listed in the standard form of the these tables.

Standard, and Non-standard Table Codes.

A collection of standardized tables **conveyed** the above information. An upper case, two letter code identifies the category of these tables. The standard table codes are as follows:

- **(HB)** NPPC habitat quality
- **(RN)** Returns back as Natural spawners.
- **(RH)** Returns back to a Hatchery. 99% of the time these are rack returns, but a few places **with** 100% marking have made splits between marked and unmarked fish.
- **(RT)** Tribal catch in the **subbasin**
- **(RS)** Sport catch in the **subbasin.**
- **(RB)** **Subbasin** grand total, (subbasin catches, natural and hatchery escapement).
- **(JM)** Number of juvenile migrants
- **(SL)** Length **of** smolts
- **(AC)** Age composition **(freshwater.ocean)**
- **(AS)** Percent females by brood year and age class
- **(AL)** Mean fork length by brood year **and** age class
- **(AF)** Mean fecundity by brood year and age class
- **(TR)** Hatchery releases by brood year
- **(AE)** Emigration of tagged fish
- **(AI)** Immigration of tagged fish
- **(TD)** Parasites and diseases
- **(AD)** Distribution, present/potential and absence figure
- **(TT)** **Subbasin** plan bar chart of life stage timing

Deviations from the standard formats, (i.e. run years instead of brood years), are identified with a third lowercase letter such as: RS-a or RS-b.

Tables for categories of information without **standardized** formats also have a third lowercase letter, and were coded as follows:

TS-a, etc.	Survival tables, any life stage
ST-a, etc.	Non-standard Smolt Timing information
AT-a, etc.	Non-standard Adult Timing information
AH-a, etc.	Adult Harvest information, i.e. Ocean or **mainstem**
ET-a, etc.	Egg Take data
AW-a, etc.	Mean weight by brood year and age class
JC-a, etc.	Juvenile age Composition

REFERENCES

Howell, P. J., K. Jones, D. Scamecchia, L. LaVoy , W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volumes I & II. Final report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Wold, E., J. Gearheard, and J. Warren. Model Comprehensive Fish Health Protection Program, Part I. Pacific Northwest Fish Health Protection Committee. January 1, 1987.

RESULTS

The results of this project are contained in five volumes.

Volume I includes the following Oregon subbasins below Bonneville Dam:

Lower Columbia
Mid-Willamette
Clackamas
Molalla
Tualatin
Coast Range
Santiam
Mckenzie
Coast Fork
Long Tom
Middle Fork
Sandy
Hood River

Volume II includes the following Oregon subbasins above Bonneville Dam:

15 Mile
Deschutes
John Day
Umatilla
Grande Ronde (including data for Washington)
Imnaha

Volume III includes the following Washington subbasins below McNary Dam:

Lower Columbia
Grays
Elochoman
Cowlitz
Kalama
Lewis
Washogal
Wind
White Salmon
Klickitat

Volume IV includes the following Washington subbasins above McNary Dam:

Walla Walla (including data for Oregon)
Snake
Tucannon
Yakima
Upper Columbia
Wenatchee
Entiat
Wells
Methow
Okanoagan

Volume V includes the following Idaho subbasins:

Clearwater
- Mainstem
- South Fork
- Mid Fork
- Locksa
- Selway

Salmon River
- Lower Mainstem
- Little Salmon
- Mid-Mainstem
- Upper Mainstem
- Lemhi
- Headwaters
- South Fork
- Pahsimeroi

The following Tables 1 through 5 summarize, by species, the presence or absence of the standardized (and some non-standard&d) tabular data for the Oregon subbasms below Bonneville Dam. Tables 6 through 10 cover the region above Bonneville Dam.

Table 1. Summary of tabular information on spring chinook salmon in eleven Oregon subbasins below Bonneville Dam.

	lcol	mwill	clak	mola	tual	crng	sant	mcke	cfrk ltom	mid fk	sand
HABITAT	✓	✓	✓	✓			✓	✓		✓	✓
SUBBASIN DISTRIBUTION											
PRODUCTION											
HATCHERY RELEASES	✓	✓	✓	✓			✓	✓	✓	✓	✓
HATCHERY RETURNS							✓				
SUBBASIN HARVEST											
SPORT											
TRIBAL											
ADULT LIFE HISTORY											
# SPAWNERS											
TOTAL SUBBASIN RETURNS											
LENGTH											
AGE COMP.							✓			✓	
SEX RATIO											
FECUNDITY											
IMMIGRATION	✓	✓	✓				✓	✓		✓	✓
EMIGRATION		✓	✓				✓	✓		✓	
JUVENILE LIFE HISTORY											
TIMING		✓	✓	✓			✓			✓	✓
SMOLT LENGTH											
# SMOLTS											
BIOCHEMICAL			✓				✓	✓		✓	
DISEASE			✓				✓				

Table 2. Summary of tabular information on **fall** chinook in eleven Oregon subbasins below Bonneville Dam.

	lcol	mwill	clak	mola	tual	cmg	sant	mcke	cfrk ltom	mid fk	sand
HABITAT	✓	✓	✓	✓			✓	✓			✓
SUBBASIN DISTRIBUTION											
PRODUCTION											
HATCHERY RELEASES	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
HATCHERY RETURNS	✓										
SUBBASIN HARVEST											
SPORT											
TRIBAL											
ADULT LIFE HISTORY											
# SPAWNERS											
TOTAL SUBBASIN RETURNS	✓										
LENGTH	✓										
AGE COMP.	✓										
SEX RATIO	✓										
FECUNDITY	✓										
IMMIGRATION	✓	✓	✓				✓				✓
EMIGRATION	✓	✓		✓				✓	✓		
JUVENILE LIFE HISTORY											
TIMING			✓	✓			✓				✓
SMOLT LENGTH											
# SMOLTS											
BIOCHEMICAL											
DISEASE		✓									

Table 3. Summary of tabular information on coho in eleven Oregon subbasins below Bonneville Dam.

	lcol	mwill	clak	mola	tual	cmg	sant	mckc	cfrk ltom	mid fk	sand
HABITAT	✓	J	✓	✓	✓	✓	✓	✓			✓
SUBBASJN DISTRIBUTION											
PRODUCTION											
HATCHERY RELEASES		✓	✓	✓	✓	✓	✓		✓	✓	✓
HATCHERY RETURNS			✓								
SUBBASJN HARVEST											
SPORT											
TRIBAL											
ADULT LIFE HISTORY											
# SPAWNERS											
TOTAL SUBBASIN RETURNS											
LENGTH											
AGE COMP.			✓								✓
SEX RATIO			✓								✓
FECUNDITY			✓								✓
IMMIGRATION	✓	✓	✓								✓
EMIGRATION			✓								✓
JUVENILE LIFE HISTORY											
TIMING			✓	✓	✓	✓	✓				✓
SMOLT LENGTH	✓										
# SMOLTS	✓		✓								
BIOCHEMICAL											
DISEASE											✓

Table 4. Summary of tabular information on summer steelhead in eleven Columiba River subbasins below Bonneville Dam.

	lcol	mwill	clak	mola	tual	cmg	sant	mckc	cfrk ltom	mid fk	sand
HABITAT	✓	✓	✓	✓			✓	✓		✓	✓
SUBBASIN DISTRIBUTION											
PRODUCTION											
HATCHERY RELEASES	✓	✓	✓	✓			✓	✓		✓	✓
HATCHERY RETURNS											
SUBBASIN HARVEST											
SPORT											
TRIBAL											
ADULT LIFE HISTORY											
# SPAWNERS											
TOTAL SUBBASIN RETURNS											
LENGTH							✓				
AGE COMP.							✓			✓	
SEX RATIO											
FECUNDITY											
IMMIGRATION											
EMIGRATION											
JUVENILE LIFE HISTORY											
TIMING			✓				✓				
SMOLT LENGTH											
# SMOLTS											
BIOCHEMICAL							✓				
DISEASE							✓				

Table 5. Summary of tabular information on winter steelhead in eleven Oregon subbasins below Bonneville Dam.

	lcol	mwill	clak	mola	tual	cmg	sant	mcke	cfrk ltom	mid fk	sand
HABITAT	✓	✓	✓	✓		✓	✓	✓		✓	✓
SUBBASIN DISTRIBUTION		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PRODUCTION											
HATCHERY RELEASES	✓	✓	✓	✓	J	✓	✓	✓		✓	✓
HATCHERY RETURNS			✓								
SUBBASIN HARVEST											
SPORT											
TRIBAL											
ADULT LIFE HISTORY											
# SPAWNERS											
TOTAL SUBBASIN RETURNS											
LENGTH											
AGE COMP.	✓		✓								
SEX RATIO			✓								
FECUNDITY											
IMMIGRATION	✓										
EMIGRATION											
JUVENILE LIFE HISTORY											
TIMING		✓	✓	✓	✓	✓				✓	✓
SMOLT LENGTH											
# SMOLTS											
BIOCHEMICAL							✓				✓
DISEASE	✓		✓	✓			✓				

Table 6. Summary of tabular information on spring chinook salmon in seven ***Oregon*** subbasins above **Bonneville** Dam.

	HOOD RIVER	15 MILE	DESCHUTES	JOHN DAY	UMATILLA	GRANDE RONDE	IMNAHA
HABITAT	✓		✓	✓	✓	✓	✓
SUBBASIN DISTRIBUTION			✓	✓		✓	
PRODUCMON							
HATCHERY RELEASES	✓		✓	✓	✓	✓	✓
HATCHERY RETURNS			✓			✓	✓
SUBBASIN HARVEST							
SPORT							
TRIBAL							
ADULT LIFE HISTORY							
# SPAWNERS			✓				
TOTAL SUBBASIN RETURNS			✓				
LENGTH			✓	✓		✓	✓
AGE COMP.			✓	✓		✓	✓
SEX RATIO			✓	✓		✓	✓
FECUNDITY			✓			✓	✓
IMMIGRATION			✓	✓		✓	✓
EMIGRATION			✓		✓	✓	✓
JUVENILE LIFE HISTORY							
TIMING			✓	✓	✓	✓	✓
SMOLT LENGTH			✓	✓			
# SMOLTS			✓	✓		✓	
BIOCHEMICAL			✓				
DISEASE			✓	✓		✓	✓

Table 7. Summary of tabular information on fall chinook salmon in seven Oregon subbasins above Bonneville Dam.

	HOOD RIVER	15 MILE	DESCHUTES	JOHN DAY	UMATILLA	GRANDE RONDE	IMNAHA
HABITAT	✓		✓		✓		✓
SUBBASIN DISTRIBUTION					✓		
PRODUCTION							
HATCHERY RELEASES	✓		✓		✓		
HATCHERY RETURNS							
SUBBASIN HARVEST							
SPORT							
TRIBAL							
ADULT LIFE HISTORY							
# SPAWNERS							
TOTAL SUBBASJN RETURNS							
LENGTH			✓				
AGE COMP.			✓				
SEX RATIO							
FECUNDITY							
IMMIGRATION			✓		✓		
EMIGRATION			✓		✓		
JUVENILE LIFE HISTORY							
TIMING			✓		✓		✓
SMOLT LENGTH							
# SMOLTS							
BIOCHEMICAL			✓				
DISEASE			✓				

Table 8. Summary of tabular information on coho salmon in seven Oregon subbasins above Bonneville Dam.

	HOOD RIVER	15 MILE	DESCHUTES	JOHN DAY	UMATILLA	GRANDE RONDE	IMNAHA
HABITAT	✓		✓				
SUBBASIN DJSTRIBUTION							
PRODUCTION							
HATCHERY RELEASES	✓				✓	✓	
HATCHERY RETURNS							
SUBBASIN HARVEST							
SPORT							
TRIBAL							
ADULT LIFE HISTORY							
# SPAWNERS							
TOTAL SUBBASJN RETURNS							
LENGTH							
AGE COMP.							
SEX RATIO							
FECUNDITY							
IMMIGRATION			✓		✓		
EMIGRATION					✓		
JUVENILE LIFE HISTORY							
TIMING					✓		
SMOLT LENGTH							
# SMOLTS							
BIOCHEMICAL							
DISEASE							

Table 9. Summary of tabular information on summer steelhead in seven Oregon subbasins above Bonneville Dam.

	HOOD RIVER	15 MILE	DESCHUTES	JOHN DAY	UMATILLA	GRANDE RONDE	IMNAHA
HABITAT			✓	✓	✓	✓	
SUBBASJN DJSTRJBUTION	✓	✓					✓
PRODUCTION							
HATCHERY RELEASES	✓		✓	✓	✓	✓	✓
HATCHERY RETURNS			✓			✓	✓
SUBBASIN HARVEST							
SPORT							
TRIBAL			✓				
ADULT LIFE HISTORY							
# SPAWNERS			✓				
TOTAL SUBBASIN RETURNS			✓				
LENGTH						✓	✓
AGE COMP.			✓			✓	✓
SEX RATIO			✓			✓	✓
FECUNDITY			✓		✓	✓	✓
IMMIGRATION			✓		✓	✓	✓
EMIGRATION						✓	
JUVENILE LIFE HISTORY							
TIMING			✓	✓	✓	✓	✓
SMOLT LENGTH							
# SMOLTS							
BIOCHEMICAL							
DISEASE			✓		✓	✓	✓

Table 10. Summary of tabular information on winter steelhead in seven Oregon subbasins above Bonneville Dam.

	HOOD RIVER	15 MILE	DESCHUTES	JOHN DAY	UMATILLA	GRANDE RONDE	IMNAHA
HABITAT		✓					
SUBBASIN DISTRIBUTION	✓	✓					
PRODUCTION							
HATCHERY RELEASES	✓		✓	✓			
HATCHERY RETURNS							
SUBBASIN HARVEST							
SPORT							
TRIBAL							
ADULT LIFE HISTORY							
# SPAWNERS							
TOTAL SUBBASIN RETURNS							
LENGTH							
AGE COMP.							
SEX RATIO							
FECUNDITY							
IMMIGRATION							
EMIGRATION							
JUVENILE LIFE HISTORY							
TIMING							
SMOLT LENGTH							
# SMOLTS							
BIOCHEMICAL							
DISEASE							

LOWER COLUMBIA RIVER SUBBASIN

Naturally Produced Spring Chinook Salmon

GEOGRAPHIC LOCATION

The Oregon side of the lower Columbia River subbasin is defined for management purposes as the mainstem Columbia River between the mouth and Bonneville Dam (RM 146), and tributaries on the Oregon side, except for the Willamette and Sandy river subbasins (Washington Department of Fisheries et al. 1990). The "lower Columbia River subbasin" is used throughout this document to refer to the Oregon side as defined above.

ORIGIN

Spring chinook are not native to the lower Columbia River subbasin (Washington Department of Fisheries et al. 1990).

DISTRIBUTION

Subbasin

Only a limited amount of spawning and rearing habitat is considered suitable for the production of spring chinook salmon. Approximately 0.5 miles of spawning and rearing habitat is located in McCord Creek and 0.8 miles of spawning and rearing habitat in Moffett Creek. Both creeks are tributaries to the Columbia River. The habitat in both creeks is rated as "good" quality (Tables 1 and 2).

ADULT LIFE HISTORY

Escapement

Spawning Area

Numbers: No brood year specific estimates of spawner escapement are available for the lower Columbia River subbasin. Run year specific estimates are available in Howell et al. (1985), from Oregon Department of Fish and Wildlife (unpublished data), and from Washington Department of Fisheries (unpublished data).

Strays

Coded wire tagged hatchery spring chinook, released as juveniles in the Umatilla, Middle Fork Willamette, Grande Ronde, Imnaha, and McKenzie river subbasins, were recovered in the lower Columbia River subbasin (Table 3).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of lower Columbia River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	100	0.0	0.0	--	0.8	--
Acres (%)	0.0	100	0.0	0.0	--	0.8	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of lower Columbia River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	0.0	0.0	0.0	0.0	--	0.0	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (AI). Non-harvest recoveries of coded wire tagged hatchery spring chinook in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Umatilla River	mainstem Col. R.[c] below Bonneville 1988	Hatchery Returns --	5	5
Middle Fork Willamette River	mainstem Col. R.[c] below Bonneville 1987	Hatchery Returns --	1	1
Grande Ronde River	mainstem Col. R.[c] below Bonneville 1988	Hatchery Returns --	1	1
Imnaha River	mainstem Col. R.[c] below Bonneville 1988	Hatchery Returns --	1	1
McKenzie River	Big Creek 1985	Hatchery Returns --	1	1

a Based on the following tag codes: 07-25-21, 07-33-13, 07-34-29, 07-42-63, 07-43-25, 07-43-28, 07-43-29.
b Estimates are modified from the Pacific States Marine Fisheries Commission coded wire tag database.
c Estimates are primarily returns to North Bonneville ladder and Bonneville Hatchery.

REFERENCES

Washington Department of Fisheries, Washington Department of Wildlife, and Oregon Department of Fish and Wildlife. 1990. Salmon and steelhead production plan (lower Columbia River subbasin). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon.

LOWER COLUMBIA RIVER SUBBASIN

Hatchery Produced Spring Chinook Salmon

ORIGIN

Hatchery spring chinook were first released into the subbasin in 1989 (1988 brood) in order to develop a gill net fishery in Youngs Bay (Washington Department of Fisheries et al. 1990). The only facility, located in Oregon, currently rearing juvenile spring chinook salmon for release into the lower Columbia River subbasin is the Clatsop Economic Development Committee's (CEDC) hatchery facility located in the South Fork Klaskanine River. Two stocks have been used for hatchery supplementation. They include the Willamette Hatchery and Clackamas River early run stocks (Table 1).

DISTRIBUTION

Subbasin

Spring chinook juveniles have been released into the Youngs and South Fork Klaskanine rivers (Table 1).

PRODUCTION

Releases

Egg

There are no records of egg releases into the subbasin.

Fry

There are no records of fry releases into the subbasin.

Fingerling

The only hatchery facility in which fingerlings were reared or acclimated prior to release in the subbasin is the CEDC (Table 1). Annual numbers released ranged from 118,674 to 263,204 fish (Table 1). Size at release ranged from 60.0 to 24.8 fish per pound (Table 1).

Smolt

The only hatchery facility in which smolts were reared or acclimated prior to release in the subbasin is the CEDC (Table 1). Annual numbers released ranged from 210,867 to 306,125 fish (Table 1). Size at release ranged from 15.6 to 7.2 fish per pound (Table 1).

Jack and Adult

There are no records of releases in the subbasin.

ADULT LIFE HISTORY

Mark Recoveries

Coded wire tagged hatchery spring chinook, released as juveniles in the lower Columbia River subbasin were recovered in the John Day and Grande Ronde river subbasins; at Cascade and Lookingglass hatcheries; and at Pelton trap (Round Butte Hatchery; Table 2).

DISEASES

Various infectious disease agents have been identified at hatchery facilities that rear or hold juvenile spring chinook for Columbia River Basin hatchery production releases (Table 3). Bacterial diseases include *Renibacterium salmoninarum* (bacterial kidney disease), *Cytophaga psychrophila* (cold water disease), and *Yersinia ruckeri* (enteric redmouth disease). Viral diseases include Erythrocytic Inclusion Body Syndrome (EIBS).

Table 1 (TR). Hatchery spring chinook releases into the Lower Columbia River subbesin by brood year and, if marked, coded wire tag code[a].

Brood Year	Broodstock	Hatchery[b]	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1988	MFk Will.[c]	CEDC	fing.	06/01/89	--	48.0	115,847	SFk Klaskanine River	--
1988	MFk Will.[c]	CEDC	fing.	06/01/89	--	48.0	232	SFk Klaskenine River	07-44-60
1988	MFk Will.[c]	CEDC	fing.	06/01/89	--	24.8	37,921	Youngs River	--
1988	MFk Will.[c]	CEDC	fing.	07/25/89	--	29.0	83,323	Youngs River	--
1988	MFk Will.[c]	CEDC	fing.	07/25/89	--	29.0	25,881	Youngs River	07-35-63
1988	MFk Will.[c]	CEDC	smolt	03/06/90	--	7.2	27,644	Youngs River	--
1988	MFk Will.[c]	CEDC	smolt	03/06/90	--	60.0	26,665	Youngs River	07-45-04
1989	MFk Will.[c]	CEDC	fing.	06/11/90	--		91,142	SFk Klaskanine River	--
1989	MFk Will.[c]	CEDC	fing.	06/11/90	--	60.0	27,532	SFk Klaskanine River	07-52-32
1989	MFk Will.[c]	CEDC	smolt	10/26/90	--	8.8	30,026	Youngs River	--
1989	MFk Will.[c]	CEDC	smolt	07/25/90	--	15.6	193,180	Youngs River	--
1989	MFk Will.[c]	CEDC	smolt	07/25/90	--	15.6	28,610	Youngs River	07-52-33
1990	Clackamss R.[d]	CEDC	fing.	06/14/91	--	50.7	93,190	SFk Klaskanine River	--
1990	Clackames R.[d]	CEDC	fing.	06/14/91	--	50.7	26,437	SFk Klaskanine River	07-56-03
1990	Clackamss R.[d]	CEDC	smolt	07/20/91	--	14.8	184,298	Youngs River	--
1990	Cleckamas R.[d]	CEDC	smolt	07/20/91	--	14.8	26,569	Youngs River	07-56-04

a Modified from Washington Department of Fisheries et al. (1990).
b CEDC refers to the Clatsop Economic Development Committee hatchery facilities. The CEDC operates a hatchery in the South Fork of the Klaskanine River and a net pen facility in Youngs River.
c Willamette Hatchery stock.
d Clackames River (Eagle Creek National Fish Hatchery) stock.

Table 2 (AE). Emigration of coded wire tagged hatchery spring chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
mainstem Col. R. below Bonneville	Cascade Hat.	Hatchery Returns		
	1984	--	1	1
mainstem Col. R. below Bonneville	John Day River	Spawning Grounds		
	1985	--	1	1
mainstem Col. R. below Bonneville	Grande Ronde River	Spawning Grounds		
	1987	--	1	1
Unknown	Round Butte Hat.	Trap Returns		
	1978	--	1	2
	1979	--	3	3
	1980	--	4	4
	1981	--	1	1
	1982	--	--	--
	1983	--	--	--
	1984	--	--	--
	1985	--	1	1
	1986	--	2	2
	1987	--	4	4
	1988	--	1	1
Unknown	Lookingglass Hatchery	Trap Returns		
	1985	--	3	3

Table 2 (AE). (cont.) Emigration of coded wire tagged hatchery sprin chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Unknown	Lookingglass Hatchery	Trap Returns (continued)		
	1986	--	1	1
	1987	--	6	6
	1988	--	5	5
mainstem Col. R. below Bonneville	Round Butte Hat.	Trap Returns		
	1979	--	4	5
	1980	--	3	3
	1981	--	--	
	1982		1	1
	1983	--	1	1
	1984	--	--	--
	1985	--	--	--
	1986	--	3	3
	1987	--	--	--
	1988	--	4	4

[a] Based on the following tag codes: 03-45-02, 23-17-05, 23-17-07, 23-17-10, 23-17-12, 23-17-14, LBYWYW, RDYW*2, YWWH, YWYWGM, YWYWOR. Based on the following tag codes from fish of unknown rearing type (assumed to be hatchery): 23-16-21, 23-16-22, 23-16-47, 23-16-48, 23-16-49, 23-16-50, 23-17-22, 23-18-14, 23-18-08, 23-18-15, 23-19-15, 23-19-18, 23-19-20, ORBL, PULBPK, RDGN*1, RDRDOR*1, RDYWOR*1, YWRD, YWYWLG*1.

[b] Estimates are modified from the Pacific States Marine Fisheries Commission coded wire tag database.

Table 3 (TD). Parasites and diseases of spring chinook at hatchery facilities located in the lower Columbia River subbasin (mouth to Bonneville Dam)[a].

Disease Type	Hatchery	Specific Pathogen
Bacteria	Bonneville	*Aeromonas spp.*
Bacteria	Bonneville	*Pseudomonas spp.*
Bacteria	Bonneville	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Bonneville	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Bonneville	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	Bonneville	Furunculosie *(Aeromonas salmonicida)*
Virus	Bonneville	Erythrocytic Inclusion Body Syndrome (EIBS)
Fungi	Bonneville	External fungi

[a] Data are from Oregon Department of Fish and Wildlife (unpublished data).

REFERENCES

Washington Department of Fisheries, Washington Department of Wildlife, and Oregon Department of Fish and Wildlife. 1990. Salmon and steelhead production plan (lower Columbia River subbasin). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon.

LOWER COLUMBIA RIVER SUBBASIN

Hatchery Produced Summer Chinook Salmon

ORIGIN

Summer chinook are native to the upper reaches of the Columbia River subbasin (above Rock Island Dam) and the Snake River subbasin (Howell et al. 1985) but are not native to the lower Columbia River subbasin (personal communication on 8/26/92 with Harold Hansen, Oregon Department of Fish and Wildlife, Clackamas, Oregon). Hatchery summer chinook were released on an experimental basis in the lower Columbia River subbasin from only one brood year (1986 brood; Table 1). In July of 1986, 182 upriver summer chinook were trapped on the Washington shore of Bonneville Dam, and held at Bonneville Hatchery for spawning (Oregon Department of Fish and Wildlife unpublished data). Juveniles were reared at Bonneville Hatchery, and released into the subbasin in November of 1987 (Table 1).

DISTRIBUTION

Subbasin

Summer chinook juveniles were released in Tanner Creek (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

There are no records of releases in the subbasin.

Fingerling

The only hatchery facility in which fingerlings were reared or acclimated prior to release in the subbasin was Bonneville Hatchery (Table 1). The total number of summer chinook released in 1987, the only year of releases, was 431,218 fish (Table 1). Size at release ranged from 13.3 to 12.6 fish per pound (Table 1).

Smolt

There are no records of releases in the subbasin.

Jack and Adult

There are no records of releases in the subbasin.

ADULT LIFE HISTORY

Escapement

Hatchery Facilities

Numbers: Estimates of the number of hatchery summer chinook returning to Bonneville Hatchery from the 1986 brood year, expanded from recoveries of coded wire tags, totaled twenty-four 3 year old fish, one hundred and nine 4 year old fish, and sixty-one 5 year old fish (Table 2). Data are from the 1988-91 return years and, therefore, estimates do not include potential returns of 6 year old fish.

In 1986, 101 summer chinook females were spawned at Bonneville Hatchery (Oregon Department of Fish and Wildlife unpublished data). Sixty-five males were collected, but the number of males and females spawned is unknown (Oregon Department of Fish and Wildlife unpublished data).

Survival: Pre-spawning mortality at Bonneville Hatchery was estimated at 7.69%; three males and 11 females (Oregon Department of Fish and Wildlife unpublished data).

Survival Rate

Fingerling to returning jack and adult survival rates for 2-, 3-, 4-, and 5- year old summer chinook (expanded from returns of fish tagged with the following coded wire tags: 07-37-09, 07-37-10, 07-37-11, 07-37-12, 07-37-13) were 0.017%, 0.046%, 0.156%, and 0.056%, respectively (Pacific States Marine Fisheries Commission coded wire tag database). Fingerling to returning jack and adult survival rates for 2-, 3-, 4-, and 5- year old summer chinook (expanded from returns of fish tagged with the following coded wire tags: 07-37-14, 07-37-15, 07-37-16, 07-37-17, 07-37-18) were O.O%, 0.036%, 0.100%, and 0.048%, respectively (Pacific States Marine Fisheries Commission coded wire tag database).

Fecundity

Mean fecundity of summer chinook trapped in 1986 and used for hatchery broodstock was 5,525 eggs per female (Table 3).

JUVENILE LIFE HISTORY

Survival Rate

For the 1986 brood year, the mortality rate of eggs at Bonneville Hatchery was 7.35%, and the mortality rate of fry was 7.5% (Oregon Department of Fish and Wildlife unpublished data). For information on fingerling survival rates, see ADULT LIFE HISTORY, Survival Rate.

Table 1 (TR). Hatchery releases of summer chinook salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT/ Fin clip[b]
1986	Col. R.[b]	Bonneville	fing.	11/05/87	--	12.6	265,858	Tanner Creek	--
1986	Cot. R.[b]	Bonneville	fing.	11/05/87	..	12.6	10,659	Tanner Creek	07-37- 14
1986	Cot. R.[b]	Bonneville	f ing.	11/05/87	--	12.6	10,660	Tanner Creek	07-37-15
1986	Cot. R.[b]	Bonnevi lle	fing.	11/05/87	--	12.6	10,660	Tanner Creek	07-37- 16
1986	Col. R.[b]	gonnevi lle	f ing.	11/05/87	--	12.6	10,660	Tanner Creek	07-37-17
1986	Col. R.[b]	Bonnevi lle	f ing.	11/05/87	__	12.6	10,660	Tanner Creek	07-37- 18
1986	Cot. R.[b]	Bonnevi l le	f ing.	11/05/87	..	12.8	59,057	Tanner Creek	--
1986	Col. R.[b]	Bonnevi 1 le	f ing.	11/05/87	..	12.8	10,600	Tanner Creek	07-37-09
1986	Cot. R.[b]	Bonneville	f ing.	11/05/87	__	13.3	10,601	Tanner Creek	07-37- 10
1986	Cot. R.[b]	Bonnevi l le	f ing.	11/05/87	--	13.3	10,601	Tanner Creek	07-37- 11
1986	Cot. R.[b]	Bonnevi l le	fing.	11/05/87	..	13.3	10,601	Tanner Creek	07-37- 12
1986	Col. R.[b]	Bonnevi l le	f ing.	11/05/87	..	13.3	10,601	Tanner Creek	07-37- 13

[a] Modified from Oregon Department of Fish and Wildlife's hatchery production database.
[b] Upper Columbia River summer chinook.

Table 2 (RH). Total escapement of summer chinook to Bonneville Hatchery by brood year[a].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1986[b]	--	0	30	12	--	--	--
1986[c]	--	24	79	49	--	--	--

[a] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.
[b] Expanded from returns of fish tagged with the following coded wire tags: 07-37-09, 07-37-10, 07-37-11, 07-37-12, 07-37-13.
[c] Expanded from returns of fish tagged with the following coded wire tags: 07-37-14, 07-37-15, 07-37-16, 07-37-17, 07-37-18.

Table 3 (AF-a). Mean fecundity (eggs per female) by run year for summer chinook at Bonneville Hatchery[a,b].

Run Year	Mean Fecundity
1986	5,525

[a] Modified from Oregon Department of Fish and Wildlife (unpublished data).
[b] Estimate is the average fecundity of the females that were used for broodstock in the one year of smolt production at Bonneville Hatchery.

REFERENCES

Howell, P.J., K. Jones, D. Scamecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

LOWER COLUMBIA RIVER SUBBASIN

Naturally Produced Fall Chinook Salmon

GEOGRAPHIC LOCATION

The Oregon side of the lower Columbia River subbasin is defined for management purposes as the mainstem Columbia River between the mouth and Bonneville Dam (RM 146), and tributaries on the Oregon side, except for the Willamette and Sandy river subbasins (Washington Department of Fisheries et al. 1990). The "lower Columbia River subbasin" is used throughout this document to refer to the Oregon side as defined above.

ORIGIN

Fall chinook are native to the lower Columbia River subbasin (Washington Department of Fisheries et al. 1990). Historic run sixes to the subbasin are unknown (Washington Department of Fisheries et al. 1990). Surveys conducted in the 1940's indicate that natural production was limited due to loss of production habitat and over harvest (Washington Department of Fisheries et al. 1990). Current information on the status of the native stock is not available, but it is believed that most naturally produced fall chinook in the subbasin are progeny of Lower River Hatchery stock (LRH) fall chinook (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, ORIGIN) and stray hatchery produced fall chinook. Limited information is available on natural production, but spawning ground surveys and field observations indicate that only a small amount of spawning occurs in tributaries of the lower Columbia River subbasin (personal communication on 8/10/92 with Don Swartz, Oregon Department of Fish and Wildlife, Clackamas, Oregon).

DISTRIBUTION

Subbasin

Lower Columbia River subbasin tributaries that produce fall chinook salmon include the Klaskanine, Youngs, Lewis and Clark, and Clatskanie river drainages and the Big, Gnat, Plympton, and Bear creek drainages (Washington Department of Fisheries et al. 1990). Past land management practices have reduced the amount of rearing habitat available in tributary streams (Washington Department of Fisheries et al. 1990). The removal of barriers to upstream migration has helped to restore or increase production habitat (Washington Department of Fisheries et al. 1990). Upstream passage is currently restricted by broodstock collection facilities located in the Klaskanine River, and Big and Gnat creeks (Washington Department of Fisheries et al. 1990). In addition, poor quality spawning habitat, adverse temperatures and predation may limit natural production (Washington Department of Fisheries et al. 1990). Available spawning and rearing habitat in the subbasin is primarily rated as "good" quality (Tables 1 and 2).

ADULT LIFE HISTORY

Escapement

Spawning Area

Numbers: Annual estimates of spawner escapement of LRH fall chinook are available for Big (Table 3), Gnat (Table 4), Plympton (Table 5), and Bear (Table 6) creeks and the Clatskanie (Table 7), Lewis and Clark (Table 8), South Fork Klaskanine (Table 9), North Fork Klaskanine (Table 10), and Youngs (Table 11) rivers. Estimates were calculated using peak count live and dead fish expansion factors.

The 1985 brood is the only brood year for which an estimate of spawner escapement is available for all possible returning age classes of LRH fall chinook. Spawner escapement for the 1985 brood was estimated at 0 jacks and 1,738 adult fish in Big Creek, 9 jacks and 93 adult fish in Gnat Creek, 0 jacks and 54 adult fish in the Clatskanie River, 12 jacks and 154 adult fish in the Lewis and Clark River, 0 jacks and 1,127 adult fish in Plympton Creek, 0 jacks and 54 adult fish in Bear Creek, and 29 jacks and 61 adult fish in the South Fork Klaskanine River (Tables 3-l 1).

Annual estimates of spawner escapement of Rogue River stock fall chinook are available for Big (Table 12), Plympton (Table 13) and Bear (Table 14) creeks, and the Lewis and Clark River (Table 15). Estimates were calculated using peak count live and dead fish expansion factors. There are no years for which data on all returning age classes is available. Annual estimates of jack escapement ranged from 0 to 5 fish (Tables 12-15).

Annual spawning ground counts in selected tributary streams, located in the lower Columbia River subbasin, are available in Howell et al. (1985) and from Oregon Department of Fish and Wildlife (unpublished data).

strays

Limited information is available on the immigration of wild or naturally produced fall chinook into the lower Columbia River subbasin. The only information available is from coded wire tag returns from ten wild fall chinook that were tagged and released as juvenile fish in the Deschutes River subbasin (Table 16). The tagged fish were recovered in the mainstem Columbia River below Bonneville Dam.

Coded wire tags have been recovered from stray hatchery fall chinook that were tagged and released as juvenile fish at sites located over a wide geographical area in the Columbia River Basin (Table 17). Coded wire tags were recovered from fall chinook that had been released as juvenile fish in subbasins of the Columbia River located in Oregon, Washington, and Idaho, as well as coastal subbasins, including the Rogue River in Oregon and the Trinity River in California (Table 17). Tag returns were primarily from fall chinook that strayed among lower Columbia River subbasin tributaries located in both Oregon and Washington (Table 17).

Age Structure

Age structure for LRH fall chinook was estimated for fall chinook sampled in Big (Table 18), Gnat (Table 19), Plympton (Table 20), and Bear creeks (Table 21) and in the Clatskanie (Table 22), Lewis and Clark (Table 23), South Fork Klaskanine (Table 24), North Fork Klaskanine (Table 25), and Youngs rivers (Table 26). A combined estimate for the 1988 run year was made for fish sampled from Big, Gnat, Plympton, and Bear creeks and the

Clatskanie River (Table 27). Age was determined from analysis of scale samples. When data was available, by total age only, returning fish were assumed to have migrated as sub-yearling smolts. This assumption is supported by scale analyses, which indicates that the majority of returning jack and adult fish migrated from freshwater as sub-yearling smolts (personal communication on 7/28/92 with Steve King, Oregon Department of Fish and Wildlife, Clackamas, Oregon). Freshwater age was designated as one year for juveniles migrating as sub-yearling smolts.

Although age structure varied considerably among tributaries and among years, the data indicates that LRH fall chinook primarily spend 2 to 3 years in the ocean (Tables 18-27).

Sex Ratio

Sex ratios (percent females) were estimated for LRH fall chinook returning to Big (Table 28) and Plympton (Table 29) creeks. Age was determined from an analysis of scales. When data was available, by total age only, returning fish were assumed to have migrated as sub-yearling smolts (see ADULT LIFE HISTORY, Age Structure).

Annual estimates of sex ratio ranged from 8% to 67 % for ocean age 2 fish and 0% to 64 % for ocean age 3 fish (Tables 28-29). No female ocean age 1 fish were recovered.

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of lower Columbia River **subbasin** fall chinook production **area**[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	20	51	27	2	--	104.5	--
Acres (%)	17	51	29	3	--	216.1	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of lower Columbia River **subbasin** fall chinook production **area**[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	59	41	--	1.7	--
Acres (%)	0.0	0.0	42	58	--	8.7	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (RB-1). Total spawning escapement of LRH fall chinook in Big Creek by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1976		--	--	--	--		
1977			--	10[c]			
1978	--	--	23[c]	--			
1979	--	2,609'	--	15			
1980	124[c]	--	548	262[d]			
1981		1,468	2,324[d]				
1982	128	1,455[d]		30d	--		
1983	14d	--	147[d]	41e			
1984	--	2,150[d]	2,188[e]	82			
1985	0[d]	166[e]	1,322	250		1,738	1,738
1986	9[e]	549	960	0		--	
1987	0	225	113	--			
1988	49	798	--	--			
1989	0	--		--			

a Estimates are from Washington Department of Fisheries (unpublished data).
b From estimates of escapement by run year. , Estimates were calculated using peak count live and dead fish expansion factors.
c Estimates of age structure at Big Creek Hatchery were used to estimate escapement by age category.
d May include small numbers of non-LRH stock.
e Age structure determined from the analysis of 330 scale samples collected in the Clatskanie River and Big, Gnat, Bear, and Plympton creeks was used to estimate age structure for escapement in Big Creek.

Table 4 (RB-2). Total spawning escapement of LRH fall chinook in Gnat Creek by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1976		--	--		0[c]	--	--
1977	--	--	--	1[c]	--	--	--
1978	--	--	31[c]	--	0	--	--
1979	--	132[c]	--	0	0[d]	--	--
1980	6[c]	--	8	0[d]	--	--	--
1981		2	22d	--	0[d]	--	--
1982	2	14d	--	0[d]	0[e]	--	--
1983	0[d]	--	17d	5[e]	0	--	--
1984	--	487[d]	267[e]	11	11	--	--
1985	9[d]	21e	60	12	0	102	93
1986	1[e]	16	94	0	--	--	--
1987	0	12	5				
1988	0	58	--	--			
1989	0	--	--	--	--	--	--

[a] Estimates are from Washington Department of Fisheries (unpublished data).
[b] From estimates of escapement by run year. Estimates were calculated using peak count live and dead fish expansion factors.
[c] Estimates of age structure at Big Creek Hatchery were used to estimate escapement by age category.
[d] May include small numbers of non-LRH stock.
[e] Age structure determined from the analysis of 330 scale samples collected in the Clatskanie River and Big, Gnat, Bear, and Plympton creeks was used to estimate age structure for escapement in Big Creek.

Table 5 (RB-3). Total spawning escapement of LRH fall chinook in Plympton Creek by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1976	--	--			--		
1977	--			11[c]	--		
1978		--	694[c]	--	--		
1979	--	2,905[c]	--	4	--	--	
1980	139[c]	--	154	0[d]	--		
1981	--	411	785[d]		--		
1982	36	934[d]	--	0[d]	--		
1983	49[d]	--	138[d]	54e	--		
1984		4,620[d]	2,871[e]	0	--		
1985	0[d]	215[e]	890	22	--	1,127	1,127
1986	12[e]	684	317	0	--	--	--
1987	29	105	22	--	--	--	--
1988	105	351	--	--	--	--	--
1989	5	--	--	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).
b From estimates of escapement by run year.' Estimates were calculated using peak count live and dead fish expansion factors.
c Estimates of age structure at Big Creek Hatchery were used to estimate escapement by age category.
d May include small numbers of non-LRH stock.
e Age structure determined from the analysis of 330 scale samples collected in the Clatskanie River and Big, Gnat, Bear, and Plympton creeks was used to estimate age structure for escapement in Big Creek.

Table 6 (BB-4). Total spawning escapement of LRH fall chinook in Bear Creek by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1978	--	--	--	--	--	. .	. .
1979			--	8	--	--	--
1980	--	--	279	0[c]	--	--	--
1981	--	748	443[c]				
1982	65	489[c]	--	0[c]	--	--	--
1983	0[c]	--	11[c]	11[d]	—	—	--
1984	--	378[c]	601[d]	0	--	--	--
1985	0[c]	46[d]	0	8	--	54	54
1986	3d	0	93	--	. .	. .	. .
1987	0	20	18	--	--	--	--
1988	14	216	--	--	--	--	--
1989	9	--	--	--	--	--	--

[a] Estimates are from Washington Department of Fisheries (unpublished data).
[b] From estimates of escapement by run year. Estimates were calculated using peak count live and dead fish expansion factors.
[c] Estimates of age structure at Big Creek Hatchery were used to estimate escapement by age category.
[d] May include small numbers of non-LEH stock.

Table 7 (RB-5). Total spawning escapement of LRH fall chinook in the Clatskanie River by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1976	--	--	--	--	--		--
1977	--	--	--	0[c]	--		--
1978	--	--	17[c]	--	--	--	--
1979		71[c]	--	0			
1980	4[c]	--	1	0[d]		--	
1981	--	1	9[d]	--		--	--
1982	0	6[d]	--	0[d]	--	--	--
1983	0[d]	--	0[d]	1[e]		--	--
1984	--	68d	35[e]	3			
1985	0[d]	3e	46	5	--	54	54
1986	0[e]	4	5	0	--	--	--
1987	3	0	0	--	--	--	--
1988	5	2					
1989	0	--	--	--		--	

[a] Estimates are from Washington Department of Fisheries (unpublished data).
[b] From estimates of escapement by run year. Estimates were calculated using peak count live and dead fish expansion factors.
[c] Estimates of age structure at Big Creek Hatchery were used to estimate escapement by age category.
[d] May include small numbers of non-LRB stock.
[e] Age structure determined from the analysis of 330 scale samples collected in the Clatskanie River and Big, Gnat, Bear, and Plympton creeks was used to estimate age structure for escapement in Big Creek.

Table 8 (RB-6). Total spawning escapement of LRH fall chinook in the Lewis and Clark River by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1976	. .	- -	- -	- -	. .	- -	- -
1977	--	- -		1[c]	. .	- -	- -
1978	- -	- -	31[c]	- -	. .	- -	- -
1979	- -	130[c]	- -	2	. .	- -	- -
1980	6[c]	--	60	0[d]	. .	- -	
1981	--	160	83[d]	--	. .		- -
1982	14	106[d]	- -	4[d]	. .	- -	- -
1983	0[d]	--	81[d]	11[e]	. .	- -	- -
1984	- -	991[d]	610[e]	25	. .	- -	- -
1985	12d	46[e]	104	4	. .	166	154
1986	3e	76	108	3	. .		- -
1987	10	21	27	- -	. .	- -	--
1988	0	4	- -	- -	--	- -	- -
1989	0	--	- -	- -	. .	- -	- -

a Estimates are from Washington Department of Fisheries (unpublished data).
b From estimates of escapement by run year. Estimates were calculated using peak count live and dead fish expansion factors.
c Estimates of age structure at Big Creek Hatchery were used to estimate escapement by age category.
d May include small numbers of non-LRH stock.
e Age structure determined from the analysis of 330 scale samples collected in the Clatskanie River and Big, Gnat, Bear, and Plympton creeks was used to estimate age structure for escapement in Big Creek.

Table 9 (RB-7). Total spawning escapement of LRH fall chinook in the South Fork Klaskanine River by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1978	--	--		--		--	--
1979	--	--	--	1	--	--	--
1980	--	--	26	0[c]		--	--
1981	--	69	24[c]	--		--	--
1982	6	12[c]	--	11[c]	--	--	--
1983	0[c]	--	200[c]	8[d]		--	--
1984	--	2,459[c]	446[d]	0	--	--	--
1985	29[c]	35d	26	0		90	61
1986	2[d]	4	54	0		--	--
1987	0	7	15	--		--	--
1988	0	16	--	--		--	--
1989	0	--	--	--		--	--

a Estimates are from Washington Department of Fisheries (unpublished data).
b From estimates of escapement by run year. Estimates were calculated using peak count live and dead fish expansion factors.
c May include small numbers of non-LRB stock.
d Age structure determined from the analysis of 330 scale samples collected in the Clatskanie River and Big, Gnat, Bear, and Plympton creeks was used to estimate age structure for escapement in Big Creek.

Table 10 (RB-8). Total spawning escapement of LRH fall chinook in the North Fork Klaskanine River by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1976	--	--		--	--		
1977	--	--	--	0	--	--	--
1978	--	--	2	--	--	--	--
1979		3		0	--	--	--
1980	0		8	0[c]	--		
1981	--	22	2[c]	--	--	--	--
1982	2	1[c]	--	--	--	--	--
1983	0[c]	--	--	ld	--	--	--
1984			17[d]	0	--	--	--
1985	--	ld	16	0	--	--	
1986	0[d]	35	7	0	--		
1987	0	0	0	--	--	--	--
1988	0	22	--	--	--	--	--
1989	0	--	--	--	--	--	--

[a] Estimates are from Washington Department of Fisheries (unpublished data).
[b] From estimates of escapement by run year. Estimates were calculated using peak count live and dead fish expansion factors.
[c] May include small numbers of non-LRH stock.
[d] Age structure determined from the analysis of 330 scale samples collected in the Clatskanie River and Big, Gnat, Bear, and Plympton creeks was used to estimate age structure for escapement in Big Creek.

Table 11 (RB-9). Total spawning escapement of LRH fall chinook in Youngs River by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1978			--	--	--	--	--
1979	--	--	--	0	--	--	--
1980		--	5	0[c]	--	--	--
1981	--	14	2=	--	--	--	--
1982	1	3[c]			--	--	--
1983	0[c]		--	-5[d]	--	--	—
1984	--	--	258[d]	0	--	--	--
1985	--	20d	51	0	--	--	--
1986	1[d]	36	17	0	--	--	--
1987	0	0	5	--	--	--	--
1988	0	14					
1989	0	--	--	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).
b From estimates of escapement by run year. Estimates were calculated using peak count live and dead fish expansion factors.
c May include small numbers of non-LRB stock.
d Age structure determined from the analysis of 330 scale samples collected in the Clatskanie River and Big, Gnat, Bear, and Plympton creeks was used to estimate age structure for escapement in Big Creek.

Table 12 (RB-10). Total spawning escapement of Rogue River stock fall chinook in Big Creek by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1982	-	--	--	-	-	-	-
1983	--	--	3	--	--	--	--
1984	--	0	--	--	--	--	--
1985	0	--	--	--	--	--	--
1986	--	--	4	--	--	--	--
1987	--	8	--	--	--	--	--
1988	0	--	--	--	--	--	--

[a] Estimates are from Washington Department of Fisheries (unpublished data).
[b] From estimates of escapement by run year. Estimates were calculated using peak count live and dead fish expansion factors.

Table 13 (RB-11). Total spawning escapement of Rogue River stock fall chinook in Plympton Creek by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1982	--	--	--	0	--	--	--
1983	--	--	0	--	--	--	--
1984	--	3	--	0	--	--	--
1985	0	--	10	1	--	--	--
1986	--	5	7	0	--	--	--
1987	0	3	1	--	--	--	--
1988	1	1	--	--	--	--	--
1989	5	--	--	--	--	--	--

[a] Estimates are from Washington Department of Fisheries (unpublished data).
[b] From estimates of escapement by run year. Estimates were calculated using peak count-live and dead fish expansion factors.

Table 14 (RB-12). Total spawning escapement of Rogue River stock fall chinook in Bear Creek by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1985	--		--				
1986	--	--	3	--	--	--	--
1987	--	0	--	--	--	--	--
1988	0	--	--	--	--	--	--

[a] Estimates are from Washington Department of Fisheries (unpublished data).
[b] From estimates of escapement by run year. Estimates were calculated using peak count live and dead fish expansion factors.

Table 15 (RB-13). Total spawning escapement of Rogue River stock fall chinook in the Lewis and Clark River by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1984		--	--	--	--		--
1985	--	--	38		--	--	
1986	--	0	--	--	--	--	--
1987	0	--	--	--	--	--	--

[a] Estimates are from Washington Department of Fisheries (unpublished data).
[b] From estimates of escapement by run year. Estimates were calculated using peak count live and dead fish expansion factors.

Table 16 (AI-l). Non-harvest recoveries of coded wire tagged wild fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Deschutes River	mainstem Col. R.[c] below Bonneville	Trap Returns		
	1983	--	6	6
	1984	--	4	4

[a] Based on the following tag codes: 07-18-35, 07-18-37, 07-21-45, 07-21-46.
[b] Modified from the Pacific States Marine Fisheries Commission coded wire tag database.
[c] Estimates are primarily returns to North Bonneville ladder and Bonneville Hatchery.

Table 17 (AI-2). Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Grays River	Col. R. Tribs.[d] below Bonneville	Spawning Grounds		
	1983	--	1	1
	1984	--	--	--
	1985	--	--	--
	1986	--	--	--
	1987	--	--	--
	1988	--	1	1
	1989	--	1	1
Spring Creek	Col. R. Tribs.[d] below Bonneville	Spawning Grounds		
	1982	--	1	1
Columbia River Tributaries (WA) below Bonneville	Col. R. Tribs.[d] below Bonneville	Spawning Grounds		
	1982	--	1	1
Hagerman NFH	mainstem Col. R.[c] below Bonneville	Hatchery Returns		
	1983	--	1	1
	1984	--	1	1
	1985	--	2	2
Hagerman NFH	mainstem Col. R.[c] below Bonneville	Trap Returns		
	1983	--	4	4

Table 17 (AI-2). (cont.) Non-harvest *recoveries* of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasfns.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
	mainstem Col. R.[c]			
Hagerman NFH	below Bonneville	Trap Returns (continued)		
	1984	--	5	5
	1985	--	4	4
	1986	--	1	1
	mainstem Col. R.[c]			
Kalama River	below Bonneville	Hatchery Returns		
	1979	--	1	1
Little White	mainstem Col. R.[c]			
Salmon River	below Bonneville	Hatchery Returns		
	1979	--	1	1
	1980	--	--	--
	1981	--	--	--
	1982	--	--	--
	1983	--	1	1
	1984	--	1	1
	1985	--	1	1
	1986	--	3	3
	1987	--	--	--
	1988	--	3	3
Little White	mainstem Col. R.[c]			
Salmon River	below Bonneville	Trap Returns		
	1987	--	1	1

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release aite	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
	mainstem			
Columbia River	mainstem Col. R.[c]			
(Bonn. - McNary)	below Bonneville	Hatchery Returns		
	1984	--	1	1
	1985	--	--	--
	1986	--		
	1987	--	- -	
	1988	--	104	104
Priest Rapids	mainstem Col. R.[c]			
spawning channel	below Bonneville	Hatchery Returns		
	1984	--	1	1
Priest Rapids	mainstem Col. R.[c]			
spawning channel	below Bonneville	Trap Returns		
	1983	--	12	12
	1984	--	23	23
	1985	--	25	25
	1986	--	22	22
	1987	--	1	1
	mainstem Col. R.[c]			
Rock Creek	below Bonneville	Trap Returns		
	1986	--	1	1
	mainstem Col. R.[c]			
Salmon River	below Bonneville	Trap Returns		
	1983	--	1	1

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbaein (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
	mainstem Col. R.[c]			
Snake River	below Bonneville	Trap Returns		
	1987	--	1	1
Snake River below	mainatem Col. R.[c]			
Hells Canyon Dam	below Bonneville	Hatchery Returns		
	1987	--	1	1
	mainstem Col. R.[c]			
Spring Creek	below Bonneville	Hatchery Returns		
	1979	--	48	48
	1980	--	--	--
	1981	--	--	--
	1982	--	--	--
	1983	--	16	16
	1984	--	29	29
	1985	--	11	11
	1986	--	2	2
	1987	--	8	8
	1988	--	11	11
	mainstem Col. R.[c]			
Spring Creek NFH	below Bonneville	Hatchery Returns		
	1984	--	13	13
	1985	--	100	100

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
	mainstem Col. R.[c]			
Spring Creek NFH	below Bonneville	Hatchery Returns (continued)		
	1986		49	49
	1987		1	1
	mainstem Col. R.[c]			
Spring Creek NFH	below Bonneville	Trap Returns		
	1987	--	1	1
	mainstem Col. R.[c]			
Turtle Rock pond	below Bonneville	Trap Returns		
	1986	--	17	17
	1987	--	1	1
	mainstem Col. R.[c]			
Trinity River	below Bonneville	Hatchery Returns		
	1983	--	1	1
	1984	--	--	--
	1985	--	1	1
	mainstem Cal. R.[c]			
Unknown	below Bonneville	Trap Returns		
	1983	a-	6	6
	1984	--	28	28
	1985	--	15	15
	1986	--	7	7
	1987	--	1	1

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river aubbasins.

Hatchery/Release site	Recovery site, Run Year(S)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
	mainstem Col. R.[c]			
Umatilla River	below Bonneville	Hatchery Returns		
	1983	--	3	3
	1984	--		--
	1985	--	2	2
	1986	--	--	--
	1987	--	3	3
	mainstem Col. R.[c]			
Umatilla River	below Bonneville	Trap Returns		
	1985	--	1	1
	1986	--	1	1
	1987	--	2	2
	mainstem Col. R.[c]			
Willamette River	below Bonneville	Hatchery Returns		
	1986	--	176	176
	1987	--	571	571
	1988	--	283	283
	mainstem Col. R.[c]			
Washougal River	below Bonneville	Hatchery Returns		
	1979	--	1	1
	1980		--	--
	1981	--		
	1982	--		

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
	mainstem Col. R.[c]			
Washougal River	below Bonneville	Hatchery Returns (continued)		
	1983	--	1	1
	1984	--	--	--
	1985	--	1	1
	1986	--	5	5
	1987	--	8	8
	1988	--	5	5
Abernathy Creek	Big Creek	Hatchery Returns		
	1980	--	6	6
	1981	--	--	--
	1982	--	1	1
	1983	--	--	--
	1984	--	1	1
Abernathy Creek	Big Creek	Spawning Grounds		
	1983	--	1	1
Columbia River Tributaries (WA) below Bonneville	Big Creek	Hatchery Returns		
	1982	--	5	5
	1983	--	--	
	1984	--	4	4
	1985	--	1	1

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Columbia River Tributaries (WA) below Bonneville	Big Creek 1984	Spawning Grounds	--	
Elokomin River	Big Creek 1979	Hatchery Returns	--	
	1980		--	
	1981		--	
	1982		--	
	1983		--	
	1984		--	
	1985		--	
	1986		--	
	1987		--	
	1988		--	
Elokomin River	Big Creek 1985	Spawning Grounds	--	
	1986		--	
	1987		--	
	1988		--	
	1989		--	
Grays River	Big Creek 1979	Hatchery Returns	--	
	1980		--	

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Grays River	Big Creek	Hatchery Returns (continued)		
	1981	--	--	--
	1982	--	--	--
	1983		--	--
	1984	--	13	13
	1985	--	9	9
	1986	--	51	51
	1987	--	61	61
	1988	--	123	123
Grays River	Big Creek	Spawning Grounds		
	1981	--	1	1
	1982	--	--	--
	1983	--	--	--
	1984	--	--	--
	1985		1	1
	1986	--	--	--
	1987	--	--	
	1988	--	2	2
	1989	--	4	4
Rogue River	Big Creek	Hatchery Returns		
	1988	--	1	1
Grays River	Gnat Creek	Spawning Grounds		
	1987	--	1	1
	1988		4	4
	1989	--	4	4

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
White Salmon R.	Gnat Creek	Spawning Grounds		
	1981	--	1	1
Grays River	Klaekanine River	Hatchery Returns		
	1987	--	2	2
	1988	--	1	1
Col. R. Tribs.[d] below Bonneville	col. R. Tribs.[d] below Bonneville	Spawning Grounds		
	1983	--	1	1
	1984	--	2	2
mainstem Col. R. below Bonneville	mainstem Col. R.[c] below Bonneville	Hatchery Returns		
	1979	--	46	46
	1980	--	--	--
	1981	--		--
	1982	--	--	--
	1983	--	71	73
mainstem Col. R. below Bonneville	mainstem Col. R.[c] below Bonneville	Trap Returns		
	1983	--	18	18
	1984	--	71	71
	1985	--	14	14
	1986	--	15	15
Big Creek	Big Creek	Hatchery Returns		
	1980	--	4	4

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbaain (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Big Creek	Big Creek	Hatchery Returns (continued)		
	1981	--	--	
	1982	--	69	69
	1983		--	--
	1984	--	77	77
	1985		60	60
	1986		149	149
	1987	--	78	78
	1988	--	425	425
Big Creek	Big Creek	Spawning Grounds		
	1981	--	4	4
	1982	--	34	34
	1983	--	18	18
	1984	--	14	14
	1985	--	16	16
	1986	--	2	2
	1987	--	1	1
	1988	--	--	
	1989	--	2	2
Klaskanine River	Klaskanine River	Hatchery Returns		
	1984	--	59	61
	1985	--	63	64
	1986	--	39	39
	1987	--	--	--
	1988	--	4	4

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River aubbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Klaskanine River	Klaskanine River	Spawning Grounds		
	1984	--	1	1
	1985	--	10	10
	1986	--	19	19
	1987	--	2	2
	1988	--	11	11
	1989	--	3	3

[a] Baaed on the following tag codes: 01-11-07, 03-42-02, 03-47-01, 05-01-50, 05-01-58, 05-02-02, 05-03-02, 05-03-49, 05-04-35, 05-05-02, 05-05-27, 05-05-28, 05-06-02, 05-06-39, 05-06-40, 05-06-41, 05-06-48, 05-06-49, 05-07-02, 05-07-40, 05-07-42, 05-07-45, 05-07-47, 05-07-49, 05-09-02, 05-10-50, 05-10-51, 05-10-52, 05-10-53, 05-10-54, 05-10-55, 05-10-56, 05-10-59, 05-11-42, 05-11-43, 05-11-44, 05-11-45, 05-11-46, 05-11-52, 05-12-51, 05-12-54, 05-12-56, 05-13-37, 05-13-54, 05-15-25, 05-15-27, 05-15-34, 05-15-35, 05-15-36, 05-15-37, 05-15-39, 05-18-58, 05-18-60, 05-41-01, 05-42-01, 05-43-01, 05-44-01, 05-45-01, 05-46-01, 05-49-01, 05-50-01, 05-54-01, 05-56-01, 05-58-01, 05-59-01, 05-60-01, 05-62-01, 06-56-16, 06-61-21, 07-17-04, 07-18-35, 07-18-37, 07-18-44, 07-21-45, 07-21-46, 07-21-59, 07-21-60, 07-21-62, 07-21-63, 07-22-27, 07-23-31, 07-23-33, 07-23-34, 07-24-10, 07-24-12, 07-26-63, 07-27-41, 07-28-35, 07-28-57, 07-28-58, 07-29-36, 07-31-24, 07-31-27, 07-31-33, 07-31-40, 07-31-43, 07-32-24, 07-32-25, 07-32-26, 07-32-27, 07-32-28, 07-32-29, 07-32-30, 07-32-31, 07-32-32, 07-32-33, 07-32-34, 07-32-35, 07-32-36, 07-32-37, 07-32-38, 07-33-19, 07-33-45, 07-33-47, 07-33-49, 07-33-50, 07-33-52, 07-33-53, 07-33-54, 07-33-55, 07-33-56, 07-34-34, 07-34-35, 07-34-36, 07-34-37, 07-34-38, 07-34-39, 07-34-40, 07-34-41, 07-34-42, 07-34-43, 07-34-53, 07-34-54, 07-34-55, 07-34-57, 07-34-58, 07-34-59, 07-34-60, 07-34-61, 07-34-62, 07-34-63, 07-35-01, 07-35-02, 07-35-03, 07-35-04, 07-35-29,

(cont.)

Table 17 (AI-2). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

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[a] (cont.) 07-38-15, 07-38-24, 07-38-25, 07-38-26, 07-38-46, 07-44-56, 09-16-10, 13-04-02, 13-08-07, 23-20-57, 23-20-60, 23-20-62, 23-20-63, 23-21-03, 23-21-06, 23-21-07, 23-21-11, 23-21-15, 23-21-17, 23-21-20, 23-21-21, 23-21-24, 23-21-25, 23-21-26, 23-21-27, 23-21-30, 23-21-31, 23-21-33, 23-21-36, 23-21-37, 23-21-38, 23-21-39, 23-21-40, 23-21-41, 23-21-42, 23-21-43, 23-21-44, 23-21-46, 23-21-47, 23-21-49, 23-21-50, 23-21-51, 23-21-52, 23-21-53, 23-21-54, 23-21-55, 23-21-56, 23-21-59, 23-21-60, 23-21-61, 23-21-62, 23-21-63, 23-22-01, 23-22-02, 23-22-03, 23-22-04, 23-22-05, 23-22-06, 23-22-08, 23-22-10, 23-22-11, 23-22-12, 23-22-13, 23-22-14, 23-22-17, 23-22-18, 23-22-19, 23-22-20, 23-22-21, 23-22-23, 23-22-24, 23-22-25, 63-16-03, 63-16-04, 63-16-41, 63-17-19, 63-19-39, 63-19-48, 63-20-17, 63-20-43, 63-21-52, 63-21-55, 63-22-34, 63-22-37, 63-22-51, 63-22-52, 63-22-60, 63-22-61, 63-22-63, 63-23-40, 63-24-56, 63-24-59, 63-24-61, 63-26-11, 63-26-12, 63-28-44, 63-28-59, 63-31-16, 63-31-19, 63-32-42, 63-32-43, 63-33-21, 63-33-26, 63-33-27, 63-33-34, 63-33-35, 63-34-07, 63-34-32, 63-34-33, 63-34-58, 63-34-59, **63-36-31,** 63-36-32, 63-37-59, 63-37-60, 63-37-61, 63-37-62, 63-38-20, 63-38-27, 63-38-28, **B5-01-09, B5-01-10, B5-01-12, B5-01-14,H1-02-03,** Hl-03-01, Hl-03-02, Hl-04-06, **H5-06-07.** Based on the following tag codes from fish of unknown rearing type (assumed to be hatchery): 03-17-30, 03-17-31, 03-17-32, 03-17-33, 03-17-36, 05-04-20, 05-10-22, 05-10-23, 10-22-10, 23-16-09, 23-16-11, 23-16-12, 23-16-13, 23-16-14, 23-16-15, 23-16-23, 23-16-25, 23-16-26, 23-16-27, 23-16-28, 23-16-29, 23-16-30, 23-16-31, 23-16-33, CEDY, CE, HO, LBYWLG, **LN*1,** RDPKLB, RDPKOR, RDYWPK, **YWBLLB*1.**

[b] Modified from the Pacific States Marine Fisheries Commission coded wire tag database.

[c] Estimates are primarily returns to North Bonneville ladder and Bonneville Hatchery.

[d] Release/recovery sites include Oregon tributaries below Bonneville Dam excluding sites located in the Klaskanine, Willamette, and Sandy river subbasins and in the Big, Gnat, and Tanner creek eubbasina.

Table 18 (AC-a). Age composition (freshwater.ocean) by run year for LRH fall chinook in Big Creek[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1987[b,c]	79	0	93	6	1					
1988[c]	72	0	4	96	0	--	--	0	--	--
1989	--	--	--	--	--	--	--	--	--	--
1990[c]	75	4	15	68	12	--	--	1	--	--
1991[b,c]	108	0	87	13	0	--	--	--	--	--

[a] Modified from Washington Department of Fisheries (unpublished data).
[b] Data available by total age only; freshwater age is assumed to be one year (see ADULT LIFE HISTORY, Age Structure).
[c] Age structure is based on an analysis of scale samples collected *from* spawning ground surveys.

Table 19 (AC-b). Age composition (freshwater.ocean) by run year for LRH fall chinook in Gnat Creek[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1987[b,c]	59	2	95	3	0	0	--	--	--	--
1988[d]	--	--	--	--	--	--	--	--	--	--
1989	--	--	--	--	--	--	--	--	--	--
1990[c]	11	0	9	73	9	9	--	--	--	--
1991[b,c]	23	0	91	9	0	0	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).

b Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Age Structure).

c Age structure is based on an analysis of scale samples collected from spawning ground surveys.

d For data on age structure of a combined sample from the Clatskanie River and Big, Gnat, Plympton, and Bear creeks, see ADULT LIFE HISTORY, Ase Structure.

Table 20 (AC-c). Age composition (freshwater.ocean) by run year for LRH fall chinook in Plympton Creek[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1987[b,c]	70	0	97	3	0	--	—	—	--	--
1988[d]	--	—	—	--	--	--	—	—	--	--
1989	--	--	--	--	--	--	--	--	--	--
1990[c]	42	24	21	50	5	--	--	--	--	--
1991[b,c]	80	1	94	5	0	--	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).

b Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Age Structure).

c Age structure is based on an analysis of scale samples collected from spawning ground surveys.

d For data on age structure of a combined sample from the Clatskanie River and Big, Gnat, Plympton, and Bear creeks, see ADULT LIFE HISTORY, Aae Structure.

Table 21 (AC-d). Age composition (freshwater.ocean) by run year for LRH fall chinook in **Bear Creek**[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1987[b,c]	70	0	97	3	0	--	--	--	--	--
1988[d]	--	--	--	--	--	--	--	--	--	--
1989	--	--	--	--	--	--	--	--	--	--
1990[c]	42	10	14	69	7	--	--	--	--	--
1991[b,c]	76	3	91	6	0	--	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).
b Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Age Structure).
c Age structure is based on an analysis of scale samples collected from spawning ground surveys.
d For data on age structure of a combined sample from the Clatskanie River and Big, Gnat, Plympton, and Bear creeks, see ADULT LIFE HISTORY, Aae Structure.

Table 22 (AC-e). Age composition (freshwater.ocean) by run year for LRH fall chinook in the Clatskanie River[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1987[b,c]	12	0	100	--	0	--	--	--	--	--
1988[d]	--	--	--	--	--	--	--	--	--	--
1989	--	--	--	--	--	--	--	--	--	--
1990[c]	2	50	0	--	50	--	--	--	--	--

[a] Estimates are from Washington Department of Fisheries (unpublished data).
[b] Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Age Structure).
[c] Age structure is based on an analysis of scale samples collected from spawning ground surveys.
[d] For data on age structure of a combined sample from the Clatskanie River and Big, Gnat, Plympton, and Bear creeks, see ADULT LIFE HISTORY, Aae Structure.

Table 23 (AC-f). Age composition (freshwater.ocean) by run year for LRH fall chinook in the Lewis and Clark River[a].

Run Year	N	Age Composition (%)								
		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1990[b]	29	0	14	86	0	--	--	--	--	--
1991[b,c]	10	0	10	80	10	--	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).
b Age structure is based on an analysis of scale samples collected from spawning ground surveys.
c Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Age Structure).

Table 24 (AC-g). Age composition (freshwater.ocean) by run year for LRH fall chinook in the South Fork Klaskanine River[a].

Run Year	N	Age Composition (%)								
		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1990[b]	9	0	11	78	--	--	--	11	--	--
1991[b,c]	12	0	50	50	--	--	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).
b Age structure is based on an analysis of scale samples collected from spawning ground surveys.
C Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Age Structure).

Table 25 (AC-h). Age composition (freshwater.ocean) by run year for LRH fall chinook in the North Fork Klaskanine River[a].

Run Year	N	Age Composition (%)								
		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1990[b]	2	0	0	100	--	--	--	--	--	--
1991[b,c]	6	0	100	0	--	--	--	--	--	--

[a] Estimates are from Washington Department of Fisheries (unpublished data).
[b] Age structure is based on an analysis of scale samples collected from spawning ground surveys.
[c] Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Age Structure).

Table 26 (AC-i). Age composition (freshwater.ocean) by run year for LRH fall chinook in **Youngs River**[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1990[b]	5	0	0	100	--	--	--	--	--	--
1991[b,c]	7	0	71	29	--	--	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).
b Age structure is based on an analysis of scale samples collected from spawning ground surveys.
c Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Age Structure).

Table 27 (AC-j). Age composition (freshwater.ocean) by run year for LRH fall chinook in the Clatskanie River and Big, Gnat, Plympton, and Bear creeks[a].

Run Year	N	Age Composition (%)								
		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1988[b,c]	330	<1	7	91	2	--	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).
b Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Age Structure).
c Age structure is based on an analysis of scale samples collected from spawning ground surveys.

Table 28 (AS-l). Percent females by brood year and age class (freshwater.ocean) for LRH fall chinook in Big Creek[a,b].

	Females (%)								
Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1984	--	--	43	--	--	--	--	--	--
N	--	--	69	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--
1985	--	67	--	--	--	--	--	--	--
N	--	3	--	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--
1986	--	--	--	--	--	--	--	--	--
N	--	--	--	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--
1987[c]	--	--	64	--	--	--	--	—	—
N	--	--	14	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--
1988[c]	--	51	--	--	--	--	--	--	--
N	--	94	--	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).
b Scale samples collected during spawner surveys were analyzed to determine age.
c Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Sex Ratio).

Table 29 (As-2). Percent females by brood year and age class (freshwater.ocean) for LRH fall chinook in Plympton Creek[a,b].

	Females (%)								
Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1987[c]	--	--	0	--	--	--	--	--	--
N	--	--	4	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--
1988[c]	--	8	--	--	--	--	--	--	--
N	--	75	--	--	--	--	--	--	--
st. dev.	--	--	--	--	a-	--	--	--	--
1989[c]	0	--	--	--	--	--	--	--	--
N	1	--	--	--	--	--	--	--	--
et. dev.	--	--	--	--	--	--	--	--	--

a Estimates are from Washington Department of Fisheries (unpublished data).
b Scales samples collected during spawner surveys were analyzed to determine age.
c Data available by total age only; freshwater age assumed to be one year (see ADULT LIFE HISTORY, Sex Ratio).

REFERENCES

Howell, P.J., K. Jones, D. Scamecchia, L. **LaVoy,** W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, **coho,** chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract **DE-AI79-84BP12737)** to Bonneville Power Administration, Portland, Oregon.

Washington Department of Fisheries, Washington Department of Wildlife, and Oregon Department of Fish and Wildlife. 1990. Salmon and steelhead production plan (lower Columbia River subbasin). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon.

LOWER COLUMBIA RIVER SUBBASIN

Hatchery Produced Fall Chinook Salmon

ORIGIN

Records of hatchery releases in the lower Columbia River subbasin date back to the late 1800's (Howell et al. 1985). Hatchery releases were summarized beginning with the 1951 brood release (Table 1), however, records prior to the 1982 brood release may be incomplete. Hatchery releases in the subbasin have primarily been from the lower Columbia River Hatchery stock (LRH) of fall chinook; which are informally called 'Yules". The name "tule" was originally used to describe that portion of the wild run of fall chinook that were already dark when they entered freshwater to spawn (Van Hyning 1967). This early segment of the wild run was then used as broodstock for hatchery production of the LRH stock. Because of this run timing it is believed that fall chinook, classified as Yules", are extremely maladapted to survival in the wild (Letter from Bob Buckman dated 8/12/92, Oregon Department of Fish and Wildlife, Seaside, Oregon). Hatchery facilities located in Oregon that currently rear LRH fall chinook for release into the subbasin include Bonneville and Big Creek.

Fall chinook that were classified as tules (Bonneville Pool Hatchery stock; BPH) were also transferred from Spring Creek Hatchery to lower Columbia River subbasin hatchery facilities for incorporation with LRH fall chinook held for broodstock (Washington Department of Fisheries et al. 1990; Howell et al. 1985). Spring Creek Hatchery is the primary source of BPH fall chinook in the mid-Columbia River subbasin. As a result of transfers among lower Columbia River hatcheries, the LRH stock is considered to be a large, blended stock (Washington Department of Fisheries et al. 1990; Howell et al. 1985). It is also believed that because of stock transfers among lower and mid- Columbia River subbasin hatchery facilities and Bonneville Hatcheries practice of incorporating stray BPH hatchery fish into the LRH broodstock that the BPH and LRH stocks are very similar to each other genetically (personal communication on 8/20/92 with Steve King, Oregon Department of Fish and Wildlife, Clackamas, Oregon).

Three substocks are recognized within the LRH stock group. They include the "blended LRH", Kalama River, and Cowlitz Hatchery substocks (Howell et al. 1985). In addition to the "blended (LRH) hatchery stock" (Howell et al. 1985), the Cowlitz and Kalama substocks (personal communication on 9/23/92 with Steve King, Oregon Department of Fish and Wildlife, Clackamas, Oregon) of the LRH stock have been released in the subbasin (Table 1). Although the BPH stock has been utilized as hatchery broodstock at Bonneville Hatchery there are no records of the release of BPH stock in the subbasin (Washington Department of Fisheries et al. 1990; Howell et al. 1985).

Other stocks of fall chinook introduced into the lower Columbia River subbasin include the Bonneville Upriver Bright (BUB), Rogue River, and Snake River stocks (Table 1). The Bonneville substock of the Upriver Bright stock has been released in the subbasin annually since 1982 (Table 1; hatchery records prior to the 1982 brood year may be incomplete). BUB stock was developed at Bonneville Hatchery from fall chinook that were trapped at Bonneville Dam and are believed to have originated in the middle and upper reaches of the Columbia River subbasin (Howell et al. 1985). Currently, the broodstock consists of BUB stock adults returning to Bonneville Hatchery, the trapping of upriver-bound fish at the dam for broodstock has not occurred since 1988 (Howell et al. 1985; personal communication on 9/23/92 with Steve King, Oregon Department of Fish and Wildlife, Clackamas, Oregon). As part of mitigation agreements, the Bonneville fall chinook program must provide 7,500

adult BUB fall chinook to fisheries in the Columbia River below Bonneville Dam (Washington Department of Fisheries et al. 1990). Rogue River hatchery stock is reared at Big Creek Hatchery and CEDC, and has been released annually since 1983 (Table 1). In addition, Snake River stock fall chinook were released in the lower Columbia River subbasin from 1980-82 (Table 1).

Due to the fact that "all natural and most hatchery production is considered to be from one stock (LRH)..." (Washington Department of Fisheries et al. 1990), as well as the fact that both the LRH and BPH stocks are probably genetically similar, managers are not concerned with either the potential genetic ramifications associated with stock transfers that occur among lower Columbia River hatcheries (and from Spring Creek Hatchery to lower Columbia River hatcheries) or the impact of stray hatchery fish spawning with the natural population (Washington Department of Fisheries et al. 1990; personal communication on 8/20/92 with Steve Ring, Oregon Department of Fish and Wildlife, Clackamas, Oregon).

DISTRIBUTION

Subbasin

Hatchery fall chinook have been released in various locations in the lower Columbia River subbasin (Table 1). LRH fall chinook have been released into the mainstem Columbia River and into mainstem Columbia River tributaries; including Tanner Creek, Big Creek, Youngs River, and the North and South forks of the Klaskanine River. BUB fall chinook have been released into the mainstem Columbia River and in Tanner Creek. Rogue River stock fall chinook have been released into Big Creek and the Youngs and South Fork Klaskanine rivers and Snake River stock fall chinook were released into Tanner Creek.

PRODUCTION

Releases

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Big Creek, Klaskanine, and the CEDC hatcheries (Table 1). Annual estimates of fry releases, prior to 1983, may be incomplete. Beginning with the 1983 estimate, annual numbers released ranged from 970 to 6,597,749 fish (Table 1). Size at release ranged from 1,064 to 126.9 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Big Creek, Klaskanine, and CEDC hatcheries and Stayton Pond (Table 1). Annual estimates of fingerling releases, prior to 1983, may be incomplete. Beginning with the 1983 estimate, annual numbers released ranged from 13,369,732 to 29,345,603 fish (Table 1). Size at release ranged from 122 to 20.7 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Big Creek and CEDC hatcheries (Table 1). Annual estimates of smolt releases, prior to 1983, may be incomplete. Beginning with the 1983 estimate, annual numbers released ranged from 134,132 to 2,220,068 fish (Table 1). Size at release ranged from 20.0 to 5.4

ADULT LIFE HISTORY

Escapement

Hatchery Facilities

Timing: Run year specific information on the temporal distribution of run timing and spawning for BUB fall chinook are available in Howell et al. (1985).

Numbers: Estimates of the number of hatchery fall chinook returning to Oregon's hatchery facilities located in the lower Columbia River subbasin are available for Bonneville (Tables 2-4), Klaskanine (Tables 5 and 6), Big Creek (Tables 7 and 8), and CEDC (Tables 9 and 10) hatcheries. Estimates include returns of both marked and unmarked fall chinook. Unmarked fish returning to Bonneville Hatchery are assumed to be hatchery fish based on the fact that natural production is limited in Tanner Creek, the stream in which Bonneville Hatchery is located (personal communication on 8/10/92 with Don Swartz, Oregon Department of Fish and Wildlife, Clackamas, Oregon). Unmarked fish returning to other hatchery facilities are assumed to be hatchery fish based on the limited amount of natural spawning that has been observed in tributaries located in the subbasin (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, ORIGIN).

Age structure was usually determined from an analysis of scales from a sub-sample of the returning fish, and a correction factor calculated from coded wire tag data (personal communication on 8/31/92 with Joe Hymer, Washington Department of Fisheries, Battleground, Washington). When data was available, by total age only, returning fish were assumed to have migrated as sub-yearling smolts (see ADULT LIFE HISTORY, Age Structure). Composition of returning fall chinook was determined by expanding coded wire tag data (personal communication on 8/10/92 with Harold Hansen, Oregon Department of Fish and Wildlife, Clackamas, Oregon). Freshwater age was designated as 1 year for juvenile fish migrating as sub-yearling smolts.

LRH fall chinook returning from the 1978-82 brood releases of both sub-yearling and yearling (age 1+) smolts were not distinguished based on life history stage at release as juveniles. However, Hansen and Thoming (1981), Hansen et al. (1982), Hansen and Johnson (1983), Hansen and Johnson (1984), and Hansen and Johnson (1985) report that LRH fall chinook that exhibited a 2 year freshwater age pattern (yearling smolt) returned exclusively to Bonneville Hatchery. LRH fall chinook with a 2 year freshwater age pattern comprised from 0.5% to 8.0% of the returns in the 1981-85 run years (Hansen and Thoming 1981; Hansen et al. 1982; Hansen and Johnson 1983; Hansen and Johnson 1984; and Hansen and Johnson 1985). The release of age 1+ LRH fall chinook smolts was discontinued after the 1981 brood release.

Bonneville Hatchery is the only hatchery facility in the lower Columbia River subbasin where total brood return estimates are available for LRH, BPH, and BUB stock fall chinook. Annual estimates of escapement to Bonneville Hatchery ranged from 170 to 9,185 jack and 2,358 to 40,452 adult LRH fall chinook (Table 2); 153 to 1,469 jack and 1,966 to 12,692 adult BUB fall chinook (Table 3); and 0 to 256 jack and 0 to 3,652 adult BPH fall chinook (Table 4).

Annual estimates of LRH fall chinook jack escapement ranged from 0 to 3 fish at Klaskanine Hatchery (Table 5); 46 to 3,665 fish at Big Creek Hatchery (Table 7); and 0 to 2 fish at the CEDC Hatchery (Table 9).

Annual estimates of Rogue River stock fall chinook jack escapement ranged from 0 to 4 fish

at Klaskanine Hatchery (Table 6); 41 to 199 fish at Big Creek Hatchery (Table 8); and 0 to 2 fish at the CEDC Hatchery (Table 10).

Survival: Smolt to returning jack and adult survival rates were estimated at Bonneville Hatchery for coded wire tagged LRH and BUB fall chinook.

Smolt to returning jack and adult survival rates for LRH fall chinook ranged from 0.0% to 0.244% for age 2 fish, 0.006% to 0.144% for age 3 fish, 0.012% to 0.435% for age 4 fish, and 0.0% to 0.06% for age 5 fish (Hansen 1983, cited by Howell et al. 1985).

Smolt to returning jack and adult survival rates for BUB fall chinook ranged from 0.0% to 0.374% for age 2 fish, 0.002% to 0.136% for age 3 fish, 0.021% to 0.424% for age 4 fish, 0.008% to 0.140% for age 5 fish, and 0.0% to 0.002% for age 6 fish (Hansen 1983, cited by Howell et al. 1985).

Fork Length

Fork length was measured for LRH and BPH fall chinook returning to Bonneville Hatchery (Tables 11-12) and LRH fall chinook returning to Klaskanine (Table 13) and Big Creek (Table 14) hatcheries. Age was determined based on an analysis of scales. When data was available, by total age only, returning fish were assumed to have migrated as sub-yearling smolts (see ADULT LIFE HISTORY, Age Structure). All unmarked fish were assumed to be hatchery fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Mean fork length of LRH fall chinook ranged from 51 cm to 68 cm for ocean age 1 fish, 77 cm to 89 cm for ocean age 2 fish, 88 cm to 96 cm for ocean age 3 fish, and 92 cm to 106 cm ocean age 4 fish (Tables 11, 13, and 14).

Mean fork length of BUB fall chinook was 61 cm for ocean age 1 fish; ranged from 69 cm to 76 cm for ocean age 2 fish and 81 cm to 88 cm for ocean age 3 fish; and was 89 cm for ocean age 4 fish (Table 12).

Age Structure

Age structure was estimated for LRH, BUB, and BPH fall chinook sampled at Bonneville Hatchery (Tables 15-20) and LRH and Rogue River stock fall chinook at Klaskanine (Tables 21 and 22), Big Creek (Tables 23 and 24), and CEDC (Tables 25 and 26) hatcheries. Age structure was determined based on estimates of brood returns by age category (see ADULT LIFE HISTORY, Escanement, Hatchery Facilities).

Although age structure varied considerably among tributaries and among years, the data indicates that LRH fall chinook primarily spend 2 to 3 years in the ocean (Tables 16-26).

Sex ratio

Sex ratios (percent females) were estimated for LRH and BUB fall chinook returning to Bonneville Hatchery (Tables 27-30) and LRH fall chinook returning to Big Creek (Tables 31-33), and Klaskanine (Table 34) hatcheries. Age was usually determined based on an analysis of scales or coded wire tags. When data was available, by total age only, returning fish were assumed to have migrated as sub-yearling smolts (see ADULT LIFE HISTORY, Escanement, Hatchery Facilities). All unmarked fish were assumed to be hatchery fish (see ADULT LIFE HISTORY, Escanement, Hatchery Facilities).

Annual estimates of mean sex ratio for returns of LRH fall chinook ranged from 23% to

52% at Bonneville Hatchery (Table 27) and 33 % to 57% at Big Creek Hatchery (Table 3 1).

Annual estimates of sex ratio for fall chinook, classified as LRH stock fish, varied widely among age categories (Tables 28, 29, and 32-34).

Annual estimates of sex ratio for returns of BUB fall chinook to Bonneville Hatchery was 22% for ocean age 1 fish; ranged from 19% to 81% for ocean age 2 fish and 71% to 76% for ocean age 3 fish; and was 71% for ocean age 4 fish (Table 30).

Fecundity

Annual estimates of mean fecundity for LRH fall chinook at Big Creek Hatchery ranged from 4,808 to 5,842 eggs per female (Table 37). All unmarked fish were assumed to be hatchery fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Mark Recoveries

Coded wire tagged hatchery fall chinook, released as juveniles in the lower Columbia River subbasin, were recovered over a wide geographical area in the Columbia River Basin and at several sites located outside of the basin. Coded wire tagged fish, returning from subbasin hatchery production releases, were recovered in the Columbia River Basin at sites located in the mid-Columbia, upper Columbia, Willamette, Sandy, Deschutes, Salmon, and Snake river subbasins (Table 36). Coded wire tagged fish, returning from subbasin hatchery production releases, were recovered outside of the Columbia River Basin at sites located in the Trask River, on the Oregon coast, and the Deschutes River, a tributary to Puget Sound in Washington (Table 36).

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile fall chinook for subbasin hatchery production (Tables 37-40). Parasites include ***Ichthyobodo sp.*** (Costia) and ***Trichodinu spp.*** Bacterial diseases include ***Renibacterium salmoninarum*** (bacterial kidney disease) and ***Cytophaga psychrophila*** (cold water disease). Viral diseases include Erythrocytic Inclusion Body Syndrome (EIBS), Infectious Hematopoietic Necrosis (IHN), and Viral Erythropoietic Necrosis (VEN).

Table 1 (TR). Hatchery releases of fall chinook into the lower Coltiia River subbesin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1951	LRH	Bonneville	fing.	06/15/52[d]	--	357.0	300,000	Lower Colmbia R. subbasin	--
1951	LRN	Bonneville	fing.	06/15/52[d]	--	320.0	200,000	Clear Creek	--
1951	LRH	Bonneville	fing.	06/15/52[d]	--	380.0	75,000	Deep Creek	--
1951	LRH	Bonneville	fing.	06/15/52[d]	--	320-380	250,000	Eagle Creek	--
1951	LRH	Bonneville	fing.	06/15/52[d]	--	380.0	100,000	Roaring River	--
1951	LRH	Delph Creek	fing.	01/01/52	12/31/52[e]	--	406,610	Delph Cr	--
1952	LRH	Bonneville	fing.	03/15/53[d]	--	352.0	1,000,000	Lower Colmbia R. subbasin	--
1952	LRH	Bonneville	fing.	03/15/53[d]	--	552.0	500,000	Clear Creek	--
1952	LRH	Bonneville	fing.	03/15/53[d]	--	675.0	500,000	Eagle Creek	--
1952	LRH	Delph Creek	fing.	01/01/53	12/31/53[e]	--	416,000	Delph Cr	--
1953	LRH	Delph Creek	fing.	05/15/54[d]	--	--	95,000	Delph Cr	--
1953	LRH	Delph Creek	fing.	01/01/54	12/31/54[e]	--	100,000	Delph Cr	--
1953	LRH	oxbow	fing.	04/15/54[d]	--	350.0	660,000	Lower Colmbia R. subbesin	--
1953	LRH	oxbow	fing.	04/15/54[d]	--	350.0	195,700	Clear Creek	--
1954	LRH	oxbow	smolt	05/15/57[d]	10/15/55[d]	293.0 41.0	1,769,138 40,010	Lover Eagle Columbia Creek R. subbesin	--
1956	LRH	Eagle Creek NFH	fing.	[illegible]					--
1957	LRH	Eagle Creek NFH	fins.	05/15/58[d]	--	244.0	1,750,008	Eagle Creek	--
1958	LRH	Eagle Creek NFH	fing.	02/15/59[d]	--	1,020	3,084,145	Eagle Creek	--
1958	LRH	Eagle Creek NFH	fing.	05/15/59[d]	--	324.0	2,601,066	Eagle Creek	--
1959	LRH	Eagle Creek NFH	fing.	04/15/60[d]	--	986.0	1,012,607	Eagle Creek	--
1959	LRH	Eagle Creek NFH	fing.	06/15/60[d]	--	230.0	2,890,274	Eagle Creek	--
1960	LRH	Eagle Creek NFH	fing.	06/15/61[d]	--	209.0	2,193,611	Eagle Creek	--
1960	LRH[f]	Big Cr.	fing.	03/15/61[d]	--	167.0	1,723,491	Big Cr.	--
1960	LRH[f]	Klaskanine	fing.	03/15/61[d]	--	220.0	101,420	Klaskanine R.	--
1961	LRH[f]	Big Cr.	fing.	05/15/62[d]	--	183.0	1,048,445	Big Cr.	--
1961	LRH[f]	Klaskanine	fing.	04/15/62[d]	--	216.0	568,032	Klaskanine R.	--
1962	LRH	Eagle Creek NFH	fing.	05/15/63[d]	--	323.0	2,435,531	Eagle Creek	--
1962	LRH[f]	Big Cr.	fing.	05/15/63[d]	--	156.0	1,110,876	Big Cr.	--
1962	LRH[f]	Klaskanine	fing.	04/15/63[d]	--	131.0	137,132	Klaskanine R.	--
1963	LRH	Eagle Creek NFH	fing.	06/15/64[d]	--	435.0	1,427,326	lower Columbia R. subbesin	--
1963	LRH[f]	Big Cr.	fing.	05/15/64[d]	--	96.0	1,856,825	Big Cr.	--
1963	LRH[f]	Klaskanine	fing.	05/15/64[d]	--	72.0	252,216	NFk Klaskanine R.	--
1964	LRH	Eagle Creek NFH	fing.	05/15/65[d]	--	479.0	554,290	Lower Colmbia R. subbesin	--
1964	LRH	Big Creek	fry	03/15/65[d]	--	1,188	118,576	Lower Colunbia R. subbasin	--
1964	LRH	Klaskanine	fing.	03/15/65[d]	--	474.0	302,412	Lower Columbia R. subbasin	--
1964	LRH	Klaskanine	fing.	03/15/65[d]	--	412.0	315,592	Lower Colmbia R. subbssin	--
1964	LRH	Klaskanine	fing.	04/15/65[d]	--	421.0	303,541	Lower Colunbia R. subbssin	--
1964	LRH	Nehalem	fing.	05/15/65[d]	--	843.0	541,206	Lower Columbia R. subbesin	--
1964	LRH	Nehalem	fing.	05/15/65[d]	--	800.0	260,800	Lower Columbia R. subbesin	--
1964	LRH	Nehalem	fing.	06/15/65[d]	--	444.0	372,835	Lower Columbia R. subbesin	--

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nunber Released	Release Location	CUT Fin	Code/ Clip[c]
1964	LRH[f]	gig Cr.	fing.	01/01/65	12/31/65[e]	90.0	1,444,325	Big Cr.	--	
1964	LRH[f]	KLaskanine	fing.	06/15/65[d]	--	92.0	191,636	NFk Klaskanine R.	--	
1965	LRH[f]	Big Cr.	fing.	05/15/66[d]	--	80.0	1,115,354	Big Cr.	--	
1965	LRH[f]	KLaskanine	fing.	05/15/66[d]	--	78.0	324,246	Klaskanine R.	--	
1966	LRH	oxbow	fry	02/15/67[d]	--	1,214	700,000	Collawash & Hot Spr. Fk.	--	
1966	LRH	oxbow	fry	02/15/67[d]	--	1,214	1,043,000	Roaring R. & Austin Hot Spr.	--	
1966	LRH	Cascade	fing.	05/15/67[d]	--	452.0	501,720	Coltawash R 8 Hot Spr. Fk.	--	
1966	LRH[f]	Big Cr.	fry	12/15/66[d]	--	1,187	5,000	Bear Cr.	--	
1966	LRH[f]	Big Cr.	fing.	05/15/67[d]	--	79.0	2,623,795	Big Cr.	--	
1966	LRH[f]	Klaskanine	fing.	05/15/67[d]	--	73.0	470,600	NFk Klaskanine R.	--	
1967	BPH	Spring Creek	fing.	02/15/68[d]	--	660.0	1,050,000	Paradise & Barton	--	
1967	BPH	White Salmon	fing.	06/15/68[d]	--	182.0	1,027,000	Paradise	--	
1967	LRH	Eagle Creek NFH	fing.	05/15/68[d]	--	487.0	1,813,800	Barton	--	
1967	LRH[f]	Big Cr.	fing.	05/15/68[d]	--	79-80	5,218,778	Big Cr.	--	
1968	LRH[f]	Big Cr.	fing.	05/15/69[d]	--	76-94	3,312,529	Big Cr.	--	
1968	LRH[f]	Bonneville	fing.	06/15/69[d]	--	160.0	1,382,091	Big Cr.	--	
1968	LRH[f]	Cascade	fing.	06/15/69[d]	07/15/69[d]	117.0	4,508,385	Big Cr.	--	
1969	LRH[f]	Big Cr.	fing.	05/15/70[d]	--	78.0	4,164,795	Big Cr.	--	
1969	LRH[f]	Kleskanine	fing.	05/15/70[d]	--	80.0	492,633	NFk Klaskanine R.	--	
1969	LRH[f]	Klaskanine	fing.	05/15/70[d]	--	79.0	1,437,995	Big Cr.	--	
1969	LRH[f]	Sandy	fing.	06/15/70[d]	--	79.6	946,846	Big Cr.	--	
1969	LRH[f]	Wahkeena	fing.	05/15/70[d]	--	62.0	470,318	Big Cr.	--	
1970	LRH	Stayton Pond	smolt	06/15/71[d]	--	82.0	313,373	Paradise	--	
1970	LRH[f]	Big Cr.	smolt	11/15/71[d]	--	7.3	123,282	Big Cr.	--	
1970	LRH[f]	Big Cr.	fing.	05/15/71[d]	--	136-224	5,879,654	Big Cr.	--	
1971	LRH	Cascade	fry	03/15/72[d]	--	1,045	806,055	Paradise & Barton	--	
1971	LRH	Sandy	fing.	04/15/72[d]	--	334.0	424,000	Paradise & Barton	--	
1971	LRH[f]	Big Cr.	smolt	11/15/72[d]	--	6.1	42,032	Big Cr.	--	
1971	LRH[f]	Big Cr.	smolt	11/15/72[d]	--	6.1	55,717	Big Cr.	--	
1971	LRH[f]	Big Cr.	fing.	05/15/72[d]	--	75-88	5,000,000	Big Cr.	--	
1971	LRH[f]	Big Cr.	fing.	05/15/72[d]	--	75-88	5,037,534	Big Cr.	--	
1971	LRH[f]	Klaskanine	fing.	05/15/72[d]	--	98.0	1'023,344	NFk Ktaskanine R.	--	
1972	LRH[f]	Big Cr.	fing.	05/15/73[d]	--	78-85	5,573,396	gig Cr.	--	
1973	LRH[f]	Big Cr.	fing.	05/15/74[d]	--	81.0	6,168,557	Big Cr.	--	
1974	LRH[f]	Big Cr.	fry	12/15/74[d]	--	1,062	784,387	Mill Cr.	--	
1974	LRH[f]	KLaskanine	smolt	11/15/75[d]	--	9.4-9.5	80,447	NFk Klaskanine R.	--	
1974	LRH[f]	Big Cr.	fing.	04/15/75[d]	--	207.0	391,366	Big Cr.	--	
1974	LRH[f]	Big Cr.	fing.	05/15/75[d]	--	767.0	5,802,164	Big Cr.	--	
1974	LRH[f]	KLaskanine	fing.	05/15/75[d]	--	71.0	672,319	NFk Klaskanine R.	--	
1974	LRH[f]	KLaskanine	fing.	06/15/75[d]	--	58.0	49,564	NFk Klaskanine R.	--	

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1975	LRH[f]	Klaskanine	smolt	11/15/76[d]	--	8.7	45,496	NFk Klaskanine R.	--
1975	LRH[f]	Big Cr.	fing.	05/15/76[d]	--	71.0	5,644,015	Big Cr.	--
1975	LRH[f]	Klaskanine	fing.	05/15/76[d]	--	72.0	3,935,644	NFk Klaskanine R.	--
1976	LRH[f]	Big Cr.	fing.	05/15/77[d]	--	81.0	5,876,072	Big Cr.	--
1976	LRH[f]	Klaskanine	fing.	05/15/77[d]	--	92.0	7,085,503	NFk Klaskanine R.	--
1976	LRH[f]	Klaskanine	fing.	05/15/77[d]	--	73.0	99,741	NFk Klaskanine R.	--
1977	LRH[f]	Big Cr.	fing.	05/15/78[d]	--	75.0	5,649,295	Big Cr.	
1977	LRH[f]	Klaskanine	fing.	05/15/78[d]	06/15/78[d]	71,78	1,907,573	NFk Klaskanine R.	--
1977	LRH[f]	Klaskanine	fing.	05/15/78[d]	06/15/78[d]	51,78	2,381,583	NFk Klaskanine R.	--
1978	LRH[f]	Big Cr.	fing.	05/15/79[d]	--	81.0	251,556	Big Cr.	
1978	LRH[f]	Big Cr.	fing.	05/15/79[d]	--	81.0	4,989,192	Big Cr.	--
1978	LRH[f]	Bonneville	fing.	05/15/79[d]	--	106-110	82,779	NFk Klaskanine R.	--
1978	LRH[f]	Klaskanine	fing.	05/15/79[d]	--	71.0	177,320	NFk Klaskanine R.	--
1978	LRH[f]	Klaskanine	fing.	05/15/79[d]	--	71.0	5,313,473	NFk Klaskanine R.	--
1978	Snake River	Bonnevi lle	smolt	03/13/80	--	8.2	246,686	Tanner Cr	--
1978	Snake River	Bonnevi lle	smolt	03/13/80	--	8.2	50,525	Tanner Cr	AD-CUT
1978	Tamer Cr	Bonneville	smolt	03/13/80	--	6.0	49,094	Tanner Cr	AD-CUT
1979	Big Cr[g]	Big Creek	fing.	07/07/80	--	36.0	247	Big Creek	--
1979	Big Cr[g]	Big Creek	fing.	07/07/80	--	36.0	5	Big Creek	AD-CUT
1979	Big Cr[g]	Big Creek	fing.	05/23/80	--	69.0	44,076	Big Creek	AD-CUT
1979	Big Cr[g]	Big Creek	fing.	05/13/80	--	77.5	4,707,591	gig Creek	--
1979	Big Cr[g]	Big Creek	fing.	05/13/80	--	77.5	96,073	Big Creek	AD-CUT
1979	Snake River	Bonneville	fing.	06/30/80	--	83.0	103,194	Tanner Cr	AD-CUT
1979	Tanner Cr	Bonneville	fing.	05/05/80	--	67.9	4,050,170	Tanner Cr	--
1979	Tanner Cr	Bonneville	fing.	05/28/80	--	70.0	2,734,902	Tanner Cr	--
1979	Tanner Cr	Bonneville	fing.	05/28/80	--	70.0	84,584	Tanner Cr	AD-CUT
1979	Tanner Cr	Bonneville	fing.	05/29/80	--	75.0	26,473	Tanner Cr	--
1979	Tanner Cr	Bonneville	fing.	06/02/80	--	75.0	26,023	Tanner Cr	CB(RP):U4
1979	Tanner Cr	Bonneville	fing.	05/27/80	--	76.1	2,102,436	Tanner Cr	--
1979	Tanner Cr	Bonneville	fing.	05/20/80	--	77.6	2,076,962	Tanner Cr	--
1979	Tanner Cr	Cascade	fing.	09/02/80	--	30.0	165,828	Tanner Cr	--
1979	Tanner Cr	Cascade	fing.	09/02/80	--	30.0	46,550	Tanner Cr	CB(LA)
1979	Tanner Cr	Cascade	fing.	09/02/80	--	30.0	59,200	Tanner Cr	CB(RA)
1979	Tanner Cr	Big Creek	fing.	05/13/80	--	77.3	1,468,345	Big Creek	--
1979	Tanner Cr	Big Creek	fing.	05/13/80	--	77.3	29,966	Big Creek	AD-CUT
1979	Tanner Cr	Klaskanine	fing.	06/04/80	--	79.0	3,554,908	NFk Klaskanine River	--
1979	LRH[f]	Klaskanine	fing.	06/15/80[d]	--	79.0	106,647	NFk Klaskanine R.	--
1979	LRH[f]	Klaskanine	fing.	06/15/80[d]	--	79.0	3,448,261	NFk Klaskanine R.	--
1979	Snake River	Bonneville	fry	06/16/80	--	500.0	6,600	Tanner Cr	

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded uire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Fin	Code/ Clip[c]
1979	Snake River	Bonneville	fry	05/16/80	--	853.0	40,970	Tanner Cr	--	
1979	Snake River	Bonneville	fry	04/30/80	--	979.0	24,470	Tanner Cr	--	
1979	Snake River	Bonneville	fry	05/07/80	--	990.0	37,644	Tanner Cr	--	
1979	Snake River	Bonneville	smolt	03/12/81	--	9.9	229,455	Tanner Cr	--	
1979	Snake River	Bonneville	smolt	12/12/80	--	12.0	154,489	Tanner Cr	--	
1979	Snake River	Bonneville	smolt	11/11/80	--	13.6	601,598	Tanner Cr	--	
1979	Snake River	Bonneville	smolt	11/11/80	--	13.6	52,312	Tanner Cr	AD-CUT	
1979	Tanner Cr	Bonneville	smolt	11/11/80	--	9.1	47,895	Tanner Cr	AD-CUT	
1980	Big Cr[g]	Big Creek	fing.	05/18/81	--	72.0	1,695,969	Big Creek	--	
1980	Big Cr[g]	Big Creek	fing.	05/18/81	--	72.0	5,103	Big Creek	AD-CUT	
1980	Big Cr[g]	Big Creek	fing.	05/12/81	--	77.0	1,354,282	Big Creek	--	
1980	Big Cr[g]	Big Creek	fing.	05/12/81	--	77.0	4,075	Big Creek	AD-CUT	
1980	Big Cr[g]	Big Creek	fing.	05/07/81	--	79.0	3,079,240	Big Creek	--	
1980	Big Cr[g]	Big Creek	fing.	05/07/81	--	79.0	9,265	Big Creek	AD-CUT	
1980	Snake River	Bonneville	fing.	07/30/81	--	34.9	94,262	Tanner Cr	--	
1980	Snake River	Bonneville	fing.	07/30/81	--	34.9	10,473	Tanner Cr	AD-CUT	
1980	Snake River	Bonneville	fing.	06/12/81	--	63.8	91,874	Tanner Cr	--	
1980	Snake River	Bonneville	fing.	06/12/81	--	63.8	10,208	Tanner Cr	AD-CUT	
1980	Tanner Cr	Bonneville	fing.	05/18/81	--	68.0	11,381	Colunbia R-l	--	
1980	Tanner Cr	Bonneville	fing.	05/18/81	--	68.0	1,264	Columbia R-l	CB(LD):U1	
1980	Tanner Cr	Bonneville	fing.	05/14/81	--	70.0	11,120	Columbia R-l	--	
1980	Tanner Cr	Bonneville	fing.	05/14/81	--	70.0	1,235	Colunbia R-l	CB(LD):U1	
1980	Tamer Cr	Bonneville	fing.	04/28/81	05/01/81	81.6	24,669	Columbia R-l	--	
1980	Tanner Cr	Bonneville	fing.	05/01/81	--	81.6	1,290	Colunbia R-l	CB(RD):V1	
1980	Tanner Cr	Bonneville	fing.	06/12/81	--	40.0	3,334	Tanner Cr	--	
1980	Tanner Cr	Bonneville	fing.	05/28/81	--	44.6	94,433	Tanner Cr	--	
1980	Tanner Cr	Bonneville	fing.	05/28/81	--	44.6	10,492	Tanner Cr	AD-CUT	
1980	Tanner Cr	Bonneville	fins.	05/12/81	--	67.7	5.214.732	Tanner Cr	--	
1980	Tanner Cr	Bonneville	fing.	05/12/81	--	67.7	106,423	Tanner Cr	AD-CUT	
1980	Tanner Cr	Bonneville	fing.	04/24/81	--	73.0	5,126,764	Tanner Cr	--	
1980	Tanner Cr	Bonneville	fing.	04/24/81	--	73.0	15,426	Tanner Cr	AD-CUT	
1980	Tanner Cr	Klaskanine	fing.	05/18/81	--	86.0	3,943,444	NFk Klaskanine River	--	
1980	Unknoun	CEDC	fing.	06/15/81[d]	--	80.0	126,280	Youngs Bay	--	
1980	Unknown	CEDC	fing.	06/15/81[d]	--	80.0	3,030,720	Youngs Bay	--	
1980	Snake River	Bonneville	smolt	03/17/82	--	7.2			--	
1980	Snake River	Bonneville	smolt	03/17/82	--	7.2	50,192	Tanner Tanner Cr Cr	07-21-43	
1980	Snake River	Bonneville	smolt	03/17/82	--	7.4	245,111	Tanner Cr	--	
1980	Snake River	Bonneville	smolt	03/17/82	--	7.4	48,787	Tamer Cr	07-21-37	
1980	Snake River	Bonneville	smolt	11/09/81	--	11.0	471,209	Tanner Cr	--	

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1980	Snake River	Bonneville	smolt	11/09/81	--	11.0	10,107	Tanner Cr	AD-CUT
1980	Tanner Cr	Bonneville	smolt	03/17/82	--	6.9	51,985	Tanner Cr	07-21-40
1980	Tanner Cr	Bonneville	smolt	11/09/81	--	10.3			--
1980	Tanner Cr	Bonneville	smolt	11/09/81[d]	--	10.3	92,288	Tanner Tanner Cr Cr	AD-CUT
1980	LRH	Stayton Pond	smolt	06/15/81[d]	--	80.0	4,080	lower Columbia R. subbasin	--
1981	Big Cr[g]	Big Creek	fins.	05/17/82	--	75.0	6,037,463	Big Creek	--
1981	Big Cr[g]	Big Creek	fing.	05/17/82	--	75.0	135,812	gig Creek	07-24-10
1981	Big Cr[g]	Klaskanine	fing.	06/07/82	--	85.0	125,035	NFk Klaskanine River	--
1981	Big Cr[g]	Klaskanine	fing.	06/07/82	--	85.0	3,995	NFk Klaskanine River	07-24-09
1981	Col. R.[h]	Bonneville	fing.	08/03/82	--	39.6	106,326	Tanner Cr	07-24-26
1981	Col. R.[h]	Bonneville	fing.	06/04/82	--	79.0	105,860	Tanner Cr	07-24-24
1981	Tanner Cr	Bonneville	fing.	04/27/82	--	79.0	46,073	Columbia R-1	--
1981	Tanner Cr	Bonneville	fing.	04/27/82	--	79.0	5,119	Columbia R-1	07-24-07
1981	Tanner Cr	Bonneville	fing.	05/28/82	06/01/82	80.0	50,683	Columbia R-1	--
1981	Tanner Cr	Bonneville	fing.	05/28/82	06/01/82	80.0	2,277	Columbia R-1	07-24-08
1981	Tanner Cr	Bonneville	fing.	04/23/82	--	79.0	96,956	Columbia R-2	--
1981	Tanner Cr	Bonneville	fing.	04/23/82	--	51.0	102,408 8,430	Columbia Tanner Cr R-2	07-24-07
1981	Tanner Cr	Bonneville	fing.	06/01/82	--				07-24-25
1981	Tanner Cr	Bonneville	fing.	06/17/82	--	67.0	231,214	Tanner Cr	--
1981	Tanner Cr	Bonneville	fing.	06/17/82	--	67.0	10,388	Tanner Cr	07-24-08
1981	Tanner Cr	Bonneville	fing.	06/25/82	--	75.0	981,000	Tanner Cr	--
1981	Tanner Cr	Bonneville	fins.	06/25/82	--	75.0	12,375	Tanner Cr	07-23-30
1981	Tanner Cr	Bonneville	fing.	06/25/82	--	75.0	12,450	Tanner Cr	07-24-11
1981	Tanner Cr	Bonneville	fing.	06/04/82	--	76.0	413,846	Tanner Cr	--
1981	Tanner Cr	Bonneville	fins.	06/04/82	--	76.0	18,594	Tanner Cr	07-24-08
1981	Tanner Cr	Bonneville	fing.	06/04/82	--	78.0	1,174,056	Tanner Cr	--
1981	Tanner Cr	Bonneville	fing.	06/04/82	--	78.0	14,820	Tanner Cr	07-23-30
1981	Tanner Cr	Bonneville	fing.	06/04/82	--	78.0	14,820	Tanner Cr	07-24-11
1981	Tanner Cr	Bonneville	fing.	04/23/82	--	79.0	743,114	Tanner Cr	--
1981	Tanner Cr	Bonneville	fing.	04/23/82	--	79.0	76,195	Tanner Cr	07-24-07
1981	Tanner Cr	Bonneville	fing.	05/21/82	06/17/82	80.0	3,536,485	Tanner Cr	--
1981	Tanner Cr	Bonneville	fing.	06/17/82	--	80.0	25,200	Tanner Cr	07-23-30
1981	Tanner Cr	Bonneville	fing.	05/21/82	05/28/82	80.0	68,875	Tanner Cr	07-24-08
1981	Tanner Cr	Bonneville	fing.	06/17/82	--	80.0	25,280	Tanner Cr	07-24-11
1981	Tanner Cr	Bonneville	fing.	06/04/82	--	83.0	458,398	Tanner Cr	--
1981	Tanner Cr	Bonneville	fing.	06/04/82	--	83.0	52,988	Tanner Cr	07-24-16
1981	Tanner Cr	Bonneville	fing.	06/04/82	--	83.0	55,587	Tanner Cr	07-24-17
1981	Tanner Cr	Bonneville	fing.	06/04/82	--	84.0	222,137	Tanner Cr	--
1981	Tanner Cr	Bonneville	fing.	06/04/82	--	84.0	53,467	Tanner Cr	07-24-15

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year ad, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1981	Tanner Cr	Bonneville	fing.	04/26/82	--	86.0	93,732	Tanner Cr	--
1981	Tanner Cr	Bonneville	fing.	04/26/82	--	86.0	10,414	Tanner Cr	07-24-07
1981	Tamer Cr	Bomeville	fing.	06/04/82	--	97.0	220,935	Tanner Cr	--
1981	Tanner Cr	Bonneville	fing.	06/04/82	--	97.0	54,545	Tanner Cr	07-24-14
1981	Tamer Cr	CEDC	fing.	05/15/82	--	80.0	2,740,960	SFk Klaskanine River	--
1981	Tanner Cr	Klaskanine	fing.	06/07/82	--	85.0	3,081,165	NFk Klaskanine River	--
1981	Tamer Cr	Klaskanine	fing.	06/07/82	--	85.0	97,580	NFk Klaskanine River	07-24-09
1981	Col. R.[h]	Bonneville	smolt	03/23/83	--	5.4	25,159	Tanner Cr	07-25-47
1981	Col. R.[h]	Bonneville	smolt	03/23/83	--	6.4	22,643	Tanner Cr	--
1981	Col. R.[h]	Bonneville	smolt	03/23/83	--	6.4	2,515	Tanner Cr	07-25-47
1981	Col. R.[h]	gonneville	smolt	03/31/83	--	7.2	116,366	Tanner Cr	--
1981	Col. R.[h]	Bonneville	smolt	11/01/82	--	12.0	239,544	Tanner Cr	--
1981	Col. R.[h]	Bonneville	smolt	11/01/82	--	12.0	50,712	Tanner Cr	07-25-45
1981	Col. R.[h]	Bonneville	smolt	11/01/82	--	12.1	50,941	Tanner Cr	07-25-48
1981	Rogue R.[i]	CEDC	smolt	08/04/83	--	14.0	45,648	SFk Klaskanine River	--
1981	Rogue R.[i]	CEDC	smolt	08/04/83	--	14.0	2,875	SFk Klaskanine River	07-28-57
1981	Rogue R.[i]	CEDC	smolt	08/04/83	--	14.0	1,625	SFk Klaskanine River	07-28-58
1981	Tanner Cr	Bonneville	smolt	03/08/83	--	6.8	38,529	Tanner Cr	07-27-01
1981	Tanner Cr	Bonneville	smolt	11/01/82	--	10.9	46,837	Tanner Cr	07-23-63
1981	Tanner Cr	Bonneville	smolt	11/01/82	--	11.8	51,790	Tanner Cr	07-25-46
1982	Big Cr[g]	Big Creek	fing.	05/06/83	--	67.0	1,042,520	Big Creek	--
1982	gig Cr[g]	Big Creek	fing.	05/05/83	--	68.0	1,028,364	Big Creek	--
1982	Big Cr[g]	Big Creek	fing.	05/02/83	05/07/83	71.0	1,708,544	Big Creek	--
1982	Big Cr[g]	Big Creek	fing.	05/03/83	05/04/83	72.0	2,053,800	Big Creek	--
1982	Big Cr[g]	Klaskanine	fing.	06/01/83	--	73.0	3,511,519	NFk Klaskanine River	--
1982	Col. R.[h]	Bonneville	fing.	08/01/83	--	41.3	104,324	Tanner Cr	07-28-28
1982	Col. R.[h]	Bonneville	fing.	06/16/83	--	80.0	102,560	Tanner Cr	07-28-27
1982	Tanner Cr	Bonneville	fing.	05/09/83	05/12/83	69.0	52,647	Colunbia R-l	--
1982	Tanner Cr	Bonneville	fing.	05/04/83	--	68.5	168,776	Tanner Cr	--
1982	Tanner Cr	Bonneville	fing.	05/04/83	--	68.5	50.698	Tanner Cr	07-27-28
1982	Tanner Cr	Bonneville	fing.	05/04/83	--	71.9	164,125	Tanner Cr	--
1982	Tanner Cr	Bonneville	fing.	05/04/83	--	71.9	50,137	Tanner Cr	07-27-27
1982	Tanner Cr	Bomeville	fing.	05/04/83	--	72.8	220,725	Tanner Cr	--
1982	Tanner Cr	Bomeville	fing.	05/04/83	--	72.8	47,470	Tanner Cr	07-27-30
1982	Tanner Cr	Bonneville	fing.	05/02/83	--	73.9	1,139,612	Tanner Cr	--
1982	Tanner Cr	Bonneville	fing.	05/04/83	--	74.3	219,994	Tanner Cr	--
1982	Tanner Cr	Bonneville	fing.	05/04/83	--	74.3	52,613	Tanner Cr	07-27-29
1982	Tanner Cr	Bonneville	fing.	05/04/83	--	75.0	233,550	Tanner Cr	--
1982	Tanner Cr	gonneville	fing.	05/11/83	--	76.5	3,185,690	Tanner Cr	--

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1982	Tanner Cr	Bonneville	fing.	05/16/83	--	77.3	1,967,594	Tanner Cr	--
1982	Tanner Cr	STEP	fing.	05/11/83	--	32.5	6,154	Youngs River	--
1982	Tanner Cr	STEP	fing.	05/11/83	--	32.5	6,586	Youngs River	RV
1982	Tanner Cr	CEDC	fing.	04/15/83	--	76.0	2,376,162	SFk Klaskanine River	--
1982	Tanner Cr	CEDC	fing.	04/15/83	--	76.0	104,174	SFk Klaskanine River	07-28-35
1982	Tanner Cr	Oxbow (Herman)	fry	02/02/83		1,064	304,868	Columbia R-2	--
1982	Col. R.[h]	Bonneville	smolt	03/15/84	--	7.6	457,148	Tanner Cr	--
1982	Col. R.[h]	Bonneville	smolt	11/01/83	--	11.8	327,450	Tanner Cr	--
1982	Rogue R.[i]	Big Creek	smolt	10/22/83		6.6	20,417	Big Creek	07-28-57
1982	Rogue R.[i]	Big Creek	smolt	10/22/83		6.6	36,297	Big Creek	07-28-58
1983	Big Cr[g]	Big Creek	fing.	05/10/84	--	72.0	350,712	Big Creek	--
1983	Big Cr[g]	Big Creek	fing.	05/09/84	05/14/84	74.0	699,670	Big Creek	--
1983	Big Cr[g]	Big Creek	fing.	05/10/84	05/14/84	76.0	1,057,236	Big Creek	--
1983	Big Cr[g]	Big Creek	fing.	05/10/84		77.0	356,125	Big Creek	--
1983	Big Cr[g]	Big Creek	fing.	05/10/84		78.0	350,064	Big Creek	--
1983	Big Cr[g]	Big Creek	fing.	05/08/84	05/14/84	79.0	1,053,070	Big Creek	--
1983	Big Cr[g]	Big Creek	fing.	05/10/84	--	81.0	697,653	Big Creek	--
1983	Big Cr[g]	Klaskanine	fing.	05/30/84	--	80.0	3,104,000	NFk Klaskanine River	--
1983	Big Cr[g]	Klaskanine	fing.	05/22/84	--	85.0	973,845	NFk Klaskanine River	--
1983	Col. R.[h]	Bonneville	fing.	08/03/84	--	49.0	102,753	Tanner Cr	07-31-26
1983	Col. R.[h]	Bonneville	fing.	06/29/84	--	80.0	106,560	Tanner Cr	07-31-25
1983	Rogue R.[i]	Big Creek	fing.	06/04/84	--	72.0	52,848	Big Creek	07-31-40
1983	Tanner Cr	Bonneville	fing.	05/08/84	--	58.7	195,565	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	05/08/84	--	58.7	80,266	Tanner Cr	07-31-22
1983	Tanner Cr	Bonneville	fing.	05/08/84	--	67.5	194,301	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	05/08/84	--	67.5	81,302	Tanner Cr	07-31-23
1983	Tanner Cr	Bonneville	fing.	05/08/84	--	71.0	192,212	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	05/08/84	--	71.0	80,428	Tanner Cr	07-31-20
1983	Tanner Cr	Bonneville	fing.	05/16/84	--	72.0	314,424	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	05/02/84	--	72.9	535,888	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	05/01/84	--	73.0	263,968	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	05/08/84	--	74.0	251,674	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	05/08/84	--	77.0	3,122,504	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	05/01/84	--	77.2	1,123,878	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	04/25/84	--	77.8	1,602,524	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	06/04/84	--	79.0	901,311	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	05/29/84	--	79.4	1,215,773	Tanner Cr	--
1983	Tanner Cr	Bonneville	fins.	05/08/84	--	79.5	193,183	Tanner Cr	--
1983	Tanner Cr	Bonneville	fing.	05/08/84	--	79.5	80,059	Tanner Cr	07-31-21

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded uire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1983	Tanner Cr	Big Creek	fing.	05/08/84	05/10/84	76.0	704,216	Big Creek	--
1983	Tanner Cr	Big Creek	fing.	05/10/84	--	77.0	704,858	Big Creek	--
1983	Tanner Cr	CEDC	fing.	05/14/84	--	69.1	2,761,015	SFk Klaskanine River	--
1983	Tanner Cr	CEDC	fing.	05/14/84	--	69.1	106,082	SFk Klaskanine River	07-31-43
1983	Col. R.[h]	Bonneville	smolt	03/08/85	--	7.1	35,057	Tanner Cr	--
1983	Col. R.[h]	Bonneville	smolt	03/08/85	--	8.0	17,416	Tanner Cr	--
1983	Col. R.[h]	Bonneville	smolt	03/08/85	--	8.0	52,463	Tanner Cr	07-03-07
1983	Col. R.[h]	Bonneville	smolt	11/01/84	--	11.6	296,647	Tanner Cr	--
1983	Col. R.[h]	Bonneville	smolt	10/30/84	--	12.1	338,619	Tanner Cr	--
1983	Col. R.[h]	Bonneville	smolt	10/30/84	--	12.1	51,945	Tanner Cr	07-30-08
1983	Col. R.[h]	Bonneville	smolt	10/30/84	--	12.5	210,975	Tanner Cr	--
1983	Rogue R.[i]	Big Creek	smolt	10/10/84	--	9.8	62,485	Big Creek	07-31-33
1983	Rogue R.[i]	CEDC	smolt	08/24/84	--	15.0	12,645	SFk Klaskanine River	LV
1984	Big Cr[g]	gig Creek	fing.	05/10/85	--	86.0	5,898,411	Big Creek	--
1984	Col. R.[h]	Bonneville	fing.	08/06/85	--	46.0	104,650	Tanner Cr	--
1984	Col. R.[h]	Bonneville	fing.	08/06/85	--	48.6	104,004	Tanner Cr	--
1984	Klaskanine R.	STEP	fing.	05/14/85	--	30.0	18,960	Skipenon River	--
1984	Klaskanine R.	STEP	fing.	04/15/85	--	50.0	2,795	Youngs River	--
1984	Klaskanine R.	STEP	fing.	04/15/85	--	50.0	9,355	Youngs River	LV
1984	Rogue R.[i]	Big Creek	fing.	05/30/85	--	76.0	2,459	Big Creek	--
1984	Rogue R.[i]	Big Creek	fing.	05/30/85	--	76.0	26,238	Big Creek	07-23-24
1984	Rogue R.[i]	Big Creek	fing.	05/30/85	--	76.0	25,782	Big Creek	07-23-25
1984	Rogue R.!	Big Creek	fing.	05/30/85	--	76.0	13,230	Big Creek	07-23-26
1984	Rogue R.?	Big Creek	fing.	05/30/85	--	76.0	13,021	Big Creek	07-23-27.
1984	Rogue R.'	Big Creek	fing.	05/30/85	--	76.0	28,935	Big Creek	07-23-28'
1984	Rogue R.[i]	CEDC	fing.	08/08/85	--	20.9	1,647	SFk Klaskanine R.	--
1984	Rogue R.!	CEDC	fing.	08/08/85	--	20.9	10,751	SFk Ktaskanine R.	07-32-34
1984	Rogue R.!	CEDC	fing.	08/08/85	--	20.9	10,208	SFk Klaskanine R.	07-32-35
1984	Rogue R.'	CEDC	fing.	08/08/85	--	20.9	10,431	SFk Klaskanine R.	07-32-36
1984	Rogue R.!	CEDC	fing.	08/08/85	--	20.9	9,221	SFk Klaskanine R.	07-32-37
1984	Rogue R.!	CEDC	fing.	08/08/85	--	20.9	10,189	SFk Klaskanine R.	07-32-38
1984	Rogue R.'	CEDC	fing.	08/08/85	--	20.9	29,410	SFk Klaskanine R.	LV
1984	Tanner Cr	Bonneville	fing.	05/13/85	--	58.2	98,488	Tanner Cr	--
1984	Tanner Cr	Bonneville	fing.	05/13/85	--	58.2	52,567	Tanner Cr	07-33-22
1984	Tanner Cr	Bonneville	fing.	05/13/85	--	61.4	195,985	Tanner Cr	--
1984	Tanner Cr	Bonneville	fing.	05/13/85	--	61.4	25,977	Tanner Cr	07-33-22
1984	Tanner Cr	Bonneville	fing.	05/13/85	--	61.4	78,972	Tanner Cr	07-33-23
1984	Tanner Cr	Bonneville	fing.	05/13/85	--	65.4	164,914	Tanner Cr	--
1984	Tanner Cr	Bonneville	fing.	05/13/85	--	73.2	131,902	Tanner Cr	--

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1984	Tanner Cr	Bonneville	fing.	05/13/85	--	73.2	80,158	Tanner Cr	07-33-24
1984	Tanner Cr	Bonneville	fins.	05/13/85	--	75.9	133,496	Tanner Cr	--
1984	Tanner Cr	Bonneville	fing.	05/13/85	--	75.9	79,755	Tanner Cr	07-33-25
1984	Tanner Cr	CEDC	fing.	06/12/85	--	72.0	2,895,941	SFk Klaskanine R.	--
1984	Tanner Cr	CEDC	fing.	06/12/85	--	72.0	98,827	SFk Klaskanine R.	07-33-45
1984	Tanner Cr	Stayton Pond	fing.	05/15/85	05/22/85	50.6	2,885,934	Tanner Cr	--
1984	Tanner Cr	Stayton Pond	fing.	05/15/85	05/22/85	50.6	23,424	Tanner Cr	07-33-52[k]
1984	Tanner Cr	Stayton Pond	fing.	05/15/85	05/22/85	50.6	23,424	Tanner Cr	07-33-53[k]
1984	Tanner Cr	Stayton Pond	fing.	05/15/85	05/22/85	50.6	23,424	Tanner Cr	07-33-54[k]
1984	Tanner Cr	Stayton Pond	fing.	05/15/85	05/22/85	50.6	23,424	Tanner Cr	07-33-55[k]
1984	Tanner Cr	Stayton Pond	fing.	05/15/85	05/22/85	50.6	23,423	Tanner Cr	07-33-56[k]
1984	Big Cr[g]	Klaskanine	fry	05/15/85	--	196.0	1.595.440	NFk Klaskanine R.	--
1984	Col. R.[h]	Bonneville	smolt	02/28/86	--	7.0	50,822	Tanner Cr	--
1984	Col. R.[h]	Bonneville	smolt	02/28/86	--	7.0	50,822	Tanner Cr	07-30-17
1984	Col. R.[h]	Bonneville	smolt	11/06/85	11/07/85	14.5	2,062,602	Tanner Cr	--
1984	Rogue R.[i]	Big Creek	smolt	10/11/85	--	9.6	3,217	Big Creek	--
1984	Rogue R.!	Big Creek	smolt	10/11/85	--	9.6	9,802	Big Creek	07-32-29
1984	Rogue R.!	Big Creek	smolt	10/11/85	--	9.6	9,584	Big Creek	07-32-30
1984	Rogue R.!	Big Creek	smolt	10/11/85	--	9.6	9,932	Big Creek	07-32-31
1984	Rogue R.!	Big Creek	smolt	10/11/85	--	9.6	10,130	Big Creek	07-32-32
1984	Rogue R.'	Big Creek	smolt	10/11/85	--	9.6	9,865	Big Creek	07-32-33
1985	Big Cr[g]	STEP	fing.	05/05/86	--	100.0	16,150	Skipanon River	--
1985	Big Cr[g]	STEP	fing.	05/05/86	--	100.0	2,850	Skipanon River	RV
1985	Big Cr[g]	STEP	fing.	05/05/86	--	100.0	28,200	Youngs River	--
1985	Big Cr[g]	STEP	fing.	05/05/86	--	100.0	1,800	Youngs River	RV
1985	Big Cr[g]	Big Creek	fins.	04/30/86	--	77.0	1,029,162	Big Creek	--
1985	Big Cr[g]	Big Creek	fing.	05/06/86	--	77.1	678,486	Big Creek	
1985	Big Cr[g]	Big Creek	fins.	05/04/86	--	78.0	1,694,307	Big Creek	
1985	Big Cr[g]	Big Creek	fing.	05/05/86	--	78.4	1,682,518	Big Creek	--
1985	Big Cr[g]	Big Creek	fing.	05/08/86	--	80.0	674,239	Big Creek	
1985	Big Cr[g]	Big Creek	fing.	04/24/86	--	96.0	883.686	Big Creek	
1985	Big Cr[g]	CEDC	fing.	05/30/86	--	77.0	2,908,557	SFk Klaskanine R.	--
1985	Big Cr[g]	CEDC	fing.	05/30/86	--	77.0	24,611	SFk Klaskanine R.	07-29-32
1985	Big Cr[g]	CEDC	fing.	05/30/86	--	77.0	24,759	SFk Klaskanine R.	07-29-33
1985	Big Cr[g]	CEDC	fing.	05/30/86	--	77.0	25,207	SFk Klaskanine R.	07-29-34
1985	Big Cr[g]	CEDC	fins.	05/12/86	--	113.0	1,508	Youngs River	--
1985	Big Cr[g]	CEDC	fing.	05/12/86	--	113.0	24,934	Youngs River	07-29-35
1985	Big Cr[g]	Klaskanine	fing.	05/05/86	--	119.0	3,634,736	NFk Klaskanine R.	
1985	Cowlitz[l]	Bonneville	fing.	08/11/86	--	40.7	184,249	Tanner Cr	

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1985	Klaskanine R. STEP		fing.	05/05/86	--	30.0	15,600	Skipanon River	--
1985	Klaskanine R. STEP		fing.	05/05/86	--	50.0	9,500	Skipanon River	--
1985	Klaskanine R. STEP		fing.	05/05/86	--	60.3	7,600	Skipanon River	--
1985	Klaskaniae R. STEP		fing.	05/05/86	--	45.0	4,500	Youngs River	--
1985	Rogue R.!	Big Creek	fing.	05/27/86	--	70.0	170	Big Creek	--
1985	Rogue R.!	gig Creek	fing.	05/27/86	--	70.0	10,555	Big Creek	07-33-47
1985	Rogue R.!	Big Creek	fing.	05/27/86	--	70.0	10,245	Big Creek	07-33-48
1985	Rogue R.'	Big Creek	fing.	05/27/86	--	70.0	10,126	Big Creek	07-33-49
1985	Rogue R.!	Big Creek	fing.	05/27/86	--	70.0	10,615	Big Creek	07-33-50
1985	Rogue R.!	Big Creek	fing.	05/27/86	--	70.0	10,579	Big Creek	07-33-51
1985	Rogue R.'	CEDC	fing.	07/20/86	--	35.0	21,625	SFk Klaskanine R.	--
1985	Rogue R.!	CEDC	fing.	07/20/86	--	35.0	190,756	SFk Klaskanine R.	07-29-36
1985	Rogue R.'	CEDC	fing.	07/20/86	--	35.0	39,059	SFk Klaskanine R.	07-38-46
1985	Tanner Cr	Bonneville	fing.	05/09/86	--	77.0	4,941,169	Tanner Cr	--
1985	Tanner Cr	Klaskanine	fing.	05/05/86	--	82.9	448,986	NFk Klaskanine R.	--
1985	Col. R.[h]	Bonneville	smolt	03/03/87	--	7.6	17,448	Tanner Cr	--
1985	Col. R.[h]	Bonneville	smolt	03/03/87	--	7.6	12,531	Tanner Cr	07-33-18
1985	Col. R.[h]	Bonneville	smolt	03/06/87	--	8.2	'49,404	Tanner Cr	--
1985	Col. R.[h]	Bonneville	smolt	03/06/87	--	8.2	35,482	Tanner Cr	07-33-18
1985	Col. R.[h]	Bonneville	smolt	10/17/86	--	12.9	49,097	Tanner Cr	07-37-55
1985	Col. R.[h]	Bonneville	smolt	10/17/86	--	13.2	47,639	Tanner Cr	07-36-36
1985	Col. R.[h]	Bonneville	smolt	10/17/86	--	13.5	47,993	Tanner Cr	07-36-35
1985	Cot. R.[h]	Bonneville	smolt	10/17/86	--	13.6	48,987	Tanner Cr	07-36-34
1985	Col. R.[h]	Bonneville	smolt	10/17/86	--	13.8	50,605	Tanner Cr	07-37-54
1985	Col. R.[h]	Bonneville	smolt	10/16/86	--	13.9	411,829	Tanner Cr	--
1985	Col. R.[h]	Bonneville	smolt	10/17/86	--	14.1	46,601	Tanner Cr	07-36-33
1985	Col. R.[h]	Bonneville	smolt	10/17/86	--	14.7	48,819	Tanner Cr	07-37-53
1985	Col. R.[h]	Bonneville	smolt	10/17/86	--	14.8	374,988	Tanner Cr	--
1985	Col. R.[h]	Bonneville	smolt	10/17/86	--	14.8	47,034	Tanner Cr	07-37-52
1985	Col. R.[h]	Bonneville	smolt	10/15/86	--	15.4	553,861	Tanner Cr	--
1985	Rogue R.[i]	Big Creek	smolt	10/03/86	--	10.1	132	Big Creek	--
1985	Rogue R.!	Big Creek	smolt	10/03/86	--	10.1	7,648	Big Creek	07-34-39
1985	Rogue R.!	Big Creek	smolt	10/03/86	--	10.1	8,427	Big Creek	07-34-40
1985	Rogue R.!	Big Creek	smolt	10/03/86	--	10.1	8,160	Big Creek	07-34-41
1985	Rogue R.!	Big Creek	smolt	10/03/86	--	10.1	8,430	Big Creek	07-34-42
1985	Rogue R.!	Big Creek	smolt	10/03/86	--	10.1	8,074	Big Creek	07-34-43
1985	Rogue R.!	Big Creek	smolt	08/19/86	--	13.5	172	Big Creek	--
1985	Rogue R.!	Big Creek	smolt	08/19/86	--	13.5	10,613	Big Creek	07-34-34
1985	Rogue R.'	Big Creek	smolt	08/19/86	--	13.5	10,275	Big Creek	07-34-35

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code".

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1985	Rogue R.[i]	Big Creek	smolt	08/19/86		13.5	10,257	Big Creek	07-34-36
1985	Rogue R.[i]	Big Creek	smolt	08/19/86		13.5	10,683	Big Creek	07-34-37
1985	Rogue R.[i]	Big Creek	smolt	08/19/86	--	13.5	10,857	Big Creek	07-34-38
1986	Big Cr[g]	Big Creek	fins.	05/04/87		73.0	315,378	Big Creek	--
1986	Big Cr[g]	Big Creek	fing.	05/04/87	--	73.0	4,180	Big Creek	07-33-19
1986	Big Cr[g]	Big Creek	fing.	05/04/87	--	73.0	4,244	Big Creek	07-38-17
1986	Big Cr[g]	Big Creek	fing.	05/01/87	05/10/87	75.0	644,262	Big Creek	--
1986	Big Cr[g]	Big Creek	fing.	05/01/87	--	75.0	4,454	Big Creek	07-33-19
1986	Big Cr[g]	Big Creek	fing.	05/01/87		75.0	4,207	Big Creek	07-38-17
1986	Big Cr[g]	Big Creek	fins.	05/05/87	05/10/87	76.0	938.982	Big Creek	--
1986	Big Cr[g]	Big Creek	fing.	05/05/87	--	76.0	4,226	Big Creek	07-33-19
1986	Big Cr[g]	Big Creek	fing.	05/05/87		76.0	4.290	Big Creek	07-38-17
1986	Big Cr[g]	Big Creek	fing.	05/07/87	--	77.0	315,103	Big Creek	--
1986	Big Cr[g]	Big Creek	fing.	05/07/87	--	77.0	4,255	Big Creek	07-33-19
1986	Big Cr[g]	Big Creek	fing.	05/07/87	--	77.0	4,322	Big Creek	07-38-17
1986	Big Cr[g]	Big Creek	fing.	05/05/87	05/10/87	78.0	1,268,644	Big Creek	--
1986	Big Cr[g]	Big Creek	fing.	05/05/87	05/07/87	78.0	12,734	Big Creek	07-33-19
1986	Big Cr[g]	Big Creek	fing.	05/05/87	05/07/87	78.0	12,930	Big Creek	07-38-17
1986	Big Cr[g]	Big Creek	fing.	05/05/87	05/07/87	79.0	631,003	Big Creek	--
1986	Big Cr[g]	Big Creek	fing.	05/05/87	05/07/87	79.0	8,421	Big Creek	07-33-19
1986	Big Cr[g]	Big Creek	fing.	05/05/87	05/07/87	79.0	8,549	Big Creek	07-38-17
1986	Big Cr[g]	Big Creek	fins.	05/04/87	05/07/87	80.0	622,791	Big Creek	
1986	Big Cr[g]	Big Creek	fing.	05/04/87	05/07/87	80.0	8,660	Big Creek	07-33-19
1986	Big Cr[g]	Big Creek	fins.	05/04/87	05/07/87	80.0	8,793	Big Creek	07-38-17
1986	Big Cr[g]	Big Creek	fing.	05/10/87	--	81.0	318,621	Big Creek	
1986	Big Cr[g]	Big Creek	fing.	04/28/87	--	82.5	318,107	Big Creek	--
1986	Big Cr[g]	Big Creek	fing.	04/28/87	--	82.5	4,269	Big Creek	07-33-19
1986	Big Cr[g]	Big Creek	fing.	04/28/87	--	82.5	4,334	Big Creek	07-38-17
1986	Big Cr[g]	CEOC	fing.	05/20/87		57.5	1.199.828	SFk Klaskanine R.	--
1986	Big Cr[g]	CEDC	fing.	05/20/87	--	57.5	.49,992	SFk Klaskanine R.	07-42-48
1986	Big Cr[g]	CEDC	fing.	05/20/87	--	45.4	42,903	Youngs River	07-42-53
1986	Big Cr[g]	CEOC	fins.	05/19/87		57.5	49,738	Youngs River	07-42-51
1986	Big Cr[g]	Klaskanine	fing.	05/05/87	--	87.0	2,832,894	NFk Klaskanine R.	
1986	Big Cr[g]	Klaskanine	fing.	05/05/87	--	87.0	52,896	NFk Klaskanine R.	07-44-56
1986	Big Cr[g]	Klaskanine	fing.	05/05/87	--	87.0	52,896	NFk Klaskanine R.	07-44-59
1986	Big Cr[g]	Klaskanine	fing.	04/07/87	--	122.0	720,035	NFk Klaskanine R.	--
1986	Big Cr[g]	Klaskanine	fing.	04/07/87	--	122.0	50,939	NFk Klaskanine R.	07-44-52
1986	Big Cr[g]	Klaskanine	fing.	04/07/87	--	122.0	50,940	NFk Klaskanine R.	07-44-55
1986	Col. R.[h]	Bonneville	fing.	07/19/87	--	99.8	19,760	Columbia R-2	23-22-22

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbesin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1986	Col. R.[h]	Bonneville	fing.	07/18/87	--	100.0	20,300	Columbia R-2	23-22-16
1986	Col. R.[h]	Bonneville	fins.	07/18/87	--	100.0	20,500	Colunbia R-2	23-22-18
1986	Col. R.[h]	Bonneville	fing.	07/18/87	--	100.0	20,500	Colunbia R-2	23-22-19
1986	Col. R.[h]	Bonneville	fing.	07/18/87	--	100.0	20,500	Colunbia R-2	23-22-20
1986	Col. R.[h]	Bonneville	fing.	07/19/87	--	100.0	20,500	Columbia R-2	23-22-21
1986	Col. R.[h]	Bonneville	fing.	07/19/87	--	100.0	19,490	Colunbia R-2	23-22-23
1986	Col. R.[h]	Bonneville	fing.	07/19/87	--	100.0	20,500	Columbia R-2	23-22-24
1986	Col. R.[h]	Bonneville	fing.	07/19/87	--	100.0	20,000	Colunbia R-2	23-22-25
1986	Col. R.[h]	Bonneville	fing.	07/18/87	--	100.1	20,510	Columbia R-2	23-22-17
1986	Col. R.[h]	Bonneville	fing.	07/15/87	--	101.3	20,353	Colunbia R-2	23-22-04
1986	Col. R.?	Bonneville	fing.	07/17/87	--	101.3	20,455	Coltiia R-2	23-22-12
1986	Cot. R.[h]	Bonneville	fing.	07/17/87	--	101.3	20,459	Columbia R-2	23-22-15
1986	Col. R.[h]	Bonneville	fing.	07/16/87	--	101.4	20,181	Columbia R-2	23-22-06
1986	Cal. R.[h]	Bonneville	fing.	07/16/87	--	101.4	19,870	Columbia R-2	23-22-10
1986	Col. R.[h]	Bonneville	fing.	07/15/87	--	101.7	19,112	Coltiia R-2	23-22-02
1986	Col. R.[h]	Bonneville	fing.	07/15/87	--	101.8	20,368	Columbia R-2	23-22-01
1986	Col. R.[h]	Bonneville	fing.	07/15/87	--	101.8	20,366	Columbia R-2	23-22-03
1986	Col. R.[h]	Bonneville	fing.	07/17/87	--	101.8	20,460	Coltiia R-2	23-22-14
1986	Col. R.[h]	Bonneville	fing.	07/16/87	--	102.0	20,404	Columbia R-2	23-22-09
1986	Col. R.[h]	Bonneville	fing.	07/16/87	--	102.1	20,310	Columbia R-2	23-22-07
1986	Col. R.[h]	Bonneville	fing.	07/17/87	--	102.2	19,426	Columbia R-2	23-22-11
1986	Col. R.[h]	Bonneville	fing.	07/17/87	--	102.3	20,450	Columbia R-2	23-22-13
1986	Col. R.[h]	Bonneville	fing.	07/15/87	--	102.6	20,423	Columbia R-2	23-22-05
1986	Col. R.[h]	Bonneville	fing.	07/09/87	--	103.5	20,597	Coltiia R-2	23-21-44
1986	Col. R.[h]	Bonneville	fing.	07/16/87	--	103.6	20,415	Colunbia R-2	23-22-08
1986	Col. R.[h]	Bonneville	fing.	07/02/87	--	104.0	19,546	Columbia R-2	23-21-19
1986	Col. R.[h]	Bonneville	fing.	07/10/87	--	104.3	20,449	Coltiia R-2	23-21-49
1986	Col. R.[h]	Bonneville	fing.	07/01/87	--	104.4	17,644	Columbia R-2	23-21-14
1986	Col. R.[h]	Bonneville	fing.	07/12/87	--	104.4	20,453	Colunbia R-2	23-21-61
1986	Col. R.[h]	Bonneville	fing.	06/28/87	--	104.7	16,755	Colunbia R-2	23-20-12
1986	Col. R.[h]	Bonneville	fing.	07/02/87	--	104.7	19,691	Columbia R-2	23-21-23
1986	Col. R.[h]	Bonneville	fing.	07/03/87	--	104.7	17,064	Columbia R-2	23-21-28
1986	Col. R.[h]	Bonneville	fing.	07/04/87	--	104.7	19,790	Columbia R-2	23-21-30
1986	Col. R.[h]	Bonneville	fing.	07/05/87	--	104.7	19,891	Coltiia R-2	23-21-35
1986	Col. R.[h]	Bonneville	fins.	06/28/87	--	104.8	19,498	Columbia R-2	23-20-11
1986	Col. R.[h]	Bonneville	fing.	07/04/87	--	104.8	19,916	Coltiia R-2	23-21-33
1986	Col. R.[h]	Bonneville	fing.	07/05/87	--	104.8	19,918	Columbia R-2	23-21-34
1986	Col. R.[h]	Bonneville	fing.	07/05/87	--	104.8	19,912	Columbia R-2	23-21-36
1986	Col. R.[h]	Bonneville	fing.	07/10/87	--	104.8	20,335	Coltiia R-2	23-21-50

Table 1 (TR). (cont.1 Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1986	Col. R.h	Bonneville	fing.	07/11/87	--	104.8	19,912	Columbia R-2	23-21-54
1986	Col. R.h	Bonneville	fing.	07/01/87	--	104.9	18,260	Columbia R-2	23-21-17
1986	Col. R.h	Bonneville	fing.	07/02/87	--	104.9	19,725	Columbia R-2	23-21-22
1986	Col. R.h	Bonneville	fing.	07/03/87	--	104.9	18,244	Columbia R-2	23-21-24
1986	Col. R.h	Bonneville	fing.	07/08/87	--	104.9	19,937	Columbia R-2	23-21-42
1986	Col. R.h	Bonneville	fing.	07/09/87	--	104.9	20,137	Columbia R-2	23-21-45
1986	Col. R.h	Bonneville	fing.	07/10/87	--	104.9	20,448	Columbia R-2	23-21-51
1986	Col. R.h	Bonneville	fing.	07/10/87	--	104.9	20,341	Coltiia R-2	23-21-52
1986	Cot. R.h	Bonneville	fing.	07/11/87	--	104.9	20,461	Coltiia R-2	23-21-57
1986	Col. R.h	Bonneville	fing.	07/12/87	--	104.9	19,937	Columbia R-2	23-21-63
1986	Col. R.h	Bonneville	fing.	06/28/87	--	105.0	18,896	Columbia R-2	23-20-13
1986	Col. R.h	Bonneville	fins.	07/01/87	--	105.0	17,223	Columbia R-2	23-21-18
1986	Col. R.h	Bonneville	fing.	07/04/87	--	105.0	19,849	Coltiia R-2	23-21-31
1986	Col. R.h	Bonneville	fing.	07/04/87	--	105.0	19,641	Columbia R-2	23-21-32
1986	Col. R.h	Bonneville	fins.	07/05/87	--	105.0	19,946	Columbia R-2	23-21-38
1986	Col. R.h	Bonneville	fing.	07/11/87	--	105.0	20,156	Columbia R-2	23-21-58
1986	Col. R.h	Bonneville	fing.	07/12/87	--	105.0	20,372	Columbia R-2	23-21-59
1986	Col. R.h	Bonneville	fing.	07/12/87	--	105.0	19,948	Columbia R-2	23-21-60
1986	Col. R.h	Bonneville	fing.	06/28/87	--	105.1	17,760	Coltiia R-2	23-20-10
1986	Cot. R.h	Bonneville	fing.	07/02/87	--	105.1	19,549	Columbia R-2	23-21-21
1986	Col. R.h	Bonneville	fing.	07/03/87	--	105.1	19,864	Columbia R-2	23-21-25
1986	Col. R.h	Bonneville	fing.	07/05/87	--	105.1	19,963	Coltiia R-2	23-21-37
1986	Col. R.h	Bonneville	fing.	07/09/87	--	105.1	19,963	Columbia R-2	23-21-48
1986	Col. R.h	Bonneville	fing.	07/10/87	--	105.1	19,973	Columbia R-2	23-21-53
1986	Col. R.h	Bonneville	fing.	07/01/87	--	105.2	19,560	Columbia R-2	23-21-15
1986	Col. R.h	Bonneville	fing.	07/02/87		105.2	18,718	Columbia R-2	23-21-20
1986	Cot. R.h	Bonneville	fing.	07/04/87	--	105.2	19,883	Columbia R-2	23-21-29
1986	Col. R.h	Bonneville	fins.	07/08/87		105.2	9,884	Coltiia R-2	23-21-40
1986	Col. R.h	Bonneville	fing.	07/08/87		105.3	19,892	Colunbia R-2	23-21-39
1986	Col. R.h	Bonneville	fins.	07/11/87	—	105.3	20,420	Columbia R-2	23-21-55
1986	Col. R.h	Bonneville	fing.	07/12/87	—	105.3	20,422	Columbia R-2	23-21-62
1986	Col. R.h	Bonneville	fing.	07/01/87		105.4	15,170	Colunbia R-2	23-21-16
1986	Col. R.h	Bonneville	fing.	07/11/87	--	105.4	20,455	Columbia R-2	23-21-56
1986	Col. R.h	Bonneville	fing.	07/03/87	--	105.5	19,930	Columbia R-2	23-21-26
1986	Col. R.h	Bonneville	fing.	07/08/87	--	105.6	19,964	Columbia R-2	23-21-43
1986	Col. R.h	Bonneville	fing.	07/03/87	--	'105.9	20,117	Columbia R-2	23-21-27
1986	Col. R.h	Bonneville	fing.	07/09/87	--	106.2	20,497	Coltiia R-2	23-21-46
1986	Col. R.h	Bonneville	fing.	06/28/87	--	106.4	21,071	Columbia R-2	23-20-09
1986	Col. R.h	Bonneville	fing.	07/09/87	--	106.6	20,777	Coltiia R-2	23-21-47

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbesin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stege	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1986	Col. R.[h]	Bonneville	fing.	07/08/87	--	106.7	19,959	Coltiia R-2	23-21-41
1986	Col. R.[h]	Bonneville	fing.	06/25/87	--	113.7	17,164	Columbia R-2	23-20-61
1986	Col. R.[h]	Bonneville	fing.	06/25/87	--	114.3	16,807	Coltiia R-2	23-20-57
1986	Col. R.[h]	Bonneville	fing.	06/26/87	--	114.4	19,556	Colunbia R-2	23-21-01
1986	Col. R.[h]	Bonneville	fing.	06/27/87	--	114.4	19,226	Coltiia R-2	23-21-06
1986	Col. R.[h]	Bonneville	fing.	06/24/87	--	114.6	9,630	Columbia R-2	23-20-54
1986	Col. R.[h]	Bonneville	fing.	06/24/87	--	114.6	11,344	Columbia R-2	23-20-55
1986	Col. R.[h]	Bonneville	fing.	06/27/87	--	114.6	18,215	Columbia R-2	23-21-07
1986	Col. R.[h]	Bonneville	fing.	06/27/87	--	114.7	19,042	Columbia R-2	23-21-08
1986	Col. R.[h]	Bonneville	fing.	06/25/87	--	114.8	17,213	Coltiia R-2	23-20-60
1986	Cot. R.[h]	Bonneville	fing.	06/27/87	--	115.0	18,852	Colunbia R-2	23-20-04
1986	Col. R.[h]	Bonneville	fing.	06/26/87	--	115.0	17,715	Coltiia R-2	23-21-03
1986	Col. R.[h]	Bonneville	fing.	06/25/87	--	115.1	17,730	Columbia R-2	23-20-54
1986	Col. R.[h]	Bonneville	fing.	06/24/87	--	115.2	11,059	Colunbia R-2	23-20-52
1986	Col. R.[h]	Bomeville	fing.	06/24/87	--	115.2	9,447	Colunbia R-2	23-20-53
1986	Col. R.[h]	Bonneville	fing.	06/24/87	--	115.3	12,335	Coltiia R-2	23-20-56
1986	Cal. R.[h]	Bonneville	fing.	06/26/87	--	115.3	14,406	Columbia R-2	23-20-62
1986	Col. R.[h]	Bonneville	fing.	06/26/87	--	115.3	18,105	Columbia R-2	23-20-63
1986	Col. R.[h]	Bonneville	fing.	06/27/87	--	115.4	18,235	Columbia R-2	23-20-05
1986	Col. R.[h]	Bonneville	fing.	06/26/87	--	115.4	17,535	Columbia R-2	23-21-02
1986	Col. R.[h]	Bonneville	fing.	06/25/87	--	115.6	16,882	Columbia R-2	23-20-53
1986	Col. R.[h]	Bomeville	fing.	09/08/87	--	20.7	19,682	Tanner Cr	--
1986	Col. R.[h]	Bonneville	fing.	09/08/87	--	20.7	40,141	Tamer Cr	07-47-41
1986	Col. R.[h]	Bonneville	fins.	09/08/87	--	21.1	42,968	Tanner Cr	
1986	Col. R.[h]	Bonneville	fing.	09/08/87	--	21.1	39,591	Tanner Cr	07-47-37
1986	Col. R.[h]	Bonneville	fing.	09/08/87	--	21.1	37,141	Tanner Cr	07-47-42
1986	Cot. R.[h]	Bonneville	fing.	09/08/87	--	21.4	19,129	Tanner Cr	
1986	Cot. R.[h]	Bonneville	fing.	09/08/87	--	21.4	40,834	Tanner Cr	07-47-35
1986	Col. R.[h]	Bonneville	fing.	09/08/87	--	22.8	19,191	Tanner Cr	
1986	Col. R.[h]	Bonneville	fing.	09/08/87	--	22.8	40,591	Tanner Cr	07-47-32
1986	Col. R.[h]	Bonneville	fing.	09/08/87	--	23.4	19,417	Tanner Cr	--
1986	Col. R.[h]	Bonneville	fing.	09/08/87	--	23.4	40,510	Tanner Cr	07-47-38
1986	Klaskanine R.	STEP	fing.	05/27/87	--	41.0	10,886	Skipanom River	
1986	Klaskanine R.	STEP	fing.	05/27/87	--	41.0	3,628	Skipanon River	RV
1986	Klaskanine R.	STEP	fing.	05/27/87	--	22.0	300	Youngs River	--
1986	Klaskaniae R.	STEP	fins.	05/27/87	--	22.0	448	Youngs River	RV
1986	Rogue R.!	Big Creek	fins.	05/29/87	--	73.0	10,750	Big Creek	07-34-53
1986	Rogue R.!	Big Creek	fing.	05/29/87	--	73.0	10,683	Big Creek	07-34-54
1986	Rogue R.'	Big Creek	fing.	05/29/87	--	73.0	10,670	Big Creek	07-34-55

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1986	Rogue R.[i]	Big Creek	fing.	05/29/87	--	73.0	10,726	Big Creek	07-34-56
1986	Rogue R.[i]	Big Creek	fing.	05/29/87	--	105.0	893'894 10 529	Big Creek	07-34-57
1986	Tanner Cr	Bonneville	fing.	04/16/87	--	[illegible]	[illegible]	Tanner Cr	--
1986	Tanner Cr	Bonneville	fing.	04/16/87	--	105.0	53,523	Tanner Cr	07-29-52
1986	Tanner Cr	Bonneville	fing.	04/16/87	--	105.0	53,023	Tanner Cr	07-29-53
1986	Tanner Cr	Bonneville	fing.	05/08/87	--	113.4	7,647,286	Tanner Cr	--
1986	Tanner Cr	Bonneville	fing.	05/08/87	--	113.4	54,291	Tanner Cr	07-30-06
1986	Tanner Cr	Bonneville	fing.	05/08/87	--	113.4	54,291	Tanner Cr	07-36-32
1986	Tanner Cr	Big Creek	fing.	04/16/87	--	106.0	771,716	Big Creek	--
1986	Tanner Cr	Big Creek	fing.	04/16/87	--	106.0	53,147	Big Creek	07-38-15
1986	Tanner Cr	Big Creek	fing.	04/16/87	--	106.0	51,387	Big Creek	07-38-16
1986	Big Cr[g]	Big Creek	fry	03/26/87	--	147.0	488,335	Big Creek	--
1986	Big Cr[g]	Big Creek	fry	03/26/87	--	147.0	12,927	Big Creek	07-38-13
1986	Big Cr[g]	Big Creek	fry	03/26/87	--	147.0	12,332	Big Creek	07-38-14
1986	Big Cr[g]	Big Creek	fry	03/27/87	--	149.0	531,923	Big Creek	--
1986	Big Cr[g]	Big Creek	fry	03/27/87	--	149.0	12,996	Big Creek	07-38-13
1986	Big Cr[g]	Big Creek	fry	03/27/87	--	149.0	13,650	Big Creek	07-38-14
1986	Big Cr[g]	Big Creek	fry	03/27/87	--	153.0	528,955	Big Creek	--
1986	Big Cr[g]	Big Creek	fry	03/27/87	--	153.0	12,512	Big Creek	07-38-13
1986	Big Cr[g]	Big Creek	fry	03/27/87	--	153.0	13,250	Big Creek	07-38-14
1986	Big Cr[g]	Big Creek	fry	03/26/87	--	158.0	478,716	Big Creek	--
1986	Big Cr[g]	Big Creek	fry	03/26/87	--	156.0	13,119	Big Creek	07-38-13
1986	Big Cr[g]	Big Creek	fry	03/26/87	--	158.0	12,930	Big Creek	07-38-14
1986	Tanner Cr	Bonneville	fry	05/08/87	--	126.9	237,028	Tanner Cr	--
1986	Tanner Cr	Bonneville	fry	05/08/87	--	126.9	106,490	Tanner Cr	07-33-28
1986	Tanner Cr	Bonneville	fry	03/25/87	--	142.0	675,376	Tanner Cr	--
1986	Tanner Cr	Bonneville	fry	03/25/87	--	142.0	54,516	Tanner Cr	07-29-50
1986	Tanner Cr	Bonneville	fry	03/25/87	--	147.3	54,516	Tanner Cr	07-29-51
1986	Cot. R.[h]	Bonneville	smolt	03/04/88	--	7.6	33,255	Tanner Cr	
1986	Cot. R.[h]	Bonneville	smolt	03/04/88	--		34,511	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	03/04/88	--	7.7	35,527	Tanner Cr	
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	10.9	44,229	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	10.9	27,804	Tanner Cr	07-43-16
1986	Cot. R.[h]	Bonneville	smolt	11/05/87	--	11.2	31,315	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	11.2	27,546	Tanner Cr	07-43-20
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	11.3	46,228	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	11.3	28,212	Tanner Cr	07-43-18
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	11.9	33,464	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	11.9	26,399	Tanner Cr	07-43-19

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbssin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	12.4	83,801	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	12.4	28,006	Tanner Cr	07-43-09
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	12.4	27,718	Tanner Cr	07-43-17
1986	Col. R.[h]	Bonneville	smolt	11/05/87	11/06/87	12.9	121.609	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	12.9	27,887	Tanner Cr	07-43-15
1986	Col. R.[h]	Bonneville	smolt	11/06/87	--	13.1	69,531	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	13.2	32,002	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/05/87	--	13.2	26,183	Tanner Cr	07-41-29
1986	Col. R.[h]	Bonneville	smolt	11/06/87	--	13.4	70,130	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/06/87	--	14.2	70,695	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/06/87	--	14.4	74,543	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/06/87	--	14.5	70,524	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/06/87	--	14.6	76,632	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	11/06/87	--	17.0	74,529	Tanner Cr	--
1986	Cal. R.[h]	Bonneville	smolt	11/06/87	--	17.4	74,254	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	09/08/87	--	19.2	17,854	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	09/08/87	--	19.2	32,296	Tanner Cr	07-47-25
1986	Col. R.[h]	Bonneville	smolt	09/08/87	--	19.3	17,892	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	09/08/87	--	19.3	32,365	Tanner Cr	07-47-21
1986	Col. R.[h]	Bonneville	snlolt	09/08/87	--	19.4	17,860	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	09/08/87	--	19.4	32,308	Tanner Cr	07-47-22
1986	Col. R.[h]	Bonneville	smolt	09/08/87	--	19.9	17,975	Tanner Cr	--
1986	Col. R.[h]	Bonneville	smolt	09/08/87	--	19.9	31,954	Tanner Cr	07-47-19
1986	Rogue R.!	Big Creek	smolt	10/05/87	--	10.5	11,101	Big Creek	07-34-58
1986	Rogue R.!	Big Creek	smolt	10/05/87	--	10.5	10,879	Big Creek	07-34-59
1986	Rogue R.!	Big Creek	smolt	10/05/87	--	10.5	10,404	Big Creek	07-34-60
1986	Rogue R.!	Big Creek	smolt	10/05/87	--	10.5	9,923	Big Creek	07-34-61
1986	Rogue R.!	Big Creek	snlolt	10/05/87	--	10.5	10,492	Big Creek	07-34-62
1986	Rogue R.!	Big Creek	smolt	08/17/87	--	12.5	10,861	Big Creek	07-34-63
1986	Rogue R.!	Big Creek	smolt	08/17/87	--	12.5	10,483	Big Creek	07-35-01
1986	Rogue R.!	Big Creek	smolt	08/17/87	--	12.5	9,971	Big Creek	07-35-02
1986	Rogue R.!	Big Creek	smolt	08/17/87	--	12.5	10,198	Big Creek	07-35-03
1986	Rogue R.!	Big Creek	smolt	08/17/87	--	12.5	10,704	Big Creek	07-35-04
1986	Rogue R.!	CEDC	smolt	08/04/87	--	20.0	17,220	SFk Klaskanine R.	--
1986	Rogue R.'	CEDC	smolt	08/04/87	--	20.0	2,780	SFk Klaskanine R.	07-42-46
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	al.0	1,658,410	Big Creek	--
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	al.0	17,174	Bia Creek	07-45-63
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	81.0	16,936	Big Creek	07-46-01
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	82.0	333,124	Big Creek	--

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbssin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT code/ Fin Clip[c]
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	82.0	3,041	Big Creek	07-45-63
1987	Big Cr[g]	Big Creek	fing.	05/10/8a	--	82.0	2,998	Big Creek	07-46-01
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	83.0	331,225	Big Creek	--
1987	Big Cr[g]	Big Creek	fing.	05/10/8a	--	83.0	3,514	Big Creek	07-45-63
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	83.0	3,466	Big Creek	07-46-01
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	85.0	999,235	Big Creek	--
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	65.0	8,979	Big Creek	07-45-63
1987	Big Cr[g]	Big Creek	fing.	05/10/8a	--	85.0	5,848	Big Creek	07-46-01
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	86.0	665,169	Big Creek	--
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	86.0	5,821	Big Creek	07-45-63
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	86.0	5,739	Big Creek	07-46-01
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	88.0	332,300	Big Creek	--
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	88.0	3,063	Big Creek	07-45-63
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	88.0	3,020	Big Creek	07-46-01
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	89.0	332,639	Big Creek	--
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	89.0	2,941	Big Creek	07-45-63
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	89.0	2,900	Big Creek	07-46-01
1987	Big Cr[g]	Big Creek	fins.	05/10/88	--	91.0	333,188	Big Creek	--
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	91.0	2,575	Big Creek	07-45-63
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	91.0	2,540	Big Creek	07-46-01
1967	Big Cr[g]	Big Creek	fing.	05/10/88	--	94.0	664,767	Big Creek	--
1987	Big Cr[g]	Big Creek	fing.	05/10/88	--	94.0	5,907	Big Creek	07-45-63
1987	Big Cr[g]	Big Creek	fing.	05/10/0a	--	94.0	5,824	Big Creek	07-46-01
1987	Big Cr[g]	Big Creek	fins.	04/25/88	--	97.0	1,106,800	Big Creek	--
1987	Big Cr[g]	Big Creek	fing.	04/25/88	--	97.0	53,857	Big Creek	07-45-61
1987	Big Cr[g]	Big Creek	fing.	04/25/88	--	97.0	52,945	Big Creek	07-45-62
1987	Big Cr[g]	CEDC	fing.	05/16/88	--	60.6	2,724,419	SFk Klaskanine R.	--
1987	Big Cr[g]	CEDC	fing.	05/16/88	--	60.6	49,938	SFk Klaskanine R.	07-40-06
1987	Big Cr[g]	CEDC	fing.	05/19/0a	--	58.2	201,178	Youngs River	--
1987	Big Cr[g]	CEDC	fing.	05/19/88	--	58.2	51,876	Youngs River	07-40-07
1987	Big Cr[g]	CEDC	fing.	05/19/88	--	72.3	52,040	Youngs River	07-40-08
1987	Big Cr[g]	Klaskanine	fing.	05/10/88	--	98.3	2,803,730	NFk Klaskanine R.	--
1987	Big Cr[g]	Klaskanine	fing.	05/10/88	--	98.3	52,162	NFk Klaskanine R.	07-46-04
1987	Big Cr[g]	Klaskanine	fing.	05/10/68	--	98.3	52,117	NFk Klaskanine R.	07-46-05
1987	Col. R.[h]	Bonneville	fins.	08/31/88	--	21.1	2,532	Columbia R-2	--
1987	Col. R.[h]	Bonneville	fing.	07/24/0a	--	48.1	30,117	Columbia R-2	23-26-52
1987	Cot. R.[h]	Bonneville	fing.	07124188	--	48.1	30,079	Columbia R-2	23-26-55
1987	Col. R.[h]	Bonneville	fing.	07/24/88	--	48.2	30,106	Columbia R-2	23-26-47
1987	Cot. R.[h]	Bonneville	fing.	07/24/88	--	48.2	30,096	Columbia R-2	23-26-49

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Coltiia River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Releese Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1987	Col. R.[h]	Bonneville	fing.	07/24/88	--	48.2	30,106	Columbia R-2	23-26-50
1987	Col. R.[h]	Bonneville	fing.	07/15/88	--	52.2	29,957	Colunbia R-2	23-26-16
1987	Col. R.[h]	Bonneville	fing.	07/15/88	--	52.2	30,676	Columbia R-2	23-26-19
1987	Col. R.[h]	Bonneville	fing.	07/15/88	--	52.3	30.897	Colunbia R-2	23-26-21
1987	Col. R.[h]	Bonneville	fing.	07/15/88	--	52.6	30,935	Colunbia R-2	23-26-22
1987	Col. R.[h]	Bonneville	fing.	07/15/88	--	52.7	29,928	Columbia R-2	23-26-25
1987	Cot. R.[h]	Bonneville	fing.	07/14/88	--	52.9	30,217	Columbia R-2	23-26-07
1987	Col. R.[h]	Bonneville	fing.	07/14/88	--	53.1	30,237	Colunbia R-2	23-26-11
1987	Col. R.[h]	Bomeville	fing.	07/14/88	--	53.2	30,240	Coltiia R-2	23-26-08
1987	Col. R.[h]	Bonneville	fing.	07/14/88	--	53.6	30,202	Columbia R-2	23-26-13
1987	Col. R.[h]	Bonneville	fing.	07/14/88	--	53.8	30,069	Columbia R-2	23-26-14
1987	Col. R.[h]	Bonneville	fins.	07/22/88	--	55.9	30,382	Columbia R-2	23-26-28
1987	Cal. R.[h]	Bonneville	fing.	07/22/88	--	56.3	30,576	Colunbia R-2	23-26-31
1987	Col. R.[h]	Bonneville	fing.	07/22/88	--	56.3	29,112	Columbia R-2	23-26-32
1987	cot. R.[h]	Bonneville	fing.	07/22/88	--	56.4	30,096	Colunbia R-2	23-26-35
1987	Col. R.[h]	Bonneville	fing.	07/22/88	--	56.6	31,645	Columbia R-2	23-26-26
1987	Col. R.[h]	Bonneville	fing.	07/23/88	--	56.8	30,068	Columbia R-2	23-26-38
1987	Col. R.[h]	Bonneville	fing.	07/23/88	--	56.9	30,116	Columbia R-2	23-26-44
1987	Col. R.[h]	Bonneville	fing.	07/23/88	--	57.3	30,056	Colunbia R-2	23-26-42
1987	Col. R.[h]	Bonneville	fing.	07/23/88	--	57.5	30,046	Colunbia R-2	23-26-37
1987	Col. R.[h]	Bonneville	fing.	07/23/88	--	57.5	30,052	Coltiia R-2	23-26-41
1987	Col. R.[h]	Bonneville	fing.	07/02/88	--	57.6	30,732	Colunbia R-2	23-25-55
1987	Col. R.[h]	Bonneville	fing.	07/02/88	--	58.2	30,296	Columbia R-2	23-25-50
1987	Col. R.[h]	Bonneville	fing.	07/02/88	--	58.2	30,274	Colunbia R-2	23-25-52
1987	Col. R.[h]	Bonneville	fing.	07/02/88	--	58.2	30,110	Colunbia R-2	23-25-56
1987	Col. R.[h]	Bonneville	fing.	07/02/88	--	58.4	30,432	Columbia R-2	23-25-59
1987	Col. R.[h]	Bonneville	fing.	07/13/88	--	59.2	30,236	Colunbia R-2	23-26-04
1987	Col. R.[h]	Bonneville	fing.	07/13/88	--	59.3	30,277	Columbia R-2	23-25-61
1987	Col. R.[h]	Bonneville	fing.	07/13/88	--	59.3	30,218	Columbia R-2	23-26-02
1987	Col. R.[h]	Bonneville	fing.	06/29/88	--	59.4	30,002	Colunbia R-2	23-25-25
1987	Col. R.[h]	Bonneville	fing.	06/29/88	--	59.4	29,868	Columbia R-2	23-25-28
1987	Col. R.[h]	Bonneville	fing.	07/13/88	--	59.5	30,260	Colunbia R-2	23-25-62
1987	Col. R.[h]	Bonneville	fins.	07/13/88	--	59.5	29,934	Columbia R-2	23-26-01
1987	Col. R.[h]	Bonneville	fing.	06/29/88	--	59.6	29,999	Colunbia R-2	23-25-21
1987	Col. R.[h]	Bonneville	fins.	06/29/88	--	59.7	29,964	Columbia R-2	23-25-22
1987	Col. R.[h]	Bonneville	fing.	06/29/88	--	59.8	30,363	Columbia R-2	23-25-26
1987	Col. R.[h]	Bonneville	fing.	07/01/88	--	63.4	29,817	Columbia R-2	23-25-49
1987	Col. R.[h]	Bonneville	fing.	07/01/88	--	63.5	30,470	Columbia R-2	23-25-47
1987	Col. R.[h]	Bonneville	fins.	07/01/88	--	63.6	30,269	Columbia R-2	23-25-41

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1987	Col. R.h	Bonnevi l le	fing.	07/01/88	--	63.6	30,278	Columbia R-2	23-25-42
1987	Col. R.h	Bonneville	fing.	06/30/88	--	63.7	30,012	Columbia R-2	23-25-38
1967	Col. R.h	Bonneville	fing.	06/30/88	--	63.9	30,073	Columbia R-2	23-25-37
1987	Col. R.h	Bonneville	fing.	06/30/88	--	64.0	30,085	Columbia R-2	23-25-31
1987	Col. R.h	Bonneville	fing.	06/30/88	--	64.1	30,068	Columbia R-2	23-25-35
1987	Col. R.h	Bonneville	fing.	07/01/88	--	64.3	30,235	Columbia R-2	23-25-44
1987	Col. R.h	Bonneville	fing.	06/30/88	--	64.7	30,067	Columbia R-2	23-25-32
1987	cot. R.h	Bonneville	fing.	06/27/88	--	64.9	30,684	Columbia R-2	23-25-01
1987	Col. R.h	Bonneville	fing.	06/27/88	--	65.1	29,899	Columbia R-2	23-25-02
1987	Col. R.h	Bonneville	fing.	06127188	--	65.2	29,666	Columbia R-2	23-25-04
1987	Col. R.h	Bonneville	fing.	06/27/8a	--	65.2	29,945	Columbia R-2	23-25-07
1987	Col. R.h	Bonneville	fing.	06/27/88	--	65.5	29,929	Columbia R-2	23-25-08
1987	Col. R.h	Bonneville	fing.	06/2a/as	--	70.3	30,664	Columbia R-2	23-25-19
1987	Col. R.h	Bonneville	fing.	06/28/88	--	70.5	30,716	Columbia R-2	23-25-14
1987	Col. R.h	Bonnevi lle	fing.	06/28/88	--	70.9	30,291	Columbia R-2	23-25-11
1987	Col. R.h	Bonneville	fins.	06/28/88	--	70.9	30,554	Columbia R-2	23-25-16
1987	Col. R.h	Bonnevi l le	fing.	06/28/88	--	71.1	30,720	Columbia R-2	23-25-13
1987	Col. R.h	Bonneville	fing.	08/08/88	--	37.2	178,639	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	08/08/88	--	37.7	178,339	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	08/08/88	--	38.5	178,132	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	08/08/88	--	39.3	181,527	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	08/08/88	--	39.5	296,333	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	08/08/88	--	39.5	53,194	Tanner Cr	07-43-03
1987	Cot. R.h	Bonneville	fing.	08/08/88	--	39.8	171,183	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	08/08/88	--	40.6	178,887	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	08/08/88	--	40.8	217,040	Tanner Cr	--
1987	Col. R.h	Bonnevi lle	fing.	08/08/88	--	41.0	1751190	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	08/08/88	--	41.5	242,358	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	07/21/88	--	66.3	9,416	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	07/09/88	--	69.6	16,428	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	07/01/88	07/01/88	70.4	60,832	Tanner Cr	
1987	Col. R.h	Bonneville	fins.	06/24/88	--	74.0	65,094	Tanner Cr	-- **
1987	Col. R.h	Bonneville	fing.	06/01/88	--	75.9	343,827	Tanner Cr	
1987	Col. R.h	Bonneville	fing.	06/01/88	--	82.2	384,708	Tanner Cr	
1987	Col. R.h	Bonneville	fing.	06/01/88	--	83.5	346,317	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	06/01/88	--	83.8	334,203	Tanner Cr	--
1987	Col. R.h	Bonneville	fing.	06/01/88	--	83.8	27,097	Tanner Cr	07-42-54
1987	Col. R.h	Bonneville	fing.	06/01/88	--	87.9	342,517	Tanner Cr	--
1987	Col. R.h	Bomevi lle	fing.	06/01/88	--	89.1	336,404	Tanner Cr	

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1987	Col. R.[h]	Bonneville	fing.	06/01/88	--	91.6	356,507	Tanner Cr	
1987	Col. R.[h]	Bonneville	fing.	06/01/88	--	92.8	328,166	Tanner Cr	--
1987	Col. R.[h]	Bonneville	fing.	06/01/88	--	92.8	26,608	Tanner Cr	07-42-54
1987	Col. R.[h]	Bonneville	fing.	06/01/88	--	98.8	345,963	Tanner Cr	--
1987	Klaskanine R.	STEP	fing.	06/02/88	--	32.0	4,500	Skipanon River	
1987	Klaskanine R.	STEP	fing.	06/02/88	--	32.0	1,500	Skipanon River	RV
1987	Klaskanine R.	STEP	fing.	05/25/88	--	39.0	24,746	Youngs River	--
1987	Klaskaniae R.	STEP	fing.	05/25/88	--	39.0	8,248	Youngs River	RV
1987	Rogue R.!	Big Creek	fing.	05/19/88	--	79.0	11,197	Big Creek	07-35-35
1987	Rogue R.'	Big Creek	fing.	05/19/88	--	79.0	10,061	Big Creek	07-35-36
1987	Rogue R.!	Big Creek	fing.	05/19/88	--	79.0	10,843	Big Creek	07-35-37
1987	Rogue R.!	Big Creek	fing.	05/19/88	--	79.0	10,726	Big Creek	07-35-38
1987	Rogue R.'	Big Creek	fing.	05/19/88	--	79.0	10,788	Big Creek	07-35-39
1987	Tanner Cr	Bonneville	fing.	04/18/88	--	87.8	883,278	Tanner Cr	--
1987	Tanner Cr	Bonneville	fins.	04/18/88	--	87.8	52,917	Tanner Cr	07-45-55
1987	Tanner Cr	Bonneville	fing.	04/18/88	--	89.9	52,917	Tanner Cr	07-45-56
1987	Tanner Cr	Bonneville	fing.	04/30/88	--	90.7	52,777	Tanner Cr	07-45-58
1987	Tanner Cr	Bonneville	fing.	04/30/88	--	91.3	8,014,064	Tanner Cr	--
1987	Tanner Cr	Bonneville	fit-q.	04/30/88	--	91.3	52,777	Tanner Cr	07-45-57
1987	Big Cr[g]	Big Creek	fry	04/05/88	--	143.2	400,602	Big Creek	--
1987	Big Cr[g]	Big Creek	fry	04/05/88	--	143.4	505,986	Big Creek	--
1987	Big Cr[g]	Big Creek	fry	04/05/88	--	146.5	393,279	Big Creek	
1987	Big Cr[g]	Big Creek	fry	04/05/88	--	149.0	53,165	Big Creek	07-45-59
1987	Big Cr[g]	Big Creek	fry	04/05/88	--	149.0	51,901	Big Creek	07-45-60
1987	Big Cr[g]	Big Creek	fry	04/05/88	--	155.2	481,042	Big Creek	--
1987	Big Cr[g]	Klaskanine	fry	04/14/88	--	199.0	747,080	NFk Klaskanine R.	--
1987	Big Cr[g]	Klaskanine	fry	04/14/88	--	199.0	49,227	NFk Klaskanine R.	07-46-02
1987	Big Cr[g]	Klaskanine	fry	04/14/88	--	199.0	50,040	NFk Klaskanine R.	07-46-03
1987	Tanner Cr	Bonneville	fry	03/16/88	--	137.3	397,966	Tanner Cr	--
1987	Tanner Cr	Bonneville	fry	03/16/88	--	137.3	53,214	Tanner Cr	07-45-53
1987	Tanner Cr	Bonneville	fry	03/16/88	--	137.3	53,214	Tanner Cr	07-45-54
1987	Tanner Cr	Bonneville	fry	03/16/88	--	142.5	491,871	Tanner Cr	--
1987	Tanner Cr	Bonneville	fry	03/02/88	--	152.0	536,560	Tanner Cr	--
1987	Tanner Cr	Bonneville	fry	03/02/88	--	155.0	1,080,195	Tanner Cr	
1987	Tanner Cr	Bonneville	fry	03/02/88	--	164.0	442,636	Tanner Cr	--
1987	Col. R.[h]	Bonneville	smolt	10/19/88	--	13.8	2,177	Columbia R-2	--
1987	Col. R.[h]	Bonneville	smolt	03/07/89	--	8.8	28,013	Tanner Cr	--
1987	Col. R.[h]	Bonneville	smolt	03/07/89	--	8.8	24,444	Tanner Cr	07-35-55
1987	Col. R.[h]	Bonneville	smolt	03/07/89	--	9.0	12,974	Tanner Cr	--

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1987	Col. R.[h]	Bonneville	smolt	11/02/88	--	12.1	61,533	Tanner Cr	--
1987	cot. R.[h]	Bonneville	smolt	11/02/88	--	12.7	118,462	Tanner Cr	--
1987	Col. R.[h]	Bonneville	smolt	11/03/88	--	12.7	53,450	Tanner Cr	07-43-04
1987	Col. R.[h]	Bonneville	smolt	11/02/88	--	13.0	58,463	Tanner Cr	--
1987	Col. R.[h]	Bonneville	smolt	11/02/88	--	13.3	57,571	Tanner Cr	--
1987	Col. R.[h]	Bonneville	smolt	11/02/88	--	13.8	58,768	Tanner Cr	--
1987	Col. R.[h]	Bonneville	smolt	11/02/88	--	13.9	57,242	Tanner Cr	--
1987	Col. R.[h]	Bonneville	smolt	11/02/88	--	14.0	49,603	Tanner Cr	--
1987	Rogue R.[i]	Big Creek	smolt	10/04/88	--	10.1	9,777	Big Creek	07-41-36
1987	Rogue R.[i]	Big Creek	smolt	10/04/88	--	10.1	9,491	Big Creek	07-41-37
1987	Rogue R.[i]	Big Creek	smolt	10/04/88	--	10.1	9,581	Big Creek	07-41-38
1987	Rogue R.[i]	Big Creek	smolt	10/04/88	--	10.1	9,562	Big Creek	07-41-39
1987	Rogue [illegible]	Big Creek	smolt	10/04/88	--	10.1	9,376	Big Creek	07-41-40
1987	Rogue R.[i]	Big Creek	smolt	08/22/88	--	13.2	10,728	Big Creek	07-41-41
1987	Rogue R.[i]	Big Creek	smolt	08/22/88	--	13.2	10,456	Big Creek	07-41-42
1987	Rogue R.[i]	Big Creek	smolt	08/22/88	--	13.2	10,419	Big Creek	07-41-43
1987	Rogue R.[i]	Big Creek	smolt	08/22/88	- -	13.2	10,513	Big Creek	07-41-44
1987	Rogue R.[i]	Big Creek	smolt	08/22/88	- -	13.2	10,346	Big Creek	07-41-45
1987	Rogue R.[i]	CEDC	smolt	08/05/88	--	15.5	52,968	SFk Klaskanine R.	--
1987	Rogue R.[i]	CEDC	molt	08/05/88	--	15.5	26,802	SFk Klaskanine R.	07-42-45
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	75.0	322,870	Big Creek	--
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	75.0	2,429	Big Creek	07-43-36
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	75.0	2,407	Big Creek	07-43-37
1988	Big Cr[g]	Big Creek	fing.	05/07/89	05/08/89	76.0	1,114,966	Big Creek	--
1988	Big Cr[g]	Big Creek	fing.	05/07/89	05/08/89	76.0	11,914	Big Creek	07-43-36
1988	Big Cr[g]	Big Creek	fing.	05/07/89	05/08/89	76.0	11,810	Big Creek	07-43-37
1988	Big Cr[g]	Big Creek	fing.	05/08/89	---	77.0	1,590,063	Big Creek	
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	77.0	14,692	Big Creek	07-43-36
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	77.0	14,565	Big Creek	07-43-37
1988	Big Cr[g]	Big Creek	fing.	05/07/89	05/08/89	78.0	970,318	Big Creek	
1988	Big Cr[g]	Big Creek	fing.	05/07/89	05/08/89	78.0	8,050	Big Creek	07-43-36
1988	Big Cr[g]	Big Creek	fing.	05/07/89	05/08/89	78.0	7,980	Big Creek	07-43-37
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	80.0	667,664	Big Creek	--
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	80.0	9,348	Big Creek	07-43-36
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	80.0	9,266	Big Creek	07-43-37
1988	Big Cr[g]	Big Creek	fing.	05/07/89	--	81.0	304,624	Big Creek	--
1988	Big Cr[g]	Big Creek	fing.	05/07/89	--	81.0	3,026	Big Creek	07-43-36
1988	Big Cr[g]	Big Creek	fing.	05/07/89	--	81.0	2,999	Big Creek	07-43-37
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	83.0	282,062	Big Creek	

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	83.0	2,844	Big Creek	07-43-36
1988	Big Cr[g]	Big Creek	fing.	05/08/89	--	83.0	2,819	Big Creek	07-43-37
1988	Big Cr[g]	Big Creek	fing.	04/28/89	--	115.0	399,919	Big Creek	--
1988	Big Cr[g]	Big Creek	fing.	04/28/89	--	115.0	17,840	Big Creek	07-43-35
1988	Big Cr[g]	Big Creek	fing.	04/28/89	--	115.0	17,761	Big Creek	07-45-21
1988	Big Cr[g]	Big Creek	fing.	04/28/89	--	116.0	406,233	Big Creek	--
1988	Big Cr[g]	Big Creek	fing.	04/28/89	--	116.0	17,719	Big Creek	07-43-35
1988	Big Cr[g]	Big Creek	fing.	04/28/89	--	116.0	17,641	Big Creek	07-45-21
1988	Big Cr[g]	Big Creek	fing.	04/28/89	--	117.0	402,654	Big Creek	--
1988	Big Cr[g]	Big Creek	fing.	04/28/89	--	117.0	17,737	Big Creek	07-43-35
1988	Big Cr[g]	Big Creek	fing.	04/28/89	--	117.0	17,660	Big Creek	07-45-21
1988	Big Cr[g]	Klaskanine	fing.	05/05/89	--	107.6	3,047,624	NFk Klaskanine R.	--
1988	Big Cr[g]	Klaskanine	fing.	05/05/89	--	107.6	52,403	NFk Klaskanine R.	07-50-25
1988	Big Cr[g]	Klaskanine	fing.	05/05/89	--	107.6	52,653	NFk Klaskanine R.	07-50-27
1988	Col. R.[h]	Bonneville	fing.	07/22/89	--	45.2	30,115	Columbia R-2	23-32-07
1988	Col. R.[h]	Bonneville	fing.	07/20/89	--	53.0	30,140	Columbia R-2	23-31-47
1988	Col. R.[h]	Bonneville	fing.	07/21/89	--	54.4	30,094	Columbia R-2	23-31-59
1988	Col. R.[h]	Bonneville	fins.	07/15/89	--	58.9	30,141	Columbia R-2	23-31-35
1988	Col. R.[h]	Bonneville	fing.	07/13/89	--	59.7	30,089	Columbia R-2	23-31-11
1988	Col. R.[h]	Bonneville	fing.	07/14/89	--	61.0	30,119	Columbia R-2	23-31-22
1988	Col. R.[h]	Bonneville	fing.	06/26/89	--	61.7	50,779	Columbia R-2	07-50-34
1988	Col. R.[h]	Bonneville	fing.	06/26/89	--	61.7	50,779	Columbia R-2	07-50-36
1988	Col. R.[h]	Bonneville	fing.	07/07/89	--	64.0	30,035	Columbia R-2	23-28-50
1988	Col. R.[h]	Bonneville	fing.	07/06/89	--	66.8	30,051	Columbia R-2	23-28-38
1988	Col. R.[h]	Bonneville	fing.	07/08/89	--	68.3	30,061	Columbia R-2	23-28-62
1988	Col. R.[h]	Bonneville	fing.	06/24/89	--	68.8	30,070	Columbia R-2	23-28-26
1988	Col. R.[h]	Bonneville	fins.	06/23/89	--	74.3	30,083	Columbia R-2	23-28-14
1988	Cal. R.[h]	Bonneville	fing.	08/02/89	--	35.0	2,533,936	Tanner Cr	--
1988	Col. R.[h]	Bonneville	fing.	08/01/89	--	35.5	420,190	Tanner Cr	--
1988	Col. R.[h]	Bonneville	fing.	06/26/89	--	67.8	50,846	Tanner Cr	07-50-30
1988	Col. R.[h]	Bonneville	fing.	06/26/89	--	67.8	50,846	Tanner Cr	07-50-33
1988	Col. R.[h]	Bonneville	fing.	06/19/89	--	al.1	268,390	Tanner Cr	--
1988	Klaskanine R.	STEP	fing.	05/10/89	--	25.0	8,500	Youngs River	RV
1988	Klaskanioe R.	STEP	fing.	03/11/89	--	71.0	12,496	Youngs River	RV
1988	Rogue R.!	Big Creek	fing.	05/23/89	--	71.0	10,970	Big Creek	07-33-46
1988	Rogue R.!	Big Creek	fing.	05/23/89	--	71.0	10,446	Big Creek	07-35-40
1988	Rogue R.!	Big Creek	firm.	05/23/89	--	71.0	10,160	Big Creek	07-41-59
1988	Rogue R.?	Big Creek	fing.	05/23/89	--	71.0	10,305	Big Creek	07-41-60
1988	Rogue R.'	Big Creek	fing.	05/23/89	--	71.0	10,113	Big Creek	07-41-61

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded uire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nunber Released	Release Location	CUT Code/ Fin Clip[c]
1988	Rogue R.[i]	CEDC	fing.	07/21/89	--	22.1	55,996	Youngs River	--
1988	Tanner Cr	Bonneville	fing.	05/01/89	05/02/89	72.9	53,117	Tanner Cr	07-50-06
1988	Tanner Cr	Bonneville	fing.	05/01/89	05/02/89	74.6	8,065,604	Tanner Cr	--
1988	Tanner Cr	Bonneville	fing.	05/01/89	05/02/89	74.6	53,117	Tanner Cr	07-50-05
1988	Tanner Cr	Bonneville	fing.	04/13/89	--	99.8	52,980	Tanner Cr	07-50-03
1988	Tanner Cr	Bonneville	fing.	04/13/89	--	101.2	1,140,634	Tanner Cr	--
1988	Tanner Cr	Bonneville	fing.	04/13/89	--	101.2	52,980	Tanner Cr	07-49-63
1988	Tanner Cr	Bonneville	fing.	05/01/89	--	109.7	425,533	Tanner Cr	--
1988	Big Cr[g]	Big Creek	fry	04/14/89	04/17/89	146.0	1,255,127	Big Creek	--
1988	Big Cr[g]	Big Creek	fry	04/14/89	04/17/89	146.0	18,589	Big Creek	07-50-09
1988	Big Cr[g]	Big Creek	fry	04/14/89	04/17/89	146.0	17,496	Big Creek	07-50-10[m]
1988	Big Cr[g]	Big Creek	fry	04/14/89	--	147.0	630,584	Big Creek	--
1988	Big Cr[g]	Big Creek	fry	04/14/89	--	147.0	8,820	Big Creek	07-50-09
1988	Big Cr[g]	Big Creek	fry	04/14/89	--	147.0	8,861	Big Creek	07-50-10[m]
1988	Big Cr[g]	Big Creek	fry	04/14/89	--	148.0	629,651	Big Creek	--
1988	Big Cr[g]	Big Creek	fry	04/14/89	--	148.0	8,813	Big Creek	07-50-09
1988	Big Cr[g]	Big Creek	fry	04/14/89	--	148.0	8,812	Big Creek	07-50-10[m]
1988	Big Cr[g]	Big Creek	fry	04/14/89	--	149.0	645,149	Big Creek	--
1988	Big Cr[g]	Big Creek	fry	04/14/89	--	149.0	8,886	Big Creek	07-50-09
1988	Big Cr[g]	Big Creek	fry	04/14/89	--	149.0	8,959	Big Creek	07-50-10[m]
1988	Big Cr[g]	Big Creek	fry	04/12/89	--	149.5	636,535	Big Creek	--
1988	Big Cr[g]	Big Creek	fry	04/12/89	--	149.5	8,812	Big Creek	07-50-09
1988	Big Cr[g]	Big Creek	fry	04/12/89	--	149.5	9,036	Big Creek	07-50-10[m]
1988	Big Cr[g]	Klaskanine	fry	04/21/89	--	151.0	774,236	NFk Klaskanine R.	--
1988	Big Cr[g]	Klaskanine	fry	04/21/89	--	151.0	52,609	NFk Klaskanine R.	07-50-23
1988	Big Cr[g]	Klaskanine	fry	04/21/89	--	151.0	51,522	NFk Klaskanine R.	07-50-24
1988	Klaskanine R.	CEDC	fry	04/21/89	--	249.7	21,205	Youngs River	--
1988	Tanner Cr	Bonneville	fry	03/20/89	--	129.8	449,004	Tanner Cr	--
1988	Tanner Cr	Bonneville	fry	03/20/89	--	133.4	448,092	Tanner Cr	--
1988	Tanner Cr	Bonneville	fry	03/20/89	--	134.3	341,651	Tanner Cr	--
1988	Tanner Cr	Bonneville	fry	03/20/89	--	134.3	53,355	Tanner Cr	07-49-58
1988	Tanner Cr	Bonneville	fry	03/20/89	--	134.3	53,355	Tanner Cr	07-49-60
1988	Tanner Cr	Bonneville	fry	03/20/89	--	145.4	448,590	Tanner Cr	--
1988	Rogue R.[j]	Big Creek	smolt	08/21/89	--	12.8	10,399	Big Creek	07-41-62
1988	Rogue R.[j]	Big Creek	smolt	08/21/89	--	12.8	10,771	Big Creek	07-41-63
1988	Rogue R.[j]	Big Creek	smolt	08/21/89	--	12.8	10,544	Big Creek	07-42-01
1988	Rogue R.[j]	Big Creek	smolt	08/21/89	--	12.8	10,792	Big Creek	07-42-02
1988	Rogue R.[j]	Big Creek	smolt	08/21/89	--	12.8	9,902	Big Creek	07-42-03
1988	Rogue R.[j]	Big Creek	smolt	08/21/89	--	12.8	10,440	Big Creek	07-42-04

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded uire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1988	Rogue R.!	Big Creek	smolt	08/21/89		12.8	10,295	Big Creek	07-42-05
1988	Rogue R.!	Big Creek	smolt	08/21/89	--	12.8	9,633	Big Creek	07-42-06
1988	Rogue R.!	Big Creek	smolt	08/21/89	--	12.8	10,378	Big Creek	07-42-07
1988	Rogue R.!	Big Creek	smolt	08/21/89		12.8	10,317	Big Creek	07-42-08
1988	Rogue R.'	CEDC	smolt	07/21/89	--	16.8	41,219	Youngs River	--
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	77.6	496,617	Tanner Cr	--
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	77.6	6,541	Tanner Cr	07-42-50
1989	Big Cr[g]	Bonnevi lle	fing.	05/07/90	--	78.5	485,514	Tanner Cr	--
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	78.5	5,896	Tanner Cr	07-42-50
1989	Big Cr[g]	Bonneville	fing.	05/07/90		80.9	490,748	Tanner Cr	--
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	80.9	6,463	Tanner Cr	07-42-50
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	81.7	511,936	Tanner Cr	--
1989	Big Cr[g]	Bonneville	fing.	05/07/90		al.7	7,268	Tanner Cr	07-42-52
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	81.8	465,447	Tanner Cr	--
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	81.8	3,065	Tanner Cr	07-42-50
1989	Big Cr[g]	Bonneville	fing.	05/07/90		81.8	3,065	Tanner Cr	07-42-52
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	82.2	476,728	Tanner Cr	--
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	82.2	6,279	Tanner Cr	07-42-50
1989	Big Cr[g]	Bonneville	fing.	05/07/90		85.5	455,405	Tanner Cr	--
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	85.5	6,466	Tanner Cr	07-42-52
1989	Big Cr[g]	Bonneville	fing.	05/07/90		88.2	285,852	Tanner Cr	--
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	88.2	3,179	Tanner Cr	07-42-52
1989	Big Cr[g]	Bonneville	fing.	05/07/90	--	89.1	498,079	Tanner Cr	--
1989	Big Cr[g]	Bonnevi lle	fing.	05/07/90	--	89:1	6,049	Tanner Cr	07-42-52
1989	Big Cr[g]	Big Creek	fing.	05/31/90	--	56.0	2,307,216	Big Creek	--
1989	Big Cr[g]	Big Creek	fing.	05/31/90	--	56.0	27,419	Big Creek	07-47-59
1989	Big Cr[g]	Big Creek	fing.	05/31/90		56.0	31,307	Big Creek	07-47-61
1989	Big Cr[g]	Big Creek	fing.	05/31/90	--	56.0	27,290	Big Creek	07-47-62
1989	Big Cr[g]	Big Creek	fing.	05/31/90	--	56.0	26,713	Big Creek	07-49-01
1989	Big Cr[g]	Big Creek	fing.	05/01/90	--	72.0	340,769	Big Creek	--
1989	Big Cr[g]	Big Creek	fing.	05/01/90	--	72.0	2,603	Big Creek	07-42-59
1989	Big Cr[g]	Big Creek	fing.	05/01/90	05/03/90	74.0	1,348,611	Big Creek	
1989	Big Cr[g]	Big Creek	fing.	05/01/90	05/03/90	74.0	7,995	Big Creek	07-42-59
1989	Big Cr[g]	Big Creek	fing.	05/01/90	05/03/90	74.0	2,615	Big Creek	07-42-61
1989	Big Cr[g]	Big Creek	fing.	05/01/90	05/03/90	75.0	1,013,662	Big Creek	--
1989	Big Cr[g]	Big Creek	fing.	05/01/90	--	75.0	5,014	Big Creek	07-42-59
1989	Big Cr[g]	Big Creek	fing.	05/07/90	05/11/90	77.0	724,037	Big Creek	--
1989	Big Cr[g]	Big Creek	fing.	05/07/90	05/11/90	77.0	7,741	Big Creek	07-42-61
1989	Big Cr[g]	Big Creek	fing.	05/03/90	--	78.0	339,449	Big Creek	--

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Colmbia River subbasin by brood year and, if marked, coded wire tag code".

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nuder Released	Release Location	CWT Code/ Fin Clip[c]
1989	Big Cr[g]	Big Creek	fing.	05/03/90	--	78.0	4,617	Big Creek	07-42-59
1989	Big Cr[g]	Big Creek	fing.	05/07/90	05/11/90	79.0	1,089,369	Big Creek	--
1989	Big Cr[g]	Big Creek	fing.	05/07/90	05/11/90	79.0	11.253	Big Creek	07-42-61
1989	Big Cr[g]	Big Creek	fing.	05/05/90	05/08/90	80.0	1.058.197	Big Creek	--
1989	Big Cr[g]	Big Creek	fins.	05/05/90	--	80.0	4,904	Big Creek	07-42-59
1989	Big Cr[g]	Big Creek	fins.	05/07/90	05/08/90	80.0	7,598	Big Creek	07-42-61
1989	Big Cr[g]	Big Creek	fing.	04/20/90	--	93.0	861.943	Big Creek	--
1989	Big Cr[g]	Big Creek	fing.	04/20/90	--	93.0	27,263	Big Creek	07-42-55
1989	Big Cr[g]	Big Creek	fing.	04/20/90	--	93.0	8,983	Big Creek	07-42-56
1989	Big Cr[g]	Big Creek	fing.	04/20/90	--	95.0	442,270	Big Creek	--
1989	Big Cr[g]	Big Creek	fing.	04/20/90	--	95.0	17,998	Big Creek	07-42-56
1989	Cowlitz[l]	Bonneville	fing.	05/07/90	--	58.2	299,148	Tanner Cr	--
1989	Cowlitz[l]	Bonneville	fing.	05/07/90	--	59.9	279,254	Tanner Cr	--
1989	Cowlitz[l]	Bonneville	fing.	05/07/90	--	64.2	299,557	Tanner Cr	--
1989	Cowlitz[l]	Bonneville	fing.	05/07/90	--	72.7	298,579	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	08/02/90	--	44.9	29,769	Colunbia R-2	23-26-33
1989	Col. R.[h]	Bonneville	fing.	08/03/90	--	45.0	29,790	Columbia R-2	23-26-39
1989	Col. R.[h]	Bonneville	fing.	07/27/90	--	49.6	29,760	Colunbia R-2	23-26-15
1989	Cal. R.[h]	Bonneville	fing.	08/01/90	--	52.9	29,836	Colmbia R-2	23-26-27
1989	Col. R.[h]	Bonneville	fing.	07/26/90	--	53.0	29,892	Coltiia R-2	23-26-09
1989	Cot. R.[h]	Bonneville	fing.	07/24/90	--	53.3	29,795	Colunbia R-2	23-25-58
1989	Col. R.[h]	Bonneville	fing.	07/31/90	--	55.0	29,755	Colunbia R-2	23-26-20
1989	Col. R.[h]	Bonneville	fing.	07/06/90	--	57.6	29,837	Colmbia R-2	23-25-05
1969	Cot. R.[h]	Bonneville	fing.	07/25/90	--	57.8	29,883	Coltiia R-2	23-26-03
1989	Col. R.[h]	Bonneville	fing.	07/13/90	--	61.8	29,788	Columbia R-2	23-25-29
1989	Col. R.[h]	Bonneville	fins.	07/10/90	--	62.7	29,845	Columbia R-2	23-25-10
1989	Col. R.[h]	Bonneville	fins.	07/17/90	--	62.8	29,767	Colmbia R-2	23-25-34
1989	Col. R.[h]	Bonneville	fing.	07/11/90	--	63.1	29.846	Columbia R-2	23-25-17
1989	Col. R.[h]	Bonneville	fing.	07/21/90	--	64.8	29,938	Colwnbia R-2	23-25-53
1989	Col. R.[h]	Bonneville	fing.	07/20/90	--	67.0	29,748	Columbia R-2	23-25-46
1989	Col. R.[h]	Bonneville	fing.	07/18/90	--	68.9	27,767	Colmbia R-2	23-25-40
1989	Col. R.[h]	Bonneville	fins.	07/12/90	--	69.2	29,756	Columbia R-2	23-25-23
1989	Col. R.[h]	Bonneville	fing.	07/02/90	--	70.7	48,780	Colmbia R-2	07-54-06
1989	Col. R.[h]	Bonneville	fing.	07/02/90	--	70.7	48,781	Coltiia R-2	07-54-07
1989	Col. R.[h]	Bonneville	fit-q.	07/05/90	--	72.4	29,612	Colmbia R-2	23-24-62
1989	Col. R.[h]	Bonneville	fing.	08/01/90	--	38.1	200,254	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fins.	08/01/90	--	39.0	201,513	Tanner Cr	--
1989	Cot. R.[h]	Bonneville	fing.	08/01/90	--	39.3	400,585	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	08/01/90	--	39.7	200,485	Tanner Cr	--

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Dete (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1989	Col. R.[h]	Bomeville	fing.	08/01/90		41.3	200,305	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	08/01/90	--	41.7	200,327	Tanner Cr	--
1989	Cal. R.[h]	Bonneville	fing.	08/01/90	--	42.2	200,661	Tanner Cr	--
1989	Cot. R.[h]	Bonneville	fing.	08/01/90	--	42.6	200,774	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	08/01/90	--	43.0	224,331	Tanner Cr	--
1989	Cot. R.[h]	Bonneville	fing.	08/01/90		43.1	200,329	Tanner Cr	--
1989	Col. R.[h]	Bomeville	fing.	08/01/90	--	43.7	200,452	Tanner Cr	--
1989	Col. R.[h]	Bomeville	fing.	08/01/90	--	43.8	200,560	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	08/01/90	--	44.3	201,388	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	08/01/90		47.1	216,377	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	07/19/90		50.1	282,364	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	07/30/90		50.8	190,043	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	07/02/90	--	72.4	49,956	Tanner Cr	07-54-08
1989	Col. R.[h]	Bonneville	fing.	07/02/90	--	72.4	49,956	Tanner Cr	07-54-09
1989	Col. R.[h]	Bonneville	fing.	06/19/90		73.7	388,031	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	06/19/90	--	74.6	388,368	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	06/19/90	--	76.0	379,772	Tanner Cr	--
1989	Col. R.[h]	Bonneville	fing.	06/19/90		77.1	203,313	Tanner Cr	--
1989	Rogue R.[i]	Big Creek	fing.	06/05/90	--	62.0	10,352	Big Creek	07-43-38
1989	Rogue R.[i]	Big Creek	fing.	06/05/90	--	62.0	10,418	Big Creek	07-43-39
1989	Rogue R.[i]	Big Creek	fing.	06/05/90		62.0	10,324	Big Creek	07-43-40
1989	Rogue R.[i]	Big Creek	fing.	06/05/90	--	62.0	10,138	Big Creek	07-43-41
1989	Rogue R.[i]	Big Creek	fing.	06/05/90	--	62.0	10,343	Big Creek	07-43-42
1989	Rogue R.?	Big Creek	fing.	06/05/90	--	62.0	10,185	Big Creek	07-43-43
1989	Rogue R.!	Big Creek	fing.	06/05/90	--	62.0	10,119	Big Creek	07-43-44
1989	Rogue R.!	Big Creek	fing.	06/05/90	--	62.0	10,455	Big Creek	07-43-45
1989	Rogue R.!	Big Creek	fing.	06/05/90	--	62.0	10,846	Big Creek	07-43-46
1989	Rogue R.!	Big Creek	fing.	06/05/90	--	62.0	156,167	Big Creek	LV
1989	Rogue R.!	CEDC	fing.	08/01/90	--	32.8	77,441	Youngs River	--
1989	Rogue R.!	CEDC	fing.	08/01/90	--	32.8	9,883	Youngs River	07-46-39
1989	Rogue R.!	CEDC	fing.	08/01/90	--	32.8	9,869	Youngs River	07-46-40
1989	Rogue R.!	CEDC	fing.	08/01/90	--	32.8	10,390	Youngs River	07-46-41
1989	Rogue R.!	CEDC	fing.	08/01/90	--	32.8	9,686	Youngs River	07-46-42
1989	Rogue R.'	CEDC	fing.	08/01/90	--	32.8	10,442	Youngs River	07-46-43
1989	Tanner Cr	Bonneville	fing.	05/07/90	--	58.7	278,715	Tanner Cr	--
1989	Tanner Cr	Bonneville	fing.	05/07/90	--	58.7	27,229	Tanner Cr	07-47-52
1989	Tanner Cr	Bonneville	fing.	05/07/90	--	60.2	297,492	Tanner Cr	--
1989	Tanner Cr	Bomeville	fing.	05/07/90	--	60.2	26,926	Tanner Cr	07-47-49
1989	Tanner Cr	Bonneville	fing.	05/07/90	--	62.6	307,772	Tamer Cr	--

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1989	Tanner Cr	Bonneville	fing.	05/07/90	- -	62.6	12,490	Tanner Cr	07-47-47
1989	Tanner Cr	Bonneville	fing.	05/07/90	- -	63.3	280,028	Tanner Cr	--
1989	Tanner Cr	Bonneville	fing.	05/07/90	- -	63.3	27,357	Tanner Cr	07-47-50
1989	Tanner Cr	Bonneville	fing.	05/07/90	- -	66.0	289,674	Tanner Cr	--
1989	Tanner Cr	Bonneville	fing.	05/07/90	--	69.0	308,126	Tanner Cr	--
1989	Tanner Cr	Bonneville	fing.	05/07/90	- -	69.0	14,518	Tanner Cr	07-47-47
1969	Tanner Cr	Bonneville	fing.	05/07/90	--	80.9	301,447	Tanner Cr	--
1989	Tanner Cr	Bonneville	fing.	05/07/90	- -	80.9	26,926	Tanner Cr	07-47-56
1989	Tanner Cr	Bonneville	fing.	05/07/90	- -	81.0	281,761	Tanner Cr	--
1989	Tanner Cr	Bonneville	fins.	05/07/90	--	81.0	26,849	Tanner Cr	07-47-55
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	--	41.3	58,284	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	--	41.3	1,989	Tanner Cr	07-52-18[j]
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	- -	41.6	42,265	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	- -	41.6	1,623	Tanner Cr	07-52-18[j]
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	- -	42.0	103,929	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	--	42.0	4,431	Tanner Cr	07-52-18[j]
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	- -	42.2	96,303	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fins.	05/02/90	- -	42.2	3,286	Tanner Cr	07-52-18[j]
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	05/03/90	42.3	104,146	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	05/03/90	42.3	3,488	Tanner Cr	07-52-18[j]
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	- -	42.4	87,037	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	- -	42.4	2,412	Tanner Cr	07-52-18[j]
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	05/03/90	42.5	150,073	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	05/03/90	42.5	5,474	Tanner Cr	07-52-18[j]
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	- -	42.6	86,833	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fins.	05/02/90	--	42.6	2,830	Tanner Cr	07-52-18[j]
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	- -	43.1	57,434	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	- -	43.1	2,455	Tanner Cr	07-52-18[j]
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	--	43.4	57,905	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	- -	43.4	2,855	Tanner Cr	07-52-18[j]
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	05/03/90	43.5	141,575	Tanner Cr	--
1989	Tanner Cr	Stayton Pond	fing.	05/02/90	05/03/90	43.5	6,108	Tanner Cr	07-52-18[j]
1989	Rogue R.!	Big Creek	fry	08/31/90	- -	176.0	970	Big Creek	LV
1989	Rogue R.!	Big Creek	smolt	08/17/90	--	13.1	5,000	Big Creek	07-45-11
1989	Rogue R.?	Big Creek	smolt	08/17/90	- -	13.1	4,915	Big Creek	07-45-12
1989	Rogue R.!	Big Creek	smolt	08/17/90	- -	13.1	4,875	Big Creek	07-45-13
1989	Rogue R.!	Big Creek	smolt	08/17/90	--	13.1	5,638	Big Creek	07-45-14
1989	Rogue R.!	Big Creek	smolt	08/17/90	--	13.1	5,666	Big Creek	07-45-15
1989	Rogue R.'	Big Creek	smolt	08/17/90	- -	13.1	5,193	Big Creek	07-45-16

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if msrked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1989	Rogue R.[i]	Big Creek	smolt	08/17/90	--	13.1	20,292	Big Creek	LV
1989	Rogue R.[i]	Big Creek	smolt	oaf17/90	--	13.5	5,320	Big Creek	07-45-11
1989	Rogue R.[i]	Big Creek	smolt	08/17/90	--	13.5	5,616	Big Creek	07-45-12
1989	Rogue R.[i]	Big Creek	smolt	08/17/90	--	13.5	5,836	Big Creek	07-45-13
1989	Rogue R.[i]	Big Creek	smolt	08/17/90	--	13.5	5,095	Big Creek	07-45-14
1989	Rogue R.[i]	Big Creek	smolt	08/17/90	--	13.5	4,873	Big Creek	07-45-15
1989	Rogue R.[i]	Big Creek	smolt	oaf17/90	--	13.5	4,926	Big Creek	07-45-16
1989	Rogue R.[i]	Big Creek	smolt	08/17/90	--	13.5	20,272	Big Creek	LV
1989	Rogue R.[i]	Big Creek	smolt	08/17/90	--	18.6	30,615	Big Creek	LV
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	55.5	354,479	Tanner Cr	--
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	55.5	7,603	Tanner Cr	07-44-08
IWO	Big Cr[g]	Bonneville	fing.	05/24/91	--	55.7	353,630	Tanner Cr	
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	55.7	7,585	Tanner Cr	07-44-07
IWO	Big Cr[g]	Bonneville	fing.	05/24/91	--	56.2	351,493	Tanner Cr	--
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	56.2	3,953	Tanner Cr	07-44-07
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	56.2	3,953	Tanner Cr	07-44-08
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	56.5	352,846	Tanner Cr	--
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	56.5	7,568	Tanner Cr	07-44-07
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	56.7	353,206	Tanner Cr	--
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	56.7	7,576	Tanner Cr	07-44-08
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	56.9	408,093	Tanner Cr	
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	56.9	7,903	Tanner Cr	07-44-08
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	57.3	353; 297	Tanner Cr	--
1990	Big Cr[g]	Bonneville	fing.	05/24/91	--	57.3	7,578	Tanner Cr	07-44-07
1990	Big Cr[g]	STEP	fing.	06/12/91	--	32.0	11,008	Youngs River	--
1990	Cowlitz[l]	Bonneville	fing.	05/24/91	--	61.3	378,711	Tanner Cr	
1990	Cowlitz[l]	Bonneville	fing.	05/24/91		74.3	430,643	Tanner Cr	--
1990	Cowlitz[l]	Bonneville	fing.	05/24/91	--	80.6	417,589	Tanner Cr	--
1990	Cowlitz[l]	Bonneville	fing.	05/24/91	--	83.7	307,179	Tanner Cr	
1990	Col. R.[h]	Bonneville	fing.	06/27/91	--	59.6	214,222	Columbia R-2	--
IWO	Col. R.[h]	Bonneville	fing.	06/25/91	06/26/91	60.7	361,469	Columbia R-2	--
1990	Cot. R.[h]	Bonneville	fing.	06/28/91		61.3	100,727	Columbia R-2	07-56-54
1990	Col. R.[h]	Bonneville	fing.	06/24/91	--	67.1	99,570	Colunbia R-2	07-46-49
1990	Cot. R.[h]	Bonneville	fing.	07/22/91	--	45.2	494,170	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	45.2	5,832	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fing.	07/22/91		45.9	177,951	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	45.9	2,161	Tamer Cr	07-55-21
1990	Cot. R.[h]	Bomeville	fing.	07/22/91	--	46.0	328,346	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	46.0	3,820	Tanner Cr	07-55-21

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nuder Released	Release Location	CUT Code/ Fin Clip[c]
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	46.3	320,333	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	46.3	3,721	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	46.4	328,879	Tanner Cr	--
IWO	Col. R.[h]	Bonneville	fing.	07/22/91	--	46.4	3.994	Tanner Cr	07-55-21
IWO	Col. R.[h]	Bonneville	fing.	07/22/91	--	46.5	164,795	Tanner Cr	--
IWO	Col. R.[h]	Bonneville	fing.	07/22/91	--	46.5	2,001	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	46.7	165,347	Tanner Cr	--
IWO	Col. R.[h]	Bonneville	fins.	07/22/91	--	46.7	1,839	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonnevi lle	fing.	07/22/91	--	47.2	164,317	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fins.	07/22/91	--	47.2	1,827	Tanner Cr	07-55-21
IWO	Col. R.[h]	Bonneville	fing.	07/22/91	--	47.3	164,384	Tanner Cr	
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	47.3	1,828	Tanner Cr	07-55-21
IWO	Col. R.[h]	Bonneville	fing.	07/22/91	--	47.9	493,439	Tanner Cr	--
IWO	Col. R.[h]	Bonneville	fing.	07/22/91	--	47.9	5,823	Tanner Cr	07-55-21
IWO	Col. R.[h]	Bonneville	fing.	07/22/91	--	48.0	164,467	Tanner Cr	--
IWO	Col. R.[h]	Bonneville	fins.	07/22/91	--	48.0	1,997	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	48.5	164,334	Tanner Cr	--
1990	Col. R.[h]	Bonnevi lle	fins.	07/22/91	--	48.5	1,827	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	48.6	330,044	Tanner Cr	
IWO	Col. R.[h]	Bonneville	fing.	07/22/91	--	48.6	3,838	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	48.8	327,833	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	48.8	3,812	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	48.9	165,061	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fins.	07/22/91	--	48.9	1,835	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	49.6	165,559	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fins.	07/22/91	--	49.6	1,841	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fin;.	07/22/91	--	50.1	330,177	Tanner Cr	
1990	Cot. R.[h]	Bonneville	fing.	07/22/91	--	50.1	3,840	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	50.2	129,134	Tanner Cr	
1990	Col. R.[h]	Bonneville	fing.	07/22/91	--	50.2	1,436	Tanner Cr	07-55-21
1990	Col. R.[h]	Bonneville	fing.	06/27/91	--	59.6	33,674	Tanner Cr	--
IWO	Col. R.[h]	Bonneville	fins.	06/24/91	--	60.5	100,171	Tanner Cr	07-14-16
1990	Cot. R.[h]	Bonneville	fing.	06/28/91	--	61.3	102,276	Tanner Cr	07-14-17
1990	Cot. R.[h]	Bonneville	fing.	05/31/91	--	75.0	411,075	Tanner Cr	--
IWO	Col. R.[h]	Bonneville	fing.	05/31/91	--	80.4	403,688	Tanner Cr	--
1990	Cot. R.[h]	Bonneville	fing.	05/31/91	--	81.4	411,396	Tanner Cr	
1990	Col. R.[h]	Bonneville	fins.	05/31/91	--	82.5	332,888	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fing.	05/31/91	--	82.6	412,009	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fins.	05/31/91	--	82.9	409,775	Tamer Cr	--

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River s&basin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1990	Col. R.[h]	Bonnevi l le	fing.	05/31/91	--	84.2	410,222	Tanner Cr	--
1990	Col. R.[h]	Bonnevi l le	fing.	05/31/91	--	85.3	410,464	Tanner Cr	--
1990	Col. R.[h]	Bonneville	fing.	05/31/91	--	86.5	194,193	Tanner Cr	--
1990	Tanner Cr	Bonnevi lle	fing.	05/10/91	--	46.6	1,997,889	Tanner Cr	--
1990	Tanner Cr	Bonneville	fing.	05/10/91		46.6	7,324	Tanner Cr	07-52-27[n]
1990	Tanner Cr	Bonnevi l le	fing.	05/10/91	--	46.6	7,324	Tanner Cr	07-52-28[n]
1990	Tanner Cr	Bonnevi l le	fing.	05/10/91	--	46.6	7,324	Tanner Cr	07-52-29"
1990	Tanner Cr	Bonnevi l le	fing.	05/10/91	--	46.6	7,324	Tenner Cr	07-52-30[n]
1990	Tanner Cr	Bonneville	fing.	05/10/91	--	46.6	7,324	Tanner Cr	07-52-31"
1990	Tanner Cr	Bonnevi l le	f ing.	05/24/91		61.7	372,730	Tanner Cr	--
1990	Tanner Cr	Bonnevi l le	f ing.	05/10/91		68.8	334,818	Tanner Cr	--
1990	Tanner Cr	Bonnevi 11 e	fing.	05/10/91	--	68.8	7,531	Tanner Cr	07-44-04
1990	Tanner Cr	Bonnevi 11 e	fing.	05/10/91	--	69.0	330,729	Tanner Cr	--
1990	Tanner Cr	Bonneville	fing.	05/10/91	--	69:0	7,785	Tanner Cr	07-44-04
1990	Tanner Cr	Bonnevi l le	fing.	05/10/91	--	70.5	221,564	Tanner Cr	--
1990	Tanner Cr	Bonnevi l le	fing.	05/10/91		70.5	7,561	Tanner Cr	07-44-04
1990	Tanner Cr	Bonneville	fing.	05/24/91		71.1	243,020	Tanner Cr	--
1990	Tanner Cr	Bonneville	fing.	05/10/91	--	71.2	336,261	Tanner Cr	--
1990	Tanner Cr	Bonneville	fing.	05/10/91	--	71.2	7,564	Tanner Cr	07-44-02
IWO	Tanner Cr	Bonnevi l le	fing.	05/10/91	--	74.1	336,043	Tanner Cr	--
1990	Tanner Cr	Bonneville	fing.	05/10/91	--	74.1	7,559	Tanner Cr	07-44-02
1990	Tanner Cr	Bonnevi l le	f ing.	05/10/91		77.1	337,764	Tanner Cr	--
1990	Tanner Cr	Bcmnevi l le	fing.	05/10/91	--	77.1	3,976	Tanner Cr	07-44-02
1990	Tanner Cr	Bonnevi l le	f ing.	05/10/91	--	77.1	3,976	Tanner Cr	07-44-04
1990	Tanner Cr	Bonnevi l le	fing.	05/10/91		79.0	335,472	Tanner Cr	--
IWO	Tanner Cr	Bonnevi l le	fing.	05/10/91	--	79.0	7,546	Tanner Cr	07-44-02
1990	Tanner Cr	Bonneville	fing.	05/10/91		79.2	357,271	Tanner Cr	--
1990	*Tamer* C r	Bonneville	f ing.	05/10/91		82.6	322,966	Tanner Cr	--

a Estimates are from Oregon Department of Fish and Wildlife (unpublished data); records prior to the 1982 brood year may be incomplete.

b LRH refers to lower Columbia River Hatchery Stock complex, and BPH refers to Bonneville *Pool* Hatchery stock, both of which are informally called tules. Tanner Creek, Klaskanine and Big Creek stocks are all part of the Lower Columbia River Hatchery Stock complex.

c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary clip; RM = right maxillary clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the mark, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark uas "U4". The "AU" code has not been identified.

(cont.)

Table 1 (TR). (cont.) Hatchery releases of fall chinook into the lower Columbia River subbasin by brood year and, if marked, coded uire tag code[a].

d Day(s) of release unknown. Standardized to the 15th of the month.
e Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.
f Stock of origin is unknown but assumed to primarily be LRH stock.
g Big Creek Hatchery stock.
h Bonneville Upriver Bright stock.
i Cole River Hatchery stock.
j Juveniles with this tag group were also released into the Santiam and Calapooia rivers, Molalla and Pudding rivers, and Coast Fork and Long Tom River subbasins.
k Juveniles with this tag group were also released into the Santiam and Calapooia rivers and Coast Fork and Long Tom River subbasins.
l Carson/Cowlitz (Washington) stock.
m This coded uire tag number is recorded as having been used to tag juvenile spring chinook salmon released into the Santiam and Calapooia rivers subbasin.
n Juveniles with this tag group were also released into the Santiam and Calapooia rivers and Molalla and Pudding rivers subbasins.

Table 2 (RH-1). Total escapement of LRH fall chinook to Bonneville Hatchery by brood year[a].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1977				--			--
1978			--	180		--	--
1979	--	--	2,410	37			
1980	--	9,324	2,330	5			--
1981	171	2,384	1,084	86		3,725	3,554
1982	314	4,373	1,341	42	0	5,970	5,656
1983	455	2,026	287	45	0	2,813	2,358
1984	9,185	28,307	12,007	134	4	49,637	40,452
1985	170	845	1,897	31	0[b]	2,943	2,773
1986	177	2,333	2,003	64[b]	--	--	--
1987	221	1,438	526[b]				--
1988	795	7,192[b]	--	--	--	--	--
1989	1,367[b]	--	--		--	--	--

[a] Estimates (from total counts and estimates of age composition by run year) are from Washington Department of-Fisheries (unpublished data).

[b] The 1991 run year data includes 172 fall chinook that were transferred from Cascade Hatchery.

Table 3 (RH-2). Total escapement of BUB fall chinook to Bonneville Hatchery by brood year".

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1979		--		--	13	--	--
1980			--	901	22	--	--
1981	--	--	1,132	217	4	--	--
1982	--	426	1,141	392	7	--	1,966
1983	153	777	2,381	697	10	4,018	3,865
1984	596	736	3,562	2,528	110	7,532	6,936
1985	520	1,881	6,253	4,225	333[b]	13,212	12,692
1986	737	2,350	5,853	2, 449[b]	—	—	--
1987	557	1,896	3,005[b]	--	--	--	--
1988	1,469	2,203[b]	--	--	--	--	--
1989	1,398[b]	--	--	--	--	--	--

[a] Estimates (from total counts and estimates of age composition by run year) are from Washington Department of Fisheries (unpublished data).

[b] The 1991 run year data does not include 182 URB stock fish that were transferred from Cascade Hatchery to Bonneville Hatchery.

Table 4 (RH-3). Total escapement of BPH fall chinook to Bonneville Hatchery by brood year[a].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1978	--	--	--	--	. .	. .	
1979	--	--	--	0	. .	. .	--
1980	--		57	0	--	. .	--
1981	--	1,141	357	31	--	--	1,529
1982	215	2,593	1,059	0	--	3,867	3,652
1983	0	131	562	0	--	693	693
1984	89	0	0	0	--	89	0
1985	9	355	4	0	--	368	359
1986	77	487	247	0	--	811	734
1987	99	302	182	--	--	--	
1988	256	2,253	--	--	--	--	--
1989	202	--	--	--	--	--	--

[a] Estimates (from total counts and estimates of age composition by run year) are from Washington Department of Fisheries (unpublished data).

Table 5 (BH-4). Total escapement of LRH fall chinook to Klaskanine Hatchery by brood year[a].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1976	--		--			. .	. .
1977	--	--	--	0	--	. .	. .
1978	--	--	41	0	--	. .	. .
1979	--	29	14	0	--	. .	--
1980	1	33	24	0	--	. .	. .
1981	1	10	5	--	--	. .	. .
1982	0	7	11	--	--	. .	. .
1983	0	20	--	--	--	. .	. .
1984	3	--	--	2	--	. .	. .
1985	--	--	10	0	--	. .	. .
1986	--	5	4	0	--	. .	. .
1987	2	1	0	--	--	. .	. .
1988	2	62	--	--	--	. .	. .
1989	1	--	--	--	--	--	. .

[a] Estimates (from total counts and estimates of age composition by run year) are from Washington Department of Fisheries (unpublished data).

Table 6 (RH-5). Total escapement of Rogue River stock fall chinook to Klaskanine Hatchery by brood year[a].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1978	--	--	. .	. .	. .	--	. .
1979	--	--	--	. .	. .	. .	. .
1980	--	--	0	. .	. .	. .	. .
1981	--	0	0	. .	. .	. .	. .
1982	3	16	. .	. .	. .	. .	. .
1983	0	--	. .	. .	. .	. .	. .
1984	--	--	. .	. .	--	. .	. .
1985	--	--	. .	. .	. .	. .	. .
1986		--	0	. .	. .	. .	. .
1987	--	2	1	. .	. .	--	--
1988	0	0	. .	. .	. .	. .	. .
1989	4		. .	. .	--	. .	. .

[a] Estimates (from total counts and estimates of age composition by run year) are from Washington Department of Fisheries (unpublished data).

Table 7 (BH-6). Total escapement of LRH fall chinook to Big Creek Hatchery by brood year[a].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1976	--	--	--	--	0		
1977	--	--	--	33	0		
1978	--	--	2,024	107	0		
1979	--	8,205	2,188	52	--		
1980	392	1,636	1,654	--	0		
1981	53	4,444	--	248			
1982	386	--	4,482	--			
1983	--	1,437	--	--	0		
1984	3,665	--	--	594	18		
1985	--	--	4,137	230	5	--	--
1986	--	1,679	3,968	245	--	--	--
1987	46	843	504	--	--	--	--
1988	149	5,151		--	--	--	--
1989	148	--		--	--	--	--

[a] Estimates (from total counts and estimates of age composition by run year) are from Washington Department of Fisheries (unpublished data).

Table 8 (RH-7). Total escapement of Rogue River stock fall chinook to Big Creek Hatchery by brood year[a].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1979	--			--	13	--	--
1980			--	901	0	--	--
1981			1,132	0	--	--	--
1982	--	426	217	--	--	--	--
1983	153	113	--	--	0	--	--
1984	41	--	--	34	1	--	--
1985	--	--	196	13	1	--	--
1986	--	175	418	10	--	--	--
1987	199	195	300	--	--	--	--
1988	80	256	--	--	--	--	--
1989	66	--	--	--	--	--	--

[a] Estimates (from total counts and estimates of age composition by run year) are from Washington Department of.Fisheries (unpublished data).

Table 9 (RH-8). Total escapement of LRH fall chinook to the CEDC Hatchery by brood year[a].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1983			--	--	--	--	--	--
1984	--	--					
1985	--	--	0	--	--	--	--
1986	--	0	9	--	--	--	--
1987	2	1	--	--	--	--	--
1988	0	--	--	--	--	--	--

[a] Estimates (from total counts and estimates of age composition by run year) are from Washington Department of Fisheries (unpublished data).

Table 10 (RH-9). Total escapement of Rogue River stock fall chinook to CEDC Hatchery by brood year[a].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1978		--	--	--	--	--	--
1979	--	--				--	--
1980	--	--	--	--	--	--	--
1981			0	--	--	--	--
1982		51	--	--	--	--	--
1983	2	--				--	--
1984	--	--	--	--	--	--	--
1985	--	--	0	--	--	--	--
1986		0	3	--	--	--	--
1987	1	9	3	--	--	--	--
1988	1	0	--	--	--	--	--
1989	0	--		--		--	--

[a] Estimates (from total counts and estimates of age composition by run year) are from Washington Department of Fisheries (unpublished data).

Table 11 (AL-l). Mean fork length by brood year and age class (freshwater. ocean) for LRH fall chinook[a] returning to Bonneville Hatchery. (Estimates for each freshwater age category along the upward diagonal to the right of a given footnote are from the same source.)

Mean Fork Length (cm)

Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4
1976	--	--	--		--	--	--	
N	--	--	--	--	--	--	--	
st. dev.	--		--		--	--	--	
1977	--		92	106	--	84	91	
N	--	--	--	--	--	--	--	
st. dev.	--	--	--	--	--	--	--	
1978	--	80	92	93	68[b]	89[c]	94	
N	--	--	--	--	--	--	--	
st. dev.	--	--	--	--	--	--	--	
1979	60[b]	82	90	92	--	--	--	
N	--	--	--	--	--	--	--	
st. dev.	--	--	--	--	--	--	--	
1980	58[c]	82	90	99	66[d]	80		
N	--		--	--	--	--	--	
st. dev.	--	--	--	--	--	--	--	
1981	58[d]	78	90	--	67[e]	85[f]	--	
N	--		--	--	--	--	--	
st. dev.	--	--	--	--	--	--	--	
1982	56[e]	81	--	--	--	--	--	
N	--	--	--	--	--	--	--	
st. dev.	--	--	--	--	--	--	--	
1983	58[f]		--	--	--	--	--	--
N	--	--	--	--	--		--	
at. dev.	--		--	--	--	--	--	

[a] Hatchery tule fall chinook. Actual stock of origin is unknown, although assumed to be LRH stock,

[b] Modified from Hansen and Thoming (1981).

[c] Modified from Hansen et al. (1982).

(cont.)

Table 11 (AL-l). (cont.) Mean fork length by brood year and age class (freshwater. ocean) for LRH fall chinook" returning to Bonneville Hatchery. (Estimates for each freshwater age category along the upward diagonal to the right of a given footnote are from the same source.)

[d] Modified from Hansen and Johnson (1983).
[e] Modified from Hansen and Johnson (1984).
[f] Modified from Hansen and Johnson (1985).

Table 12 (AL-4). Mean fork length by brood year and age class (freshwater. ocean) for BUB fall chinook returning to Bonneville Hatchery[a,b].

Mean Fork Length (cm)

Brood Year		1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4
1978		--	--	--	89	--	--	88	--
	N	--	--	--	409	--	--	109	--
St.	dev.	--	--	--	--	--	--	--	--
1979		--	--	81	--	--	76	--	--
	N	--	--	3,948	--	--	160	--	--
St.	dev.	--	--	--	--	--	--	--	--
1980		--	69	--	--	61	--	--	--
	N	--	430	--	--	119	--	--	--
st.	dev.	--	--	--	--	--	--	--	--

[a] Modified from Hansen (1983, cited by Howell et al. 1985).
[b] Data based on random sample of untagged adults that returned volitionally to Bonneville Hatchery, or were trapped at Cascade Hatchery and transported to Bonneville Hatchery.

Table 13 (AL-2). Mean fork length by brood year and age class (freshwater. ocean) for LRH fall chinook[a] returning to Klaskanine Hatchery. (Estimates for each age category along the upward diagonal to the right of a given footnote are from the same source.)

Mean Fork Length (cm)

Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4
1978	--	--	93	--	--	--	--	--
N	--	--	--	--	--	--	--	--
st. dev.	--	--	—	—	—	—	--	—
1979	--	80	91	--	--	--	--	--
N	--	--	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--
1980	63[b]	81	88	--	--	--	--	--
N	--	--	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--
1981	51[c]	78[d]	go	—	—	--	--	—
N	--	--	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--
1982	--	77[e]	—	—	—	—	—	—
N	--	--	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--

[a] Hatchery tule fall chinook. Actual stock of origin is unknown, although assumed to be LRH stock.
[b] Modified from Hansen et al. (1982).
[c] Modified from Hansen and Johnson (1983).
[d] Modified from Hansen and Johnson (1984).
[e] Modified from Hansen and Johnson (1985).

Table 14 (AL-3). Mean fork length by brood year and age class (freshwater. ocean) for LRH fall chinook[a] returning to Big Creek Hatchery. (Estimates for each freshwater age category along the upward diagonal to the right of a given footnote are from the same source.)

Mean Fork Length (cm)

Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4
1976		--	--	99		--		
N		--	--	--		--		
st. dev.	--	--	--	--		--		
1977	--	--	96	100	--	--		
N		--	--	--		--		
st. dev.		--	--	--		--		
1978	--	83	95	97	--	--	--	
N	--	--	--	--	--	--		
st. dev.	--	--	--	--		--		
1979	60[b]	84	94	98		--		
N	--	--	--	--		--		
st. dev.	--	--	--	--		--		
1980	60[c]	83	90	96		--		
N	--	--	--	--	--	--		
st. dev.	--	--	--	--	--	--		
1981	58[d]	80	93	--	--	--		
N	--	--	--	--		--		
st. dev.	--	--	--	--		--		
1982	55[e]	83	--	--		--		
N	--	--	--	--	--	--		
et. dev.	--	--	--	--		--		
1983	57f	--	--	--		--		
N	--	--	--	--		--		
st. dev.	a-	--	--	--		--		--

[a] Hatchery tule fall chinook; actual stock of origin is unknown, although assumed to be LRH stock.

(cont.)

Table 14 (AL-3). (cont.) Mean fork length by brood year and age class (freshwater. ocean) for LRH fall chinook[a] returning to Big Creek Hatchery. Estimates for each freshwater age category along the upward diagonal to the right of a given footnote were derived from the same reference.

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[b] Modified from Hansen and Thoming (1981).
[c] Modified from Hansen et al. (1982).
[d] Modified from Hansen and Johnson (1983).
[e] Modified from Hansen and Johnson (1984).
[f] Modified from Hansen and Johnson (1985).

Table 15 (AC-l). Age composition (freshwater.ocean) by brood year for LRH fall chinook at Bonneville Hatchery[a].

Brood Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1981	--	5	64	29	2	0	--	. .	. .	. .
1982	. .	5	72	22	1	0	. .	. .	. .	. .
1983	. .	16	72	10	2	0	--	. .	. .	. .
1984	. .	19	57	24	<1	<1	. .	. .	. .	. .
1985	--	6	29	64	1	0	--	--	--	--

[a] Estimates of age structure are based on brood returns to Bonneville Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 16 (AC-a). Age composition (freshwater.ocean) by run year for LRH fall chinook at Bonneville Hatchery[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1983	--	1	77	20	2	0	--	--	--	--
1984	--	6	47	46	1	0	--	--	--	--
1985	--	8	74	18	<1	0	--	--	--	--
1986	--	73	16	10	1	0	--	--	--	--
1987	--	1	98	1	<1	0	--	--	--	--
1988	--	1	6	92	<1	0	--	--	--	--
1989	--	5	51	41	3	0	--	--	--	--
1990	--	18	34	47	1	<1	--	--	--	--
1991	--	15	78	6	1	0	--	--	--	--

[a] Estimates of age structure are based on brood returns to Bonneville Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 17 (AC-2). Age composition (freshwater.ocean) by brood year for BUB fall chinook at Bonneville Hatchery[a].

Brood Year	N	Age Composition (%)								
		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1983	--	4	19	59	17	<1	--	--	--	--
1984	--	8	10	47	34	1	--	--	--	--
1985	--	4	14	47	32	3	--	--	--	--

[a] Estimates of age structure are based on brood returns to Bonneville Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 18 (AC-b). Age composition (freshwater.ocean) by run year for BUB fall chinook at Bonneville Hatchery[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1985	--	6	16	43	34	<1	--	--	--	--
1986	--	22	28	41	8	1	--	--	--	--
1987	--	13	18	59	10	<1	--	--	--	--
1988	--	11	27	52	10	<1	--	--	--	--
1989	--	5	20	53	22	<1	--	--	--	--
1990	--	11	14	43	31	1	--	--	--	--
1991	--	15	23	32	26	4	--	--	--	--

[a] Estimates of age structure are based on brood returns to Bonneville Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 19 (AC-3). Age composition (freshwater.ocean) by brood year for BPH fall chinook at Bonneville Hatchery[a].

Brood Year	N	Age composition % 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1982	--	6	67	27	0	0	--	--	--	--
1983	--	0	19	81	0	0	--	--	--	--
1984	--	100	0	0	0	0	--	--	--	--
1985	--	2	97	0	0	0	--	--	--	--
1986	--	10	60	30	0	0	--	--	--	--

[a] Estimates of age structure are based on brood returns to Bonneville Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 20 (AC-c). Age composition (freshwater.ocean) by run year for BPH fall chinook at Bonneville Hatchery[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1984	--	15	81	4	0	0	--	--	--	--
1985	--	0	88	12	0	0	--	--	--	--
1986	--	7	10	81	2	0	--	--	--	--
1987	--	2	0	98	0	0	--	--	--	--
1988	--	18	82	0	0	0	--	--	--	--
1989	--	17	82	1	0	0	--	--	--	--
1990	--	32	37	31	0	0	--	--	--	--
1991	--	8	85	7	0	0	--	--	--	--

[a] Estimates of age structure are based on brood returns to Bonneville Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 21 (AC-d). Age composition (freshwater.ocean) by run year for LRH fall chinook at Klaskanine Hatchery".

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1982	--	1	41	58	0	0	--	--	--	--
1983	--	2	69	29	0	0	--	--	--	--
1984	--	0	29	71	0	0	--	--	--	--
1985	--	0	58	42	0	0	--	--	--	--
1986	--	9	59	32	0	0	--	--	--	--
1987	--	--	--	--	--	--	--	--	--	--
1988	--	--	--	--	--	--	--	--	--	--
1989	--	11	26	53	10	0	--	--	--	--
1990	--	29	14	57	0	0	--	--	--	--
1991	--	2	98	0	0	0	--	--	--	--

[a] Estimates of age structure are based on brood returns to Klaskanine Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 22 (AC-e). Age composition (freshwater.ocean) by run year for Rogue River stock fall chinook at Klaskanine Hatchery[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1984	--	100	0	0	0	0	--	--	--	--
1985	--	0	100	0	0	0	--	--	--	--
1986	--	--	--	--	--	--	--	--	--	--
1987	--	--	--	--	--	--	--	--	--	--
1988	--	--	--	--	--	--	--	a-	--	--
1989	--	--	--	a-	--	--	--	--	--	--
1990	--	0	100	0	0	0	--	--	--	--
1991	--	80	0	20	0	0	--	--	--	--

[a] Estimates of age structure are based on brood returns to Klaskanine Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 23 (AC-f). Age composition (freshwater.ocean) by run year for LRH fall chinook at Big Creek Hatchery".

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1982	- -	4	77	19	<1	0	- -	- -	- -	- -
1983	- -	1	41	55	3	0	- -	- -	- -	- -
1984	--	6	68	25	1	0	- -	- -	- -	- -
1985	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1986	- -	37	15	46	2	0	- -	- -	- -	- -
1987	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
1988	--	- -			- -	- -	- -	- -	- -	- -
1989	- -	1	26	64	9	0	- -	- -	- -	- -
1990	--	3	16	76	4	<1	- -	- -	- -	- -
1991	- -	2	85	8	4	<1	- -	- -	- -	- -

a Estimates of age structure are based on brood returns to Big Creek Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 24 (AC-g). Age composition (freshwater.ocean) by run year for Rogue River stock fall chinook at Big Creek Hatchery[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1985	--	6	16	43	34	<1	--	--	--	--
1986	--	11	30	59	0	0	--	--	--	--
1987	--	--	--	--	--	--	--	--	--	--
1988	--	--	--	--	--	--	--	--	--	--
1989	--	33	29	32	6	0	--	--	--	--
1990	--	11	28	59	2	<1	--	--	--	--
1991	--	10	40	47	2	<1	--	--	--	--

[a] Estimates of age structure are based on brood returns to Big Creek Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 25 (AC-h. . age composition (freshwater.ocean) by run year for LRH fall chinook at CEDC Hatchery[a].

Run Year	N	Age Composition (%)								
		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1989	--	100	0	0	0	0	--	--	--	--
1990	--	0	10	90	0	0	--	--	--	--

[a] Estimates of age structure are based on brood returns to the CEDC Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 26 (AC-i). Age composition (freshwater.ocean) by run year for Rogue River stock fall chinook at CEDC Hatchery[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1985	--	4	96	0	0	0	--	--	--	--
1986	--	--	--	--	--	--	--	--	--	--
1987	--	--	--	--	--	--	--	--	--	--
1988	--	--	--	--	--	--	--	--	--	--
1989	--	100	0	0	0	0	--	--	--	--
1990	--	8	69	23	0	0	--	--	--	--
1991	--	0	0	100	0	0	--	--	--	--

[a] Estimates of age structure are based on brood returns to the CEDC Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 27 (AS-a). Percent females by run year for LRH fall chinook at Bonneville Hatchery[a].

Run Year	Females (%)
1977	46
N	18,192
st. dev.	--
1978	52
N	35,226
st. dev.	--
1979	44
N	23,148
st. dev.	--
1980	47
N	21,361
st. dev.	--
1981	41
N	34,265
st. dev.	--
1982	50
N	23,280
st. dev.	--
1983	47
N	13,401
st. dev.	--
1984	42
N	5,478
st. dev.	--
1985	40
N	8,841
st. dev.	--
1986	23
N	14,425
st. dev.	--

[a] Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Washington Department of Fisheries et al. 1990).

Table 28 (AS-l). Percent females by brood year and age class (freshwater.ocean) for LRH fall chinook[a] at Bonneville Hatchery. (Estimates for each freshwater age category along the upward diagonal to the right of a given footnote are from the same source.)

Females (%)

Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1976			--	24		--	--	--	
N		--		--		--	--	--	
st. dev.		--		--	--		--	--	
1977			58	0			56	100	--
N		--	--	--	--		--	--	
st. dev.			--	--	--		--	--	
1978		37	49	48	--	28[a]	51[b]	48	
N		--	--	--		--	--	--	
st. dev.		--	--	--	--	--	--	--	
1979	0[a]	49	49	50		--	--	--	
N		--	--	--		--		--	
st. dev.		--	--	--		--	--	--	
1980	0[b]	49	48	0	--	5oc	55	--	
N		--	--		--	--	--	--	
st. dev.		--	--			--	--	--	
1981	0[c]	49	49	--	--	50d	48[e]	--	
N			--			--	--	--	
st. dev.			--	--		--	--	--	
1982	0[d]		--	--		--	--	--	
N			--	--		--	--	--	
st. dev.			--			--	--	--	
1983	0[e]		--			--	--	--	
N		--	--			--	--	--	
at. dev.		--	--			--	--	--	

[a] Hatchery tule fall chinook; assumed to be LRH stock.
[b] Modified from Hansen and Thoming (1981).
[c] Modified from Hansen et al. (1982).
[d] Modified from Hansen and Johnson (1983).
[e] Modified from Hansen and Johnson (1984).
[f] Modified from Hansen and Johnson (1985).

Table 29 (AS-2). Percent females by brood year and age class (freshwater.ocean) for LRH fall chinook at Bonneville Hatchery[a,b]. (Estimates for each freshwater age category along the upward diagonal to the right of a given footnote are from the same source.)

Females (%)

Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1981		--	--	56	--	--	--	--	--
N		--	--	9	--	--		--	--
at. dev.	--	--			--	--			--
1982	--	--	67	--		--	--	--	
N	--	--	111	--		--	--	--	--
st. dev.	--	--	--	--		--	--	--	
1983	--	42		33				--	--
N		52	--	3	--	--	--	--	--
st. dev.		--	--	--		--	--	--	--
1984	0[c]	--	70	--	--		100	--	--
N	550	--	1,126			--	1		--
st. dev.	--	--	--		--	--	--	--	--
1985	--	38	--	--	--	0[c]	--	--	--
N		106	--	--	--	2	--		--
st. dev.		--	--	--	--				--
1986	0[c]	--					--	--	
N	22	--	--	--	--	--	--	--	--
st. dev.	--	--	--		--		--	--	

[a] For the 1986 run year, total age was determined from coded wire tags; freshwater age is assumed to be one year (see ADULT LIFE HISTORY, Sex Ratio).

[b] Age for fall chinook sampled from the 1988 run year was determined from an analysis of scale samples.

[c] Estimates are from Washington Department of Fisheries (unpublished data).

Table 30 (AS-3). Percent females by brood year and age class (freshwater. ocean) for BUB fall chinook returning to Bonneville Hatchery[a,b].

	Females (%)							
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4
1978	--	--	--	71	--	--	76	--
N	--	--	--	409	--	--	109	--
st. dev.	--	--	--	--	--	--	--	--
1979	--	--	71	--	--	81	--	--
N	--	--	3,948	--	--	160	--	--
st. dev.	--	--	--	--	--	--	--	--
1980	--	19	--	--	22	--	--	--
N	--	430	--	--	119	--	--	--
st. dev.	--	--	--	--	--	--	--	--

[a] Modified from Hansen (1983, cited by Howell et al. 1985).
[b] Data based on random sample of untagged adults that returned volitionally to Bonneville Hatchery or were trapped at Cascade Hatchery and transported to Bonneville Hatchery.

Table 31 (AS-b). Percent females by run year for LRH fall chinook at Big Creek Hatchery[a].

Run Year	Females (%)
1977	48
N	8,194
st. dev.	--
1978	57
N	5,412
st. dev.	--
1979	51
N	2,668
st. dev.	--
1980	46
N	2,861
st. dev.	--
1981	45
N	4,317
st. dev.	--
1982	42
N	10,645
st. dev.	--
1983	54
N	3,987
at. dev.	--
1984	38
N	6,536
st. dev.	--
1985	37
N	10,906
st. dev.	--
1986	33
N	9,640
st. dev.	--

Table 31 (AS-b). (cont.) Percent females by run year for LRH fall chinook at Big Creek Hatchery[a].

Run Year	Females (%)
1986	33
N	9,640
st. dev.	--

[a] Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Washington Department of Fisheries et al. 1990).

Table 32 (AS-4). Percent females by brood year and age class (freshwater.ocean) for LRH fall chinook[a] at Big Creek Hatchery. (Estimates for each freshwater age category along the upward diagonal to the right of a given footnote are from the same source.)

Females (%)

Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1976				19	--	--			
N		--		--					
st. dev.		--	--	--		--	--	--	
1977		--	60	48					
N			--	--	--				
st. dev.		--	--	--					
1978		41	49	50		--			
N	--		--	--					
st. dev.			--	--					
1979	0[b]	49	49	48					
N			--	--					
st. dev.		--	--	--					
1980	0[c]	49	49	48					
N			--	--					
at. dev.			--	--					
1981	0[d]	49	48	--					
N			--	--					
et. dev.		--	--	--					--
1982	0[e]	49	--	--					
N		--	--	--	--	--			
st. dev.		--	--	--	--				--
1983		--	--	--		--			--
N		--	--	--	--				--
et. dev.	--	--	--	--		--			

[a] Hatchery tule fall chinook; assumed to be LRH stock.
[b] Modified from Hansen and Thoming (1981).
[c] Modified from Hansen et al. (1982).
[d] Modified from Hansen and Johnson (1983).
[e] Modified from Hansen and Johnson (1984).
[f] Modified from Hansen and Johnson (1985).

Table 33 (AS-5). **Percent females by brood year and age class (freshwater.ocean) for LRH fall chinook at Big Creek Hatchery[a,b,c]. (Estimates for each freshwater age category along the upward diagonal to the right of a given footnote are from the same source.)**

Females (%)

Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1981	--	. .	. .	100	--		--	. .	
N	--	. .	. .	4	--		. .	. .	
st. dev.	--	. .	--	--	--	--	. .	. .	. .
1982	--	--	68	--	--	--	. .	. .	. .
N	--	. .	19	--	--	--	. .	--	. .
st. dev.	--	--	--	--	--	--		--	. .
1983	--	67	--	--	--	--	--	. .	--
N	--	3	--	--	--	--	. .	. .	. .
st. dev.	--	--	--	--	--	--	. .	. .	. .
1984	0[d]	--	22		--	--	. .	. .	
N	37		98	--	--	--	. .	. .	--
st. dev.	--	--	--	--	--		. .	. .	--
1985	--	5	--	33	--	--	. .	. .	--
N	--	19	--	6	--	--	. .	. .	--
st. dev.	--		--	--	--		. .	. .	--
1986	0[d]	--	54		--	--	. .	. .	
N	2	--	94	--	--	--	. .	. .	
st. dev.	--	--	--	--	--	--	. .	. .	--
1987	--	18	100	--	--	--	. .	. .	--
N	--	28	9		--		. .	. .	--
st. dev.	--	--	--	--	--		. .	. .	--
1988	0[d]	50d	--	. .	--	--	. .	. .	--
N	--	101	--	. .	--	--	. .	. .	--
et. dev.	--	--	--	. .	--	--	. .	. .	--

[a] **Data for fall chinook sampled from the 1986 and 1990-91 run years was available by total age only; freshwater age was assumed to be one year (see ADULT LIFE HISTORY, Sex Ratio).**

(cont.)

Table 33 (AS-5). (cont.) Percent females by brood year and age class (freshwater.ocean) for LRH fall chinook at Big Creek Hatchery[a,b,c]. (Estimates for each freshwater age category along the upward diagonal to the right of a given footnote are from the same source.)

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[b] Age for fall chinook sampled from the 1986 run year was determined from coded wire tags.

[c] Age for fall chinook sampled from the 1988 and 1990-91 run years was determined from an analysis of scale samples.

[d] Modified from Washington Department of Fisheries (unpublished data).

Table 34 (AS-6). Percent females by brood year and age class (freshwater.ocean) for LRH fall chinook[a] at Klaskanine Hatchery. (Estimates for each freshwater age category along the upward diagonal *to* the right of a given footnote are from the same source.)

Females (%)

Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1978	--	--	48	--		--	--	--	--
N	--	--	--	--		--	--	--	--
st. dev.	--		--	--		--	--	--	--
1979		49	51		--	--	--	--	
N		--	--			--	--	--	
at. dev.	--	--	--	--			--	--	--
1980	0[b]	50	48		--		--	--	
N	--		--		--				
st. dev.	--		--	--	--	--		--	
1981	0[c]	50[d]	48		--	--	--	--	--
N	--	--	--	--	--	--	--	--	
st. dev.	--	--	--		--		--	--	
1982		50[e]			--			--	--
N	--		--	--	--	--	--	--	
st. dev.	--	--	--	--	--	--	--	--	

[a] Hatchery tule fall chinook; assumed to be LRH stock.
[b] Modified from Hansen et al. (1982).
[c] Modified from Hansen and Johnson (1983).
[d] Modified from Hansen and Johnson (1984).
[e] Modified from Hansen and Johnson (1985).

Table 35 (AF-a). Mean fecundity (eggs per female) by run year for LRH fall chinook at Big Creek Hatchery[a].

Run Year	Mean Fecundity
1977	5,739
1978	5,689
1979	5,784
1980	5,411
1981	5,810
1982	5,327
1983	5,479
1984	4,808
1985	5,556
1986	5,842
1987	5,103

[a] Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Washington Department of Fisheries et al. 1990).

Table 36 (AE). Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles into the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Columbia River estuary	Abernathy SCDC	Hatchery Returns		
	1982		--	
Columbia River estuary	Big Creek Hat.	Hatchery Returns		
	1980		--	
	1981		--	
	1982		--	
Columbia River estuary	Big Creek	Spawning Grounds		
	1981		--	
	1982		--	
Columbia River estuary	Col. R. Tribs.[d] below Bonneville	Spawning Grounds		
	1981		--	
	1982		--	
	1983		--	
Columbia River estuary	Gnat Creek	Spawning Grounds		
	1982		--	
Col. R. Tribs.[d] below Bonneville	Big Creek Hat.	Hatchery Returns		
	1982		--	
	1983		--	
	1984		--	

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Col. R. Tribs.[d] below Bonneville	Big Creek	Spawning Grounds		
	1983	--	1	1
	1984	--	2	2
Col. R. Tribs.[d] below Bonneville	Klaskanine River	Spawning Grounds		
	1984	--	1	1
mainstem Col. R. below Bonneville	Cascade Hat.	Hatchery Returns		
	1983	--	2	2
mainstem Col. R. below Bonneville	Klaskanine River	Spawning Grounds		
	1989	--	1	1
Big Creek	Abernathy SCDC	Hatchery Returns		
	1981	--	2	2
	1982	--	7	7
	1983	--	4	4
	1984	--	1	1
	1985	--	5	5
	1986	--	1	1
	1987	--	5	5
	1988	--	40	40
	1989	--	16	16

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Big Creek	Abernathy Creek	Spawning Grounds		
	1985	--	2	9
	1986		--	--
	1987	--		--
	1988	--	2	4
	Col. R. Tribs.[d]			
Big Creek	below Bonneville	Spawning Grounds		
	1981	--	3	3
	1982	--	40	40
	1983	--	22	22
	1984		11	11
	1985	--	14	14
	1986	--	--	--
	1987	--	1	1
	1988	--	1	1
	1989	--	4	4
	Columbia River Tributaries (WA)			
Big Creek	below Bonneville	Trap Returns		
	1986	--	1	1

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run	Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
	Columbia River Tributaries (WA)				
Big Creek	below Bonneville		Spawning Grounds		
		1984	--	4	8
		1985	--	1	2
		1986	--	--	--
		1987	--	--	--
		1988	--	1	3
Big Creek	Cowlitz Hat.		Hatchery Returns		
		1988	--	1	1
Big Creek	Elokomin Hat.		Hatchery Returns		
		1984	--	16	16
		1985	--	10	10
		1986	--	12	12
		1987	--	12	12
		1988	--	18	18
Big Creek	Elokomin River		Spawning Grounds		
		1984		1	4
		1985	--	--	--
		1986	--	1	3
		1987	--	1	9
		1988	--	4	8

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released in the Willamette and Sandy river subbaeins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Big Creek	Gnat Creek	Spawning Grounds		
	1981	--	1	1
	1982	--	1	1
	1983	--		
	1984	--	--	
	1985	--	--	
	1986	--	--	--
	1987	--	--	
	1988	--	1	1
Big Creek	Grays River Hat.	Hatchery Returns		
	1985	--	1	1
	1986	--	4	4
	1987	--	--	--
	1988	--	4	4
Big Creek	Kalama Falls Hat.	Hatchery Returns		
	1985	--	2	2
Big Creek	Kalama River	Spawning Grounds		
	1987	--	1	4
Big Creek	Klaskanine ponds	Hatchery Returns		
	1987	--	140	140
	1988	--	4	4
Big Creek	Klaskanine Hat.	Hatchery Returns		
	1988	--	1	1
Big Creek	Lewis River Hat.	Hatchery Returns		
	1987	--	1	12

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run	Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Big Creek	mainstem Columbia River (Bonn.-McNary)		Trap Returns		
		1987	--	1	1
Big Creek	Salmon River Hat.		Hatchery Returns		
		1979	--	1	1
Big Creek	Salmon River		Spawning Grounds		
		1985	--	1	1
Big Creek	Sandy River		Spawning Grounds		
		1989	--	1	1
Big Creek	Willamette River		Trap Returns		
		1982	--	1	1
		1983	--	2	2
		1984	--	- -	--
		1985	--	2	2
		1986	--	1	1
		1987	--	3	6
		1988	--	2	4
Klaskanine River	Abernathy SCDC		Hatchery Returns		
		1985	--	9	9
		1986	--	4	4

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Klaskanine River	Big Creek Hat.	Hatchery Returns		
	1980	--	5	5
	1981	--	--	--
	1982	--	--	--
	1983	--	--	--
	1984		56	56
	1985		334	334
	1986		222	222
	1987		12	12
	1988	--	27	27
Klaskanine River	Big Creek	Spawning Grounds		
	1981	--	1	1
	1982	--	1	1
	1983	--	--	--
	1984	--	--	--
	1985	--	4	4
	1986	--	9	9
	1987		1	1
	1988	--	1	1
	1989		2	2
Klaskanine River	Col. R. Tribs.[d] below Bonneville	Spawning Grounds		
	1981	--	3	3
	1982	--	3	3

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
	Col. R. Tribs.[d]			
Klaskanine River	below Bonneville	Spawning Grounds (continued)		
	1983	--		9
	1984	--		3
	1985	--		6
	1986	--		3
	1987	--		1
	1988	--		2
	1989	--		2
	Columbia River Tributaries (WA)			
Klaskanine River	below Bonneville	Trap Returns		
	1986	--	4	4
	Columbia River Tributaries (WA)			
Klaekanfne River	below Bonneville	Spawning Grounds		
	1985	--	1	2
	1986	--	--	--
	1987	--	--	--
	1988	--	1	3
Klaskanine River	Cole Rivers Hat.	Hatchery Returns		
	1986	--	2	2
Klaskanine River	Cowlitz Hat.	Hatchery Returns		
	1986	--	1	1

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Klaskanine River	Cowlitz River	Spawning Grounds		
	1986	--	1	2
	1987	--	1	3
Klaskanine River	Elokomin Hat.	Hatchery Returns		
	1984	--	1	1
	1985	--	7	7
	1986	--	22	22
	1987	--	1	1
Klaskanine River	Elokomin River	Spawning Grounds		
	1985	--	1	5
	1986	--	--	--
	1987	--	--	--
	1988	--	1	3
Klaskanine River	Gnat Creek	Spawning Grounds		
	1987	--	1	1
Klaskanine River	Grays River Hat.	Hatchery Returns		
	1984	--	4	4
	1985	--	7	7
	1986	--	19	19
	1987	--	--	--
	1988	--	2	2
Klaskanine River	Grays River	Spawning Grounds		
	1984	--	1	12
	1985	--	--	--

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Klaskanine River	Grays River	Spawning Grounds (continued)		
	1986	--	--	--
	1987	--	1	17
	1988	--	1	9
Klaskanine River	Kalama Falls Hat.	Hatchery Returns		
	1986	--	1	1
Klaskanine River	Sea Resources net pens	Hatchery Returns		
	1984	--	1	1
	1985	--	1	1
	1986	--	--	--
	1987	--	7	7
	1988	--	5	5
Klaskanine River	Willamette River	Trap Returns		
	1985	--	2	2
	1986	--	--	--
	1987	--	--	--
	1988		2	4
Klaskanine River	Wind River	Spawning Grounds		
	1987	--	1	16
Tanner Creek	Abernathy SCDC	Hatchery Returns		
	1984	--	1	1
Tanner Creek	Bonneville Hat.	Hatchery Returns		
	1983	--	980	998

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Tanner creek	Bonneville Hat.	Hatchery Returns (continued)		
	1984	--	1,191	1,191
	1985	--	1,169	1,169
	1986		911	911
	1987	--	1,879	1,879
	1988		1,192	1,192
Tanner Creek	Cascade Hatchery	Hatchery Returns		
	1983	--	84	84
	1984	--	14	14
	1985	--	13	13
	1986	--	5	5
	1987	--	22	22
	1988		42	42
Tanner Creek	Cole Rivers Hat.	Hatchery Returns		
	1986	--	1	1
Tanner creek	Deschutes Fac., Washington	Hatchery Returns		
	1985	--	1	1
Tanner Creek	Fall Creek Hat.	Hatchery Returns		
	1987	--	1	1
Tanner Creek	Kalama Falls Hat.	Hatchery Returns		
	1985	--	1	1
Tanner Creek	Lewis River	Spawning Grounds		
	1987	--	1	4

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Tanner Creek	Little White Salmon Hatchery	Hatchery Returns		
	1981	--	12	12
	1982	--	58	58
	1983	--	20	20
	1984	--	30	30
	1985	--	49	49
	1986	--	14	14
	1987	--	38	38
	1988	--	15	15
	1989	--	22	22
Tanner Creek	Lyons Ferry Hat.	Hatchery Returns		
	1985	--	4	4
	1986	--	1	1
	1987	--	4	4
	1988	--	5	5
Tanner Creek	mainstem Col. R.[c] below Bonneville	Trap Returns		
	1983	--	12	12
	1984	--	63	63
	1985	--	17	17
	1986	--	5	5

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Tanner Creek	mainstem Columbia River (Bonn.-McNary)	Hatchery Returns		
	1988	--	25	25
Tanner Creek	mainstem Columbia River (Bonn.-McNary)	Trap Returns		
	1986	--	2	2
	1987	--	26	26
Tanner Creek	mainstem Columbia River (McNary-Priest Rapids)	Spawning Grounds		
	1984	--	2	23
	1985	--	1	22
	1986	--	2	57
	1987	--	--	--
	1988	--	3	64
Tanner creek	Oregon Aqua, OR.	Hatchery Returns		
	1982	--	1	1
Tanner Creek	Priest Rapids spawning channel	Hatchery Returns		
	1986	--	1	1
	1987	--	--	--
	1988	--	1	1

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Tanner Creek	Sandy River	Spawning Grounds		
	1984		1	1
Tanner Creek	Snake River	Trap	Returns	
	1987	--	1	1
Tanner Creek	Spring Creek NFH	Hatchery	Returns	
	1981	--	2	2
	1982		6	6
	1983		3	3
	1984		5	5
	1985	--	3	3
	1986	--	7	7
Tanner Creek	Spring Creek NFH	Hatchery	Returns	
	1987	--	5	5
	1988	--	7	7
	1989	--	5	5
Tanner Creek	Trask River Hat.	Hatchery	Returns	
	1987	--	1	1
Tanner Creek	White Salmon ponds	Hatchery	Returns	
	1987	--	1	1
Tanner Creek	White Salmon River	Spawning	Grounds	
	1987	--	4	32
	1988	--	1	8

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Unknown	Deschutes River 1984	Spawning Grounds --	1	1

[a] Based on the following tag codes: 03-40-02, 03-41-02, 03-42-02, 03-48-01, 03-49-01, 03-50-01, 03-51-01, 03-53-01, 05-06-49, 07-16-08, 07-16-58, 07-16-60, 07-16-61, 07-17-05, 07-17-11, 07-17-12, 07-17-33, 07-17-34, 07-17-35, 07-17-36, 07-18-42, 07-18-44, 07-18-45, 07-19-13, 07-21-33, 07-21-34, 07-21-35, 07-21-36, 07-21-37, 07-21-38, 07-21-39, 07-21-40, 07-21-41, 07-21-42, 07-21-43, 07-21-56, 07-21-57, 07-21-58, 07-21-59, 07-21-60, 07-21-61, 07-21-62, 07-22-07, 07-22-27, 07-23-29, 07-23-30, 07-23-31, 07-23-32, 07-23-33, 07-23-34, 07-23-41, 07-23-42, 07-23-43, 07-23-44, 07-23-45, 07-23-46, 07-23-58, 07-23-63, 07-24-07, 07-24-08, 07-24-09, 07-24-10, 07-24-11, 07-24-12, 07-24-13, 07-24-14, 07-24-15, 07-24-16, 07-24-17, 07-24-24, 07-24-25, 07-24-26, 07-25-06, 07-25-07, 07-25-45, 07-25-47, 07-25-48, 07-27-01, 07-27-27, 07-27-28, 07-27-29, 07-27-30, 07-28-27, 07-28-28, 07-28-35, 07-28-57, 07-28-58, 07-29-32, 07-29-50, 07-29-51, 07-29-52, 07-29-53, 07-30-06, 07-30-07, 07-30-08, 07-31-20, 07-31-21, 07-31-22, 07-31-23, 07-31-25, 07-31-26, 07-31-33, 07-31-40, 07-31-43, 07-32-24, 07-32-25, 07-32-26, 07-32-27, 07-32-28, 07-32-29, 07-32-30, 07-32-31, 07-32-32, 07-32-33, 07-32-34, 07-32-35, 07-32-36, 07-32-37, 07-32-38, 07-33-17, 07-33-18, 07-33-19, 07-33-22, 07-33-23, 07-33-24, 07-33-25, 07-33-28, 07-33-45, 07-33-48, 07-34-34, 07-34-35, 07-34-36, 07-34-37, 07-34-38, 07-34-40, 07-34-41, 07-34-42, 07-34-43, 07-34-57, 07-34-59, 07-34-60, 07-34-61, 07-34-62, 07-34-63, 07-35-01, 07-35-02, 07-35-03, 07-36-33, 07-36-34, 07-36-35, 07-36-36, 07-37-52, 07-37-53, 07-37-54, 07-37-55, 07-38-16, 07-38-17, 07-38-46, 07-41-29, 07-41-42, 07-42-48, 07-42-53, 07-43-09, 07-43-16, 07-43-17, 07-43-18, 07-43-20, 07-44-52, 07-44-55, 07-44-59, 07-47-19, 07-47-21, 07-47-22, 07-47-25, 07-47-32, 07-47-35,

(cont.)

Table 36 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

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[a] (cont.) 07-47-37, 07-47-38, 07-47-41, 07-47-42. Based on the following tag codes from fish of unknown rearing type (assumed to be hatchery): 03-17-33.

[b] Estimates are modified from the Pacific States Marine Fisheries Commission coded wire tag database.

[c] Estimates are primarily returns to North Bonneville ladder and Bonneville Hatchery.

[d] Release/recovery sites include Oregon tributaries below Bonneville Dam excluding sites located in the Klaskanine, Willamette, and Sandy river subbasins and in the Big, Gnat, and Tanner creek subbasins.

Table 37 (TD-1). Parasites and diseases of LRH fall chinook at hatchery facilities located in the lower Columbia River subbasin (mouth to Bonneville Dam)[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Klaskanine	*Hexamita spp.*
Parasite	Klaskanine	*Epistylis sp.*
Parasite	Klaskanine	*Trichodina spp.*
Parasite	Klaskanine	*Scyphidia*
Parasite	Bonneville	Costia *(Ichthyobodo sp.)*
Parasite	Bonneville	*Hexamita spp.*
Bacteria	Klaskanine	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Klaskanine	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Klaskanine	Bacterial gill disease
Bacteria	Klaskanine	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	Klaskanine	*Aeromonas spp.*
Bacteria	Bonneville	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Bonneville	*Aeromonas spp.*
Bacteria	Bonneville	*Pseudomonas*
Bacteria	Bonneville	Bacterial gill disease
Bacteria	Big Creek	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	Big Creek	*Aeromonas spp.*
Bacteria	Big Creek	*Pseudomonas spp.*
Bacteria	Big Creek	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Big Creek	Motile gill bacteria
Virus	Bonneville	Infectious Hematopoietic Necrosis (IHN)
Virus	Big Creek	Infectious Hematopoietic Necrosis (IHN)
Fungus	Bonneville	External fungi

[a] From *Oregon* Department of Fish and Wildlife (unpublished data).

Table 38 (TD-2). Parasites and diseases of adult LRH fall chinook at hatchery facilities located in the lower Columbia River subbasin (mouth to Bonneville Dam)[a].

Disease Type	Hatchery	Specific Pathogen
Bacteria	Klaekanine	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Bonneville	*Aeromonas spp.*
Bacteria	Bonneville	*Pseudomonas spp.*
Bacteria	Bonneville	Enteric redmouth *(Yersinia ruckeri)*

[a] From Oregon Department of Fish and Wildlife (unpublished data).

Table 39 (TD-3). Parasites and diseases of BUB fall chinook at hatchery facilities located *in* the lower Columbia River subbasin (mouth to Bonneville Dam)[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Bonneville	Gill amoeba
Bacteria	Bonneville	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Bonneville	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Bonneville	Bacterial gill disease
Bacteria	Bonneville	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Bonneville	*Aeromonas spp.*
Bacteria	Bonneville	*Pseudomonas spp.*
Virus	Bonneville	Viral Erythropoietic Necrosis (VEN)
Virus	Bonneville	Infectious Hematopoietic Necrosis (IHN)
Virus	Bonneville	Erythrocytic Inclusion Body Syndrome (EIBS)
Fungus	Bonneville	External fungi

[a] From Oregon Department of Fish and Wildlife (unpublished data).

Table 40 (TD-4). Parasites and diseases of adult BUB fall chinook at hatchery facilities located in the lower Columbia River eubbaein (mouth to Bonneville Dam)[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Bonneville	*Ceratomyxa shasta*
Bacteria	Bonneville	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Bonneville	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Bonneville	Furunculosie *(Aeromonas salmonicida)*
Bacteria	Bonneville	Bacterial gill disease
Bacteria	Bonneville	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	Bonneville	*Aeromonas spp.*
Bacteria	Bonneville	*Pseudomonas spp.*
Virus	Bonneville	Infectious Hematopoietic Necrosis (IHN)
Virus	Bonneville	Viral Erythropoietic Necrosis *(VEN)*

[a] From Oregon Department of Fish and Wildlife (unpublished data).

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LOWER COLUMBIA RIVER SUBBASIN

Naturally Produced Coho Salmon

GEOGRAPHIC LOCATION

The Oregon side of the lower Columbia River subbasin is defined for management purposes as the mainstem Columbia River between the mouth and Bonneville Dam (RM 146), and tributaries on the Oregon side, except for the Willamette and Sandy river subbasins (Washington Department of Fisheries et al. 1990). The "lower Columbia River subbasin" is used throughout this document to refer to the Oregon side as defined above.

ORIGIN

Coho are indigenous to the lower Columbia river subbasin. The subbasin currently supports runs of naturally produced fish although runs have declined significantly from historic levels (Washington Department of Fisheries et al. 1990). Limited natural production currently occurs on Oregon's side of the subbasin and virtually all naturally produced fish are considered to be the progeny of hatchery produced fish that spawn in the wild (personal communication on 7/30/92, Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon). The native wild population is considered to be virtually extinct (Howell et al. 1985). Factors which have contributed to the decline of the wild population include over harvest and habitat degradation (Washington Department of Fisheries et al. 1990; Oregon Department of Fish and Wildlife unpublished data).

DISTRIBUTION

Subbasin

The amount of spawning and rearing habitat in the subbasin has been reduced due in part to poor logging practices, channelization and diking of streams, and barriers to upstream migration (Washington Department of Fisheries et al. 1990; Oregon Department of Fish and Wildlife unpublished data). Currently, there are approximately 335 miles of habitat considered suitable for spawning and rearing in the subbasin (Table 1). Spawning and rearing habitat, on Oregon's side of the subbasin, is located in areas of the Lewis and Clark, Youngs, Klaskanine, and Clatskanie river subbasins and in the Big, Gnat, Bear, Plympton, and Milton creek subbasins (Northwest Power Planning Council's presence/absence database unpublished data). The available coho spawning and rearing habitat is rated as primarily of "fair" and "good" quality (Tables 1 and 2).

PRODUCTION

Juvenile

Smolt

Downstream migrant juvenile coho from the 1954-59 brood years were counted at a weir located near the mouth of Gnat Creek approximately 100 yards upstream from the mouth of Rock Creek.

Annual estimates of the number of downstream migrants ranged from 953 to 3,038 juvenile

fish (Table 3).

Harvest

Sport

Columbia R. (tribs.): Although estimates of sport harvest of naturally produced coho are not available by brood year, estimates by run year are available in Howell et al. (1985) for the combined sport harvest of naturally and hatchery produced fish.

ADULT LIFE HISTORY

Escapement

Columbia R. (tribs.)

Timing: Coho return to Gnat Creek from mid-September to mid-February (Willis 1962). Although peak migration occurs around mid to late October, large numbers of fish continue to return through mid-December (Willis 1962).

Spawning Area

Timing: Wild coho spawn in the lower Columbia River subbasin from late November through early January (Hirose 1983, as cited by Howell et al. 1985). Most adult fish sampled in Gnat Creek did not ripen until after November 20 (Willis 1962).

Numbers: No brood year specific estimates of spawner escapement are available. Spawning ground counts are available in Howell et al. (1985) and from Oregon Department of Fish and Wildlife (unpublished data).

strays

Stray hatchery coho were recovered in the lower Columbia River subbasin at Bonneville Dam, in the Klaskanine River and Big, Gnat, and Tanner creeks, and in other small mainstem Columbia River tributaries located in the subbasin (Table 4). Coded wire tags were recovered from stray coho released as juvenile fish in subbasins that include the Grays, Cowlitz, Lewis, Umatilla, and Yakima river subbasins in the Columbia River Basin and the Alsea, Nehalem, and Umpqua river subbasins located on the Oregon coast (Table 4).

Late run hatchery coho were recovered in the mainstem Columbia River below Bonneville Dam and in Big Creek (Table 5). Coded wire tags were recovered from stray late run coho released as juvenile fish in the Washougal, Elokomin, and Grays river subbasins and in other small Washington tributaries of the Columbia River below Bonneville (Table 5).

Age Structure

Age structure was estimated for coho salmon collected in Gnat Creek at a weir located near the mouth of Gnat Creek approximately 100 yards upstream from the mouth of Rock Creek. Male coho were aged based on size; those less than 20 inches in length were classified as jacks. All females were classified as adults. Stock of origin is unknown and samples may have been comprised of both naturally and hatchery produced fish. All naturally produced coho salmon were assumed to have migrated as age 1+ smolts. This assumption is based on data that indicates most downstream migrant age 0+ smolts do not survive (Willis 1962) and

data from an analysis of coho scales (Oregon Department of Fish and Wildlife unpublished data) that indicates virtually all returning fish migrated as age 1+ smolts (personal communication on 7/30/92 with Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon). Freshwater age was designated as 2 years for juveniles migrating as age 1+ smolts. Ocean age was designated as age 1 for jacks (total age 2) and age 2 for adults (total age 3) for purposes of presenting age in the standardized format of this report; even though jacks return in the same year in which they migrate as smolts and adults do not spend two complete years in the ocean (personal communication on 8/10/92 with Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon).

Annual estimates of age structure, by brood year, ranged from 52% to 74% age 2 fish and 26% to 48% age 3 fish (Table 6).

Annual estimates of age structure, by run year, ranged from 43 % to 80% age 2 fish and 20% to 57% age 3 fish (Table 7).

Sex Ratio

Sex ratios (percent females) were estimated for coho salmon collected in Gnat Creek at a weir located near the mouth of Gnat Creek approximately 100 yards upstream from the mouth of Rock Creek. Stock of origin is unknown and samples may have been comprised of both naturally and hatchery produced fish. Coho were aged based on a combination of factors associated with size and sex of the fish and all fish were assumed to have migrated as age 1 + smolts (see ADULT LIFE HISTORY, Age Structure).

Annual estimates of sex ratio ranged from 28% to 76% for adult fish (Table 8). No jacks were classified as females.

JUVENILE LIFE HISTORY

Fork Length

Wild coho smolts from the 1954-59 brood years were collected at the Gnat Creek weir and from the 1961 brood in Cedar and Big creeks and the Klaskanine River (see ADULT LIFE HISTORY, Age Structure) and measured to the nearest 1 mm fork length. Mean annual fork length for age 1 + smolts ranged from 99 mm to 121 mm (Table 9).

Mieration Timing

Downstream migrant juvenile coho from the 1954-59 brood years were counted in Gnat Creek at a weir located near the mouth of Gnat Creek approximately 100 yards upstream from the mouth of Rock Creek. Peak migration occurred in April and May (Willis 1962).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of lower Columbia River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poorb	Unknown	Total	Confi-dence
Miles (%)	16.0	35.0	41.0	8.0	--	335.0	--
Acres (%)	15.0	42.0	36.0	7.0	--	367.3	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of lower Columbia River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	0.0	19.0	81.0	--	20.5	--
Acres (%)	0.0	0.0	8.0	92.0	--	113.1	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 3 (JM). Number of natural juvenile coho salmon that migrated from Gnat Creek in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b].

Brood Year	Time of Miaration		
	Fall (subyearling)	Spring	Total
1954	--	3,038	3,038
1955	--	2,612	2,612
1956	--	1,658	1,658
1957	--	958	958
1958	--	953	953
1959	--	3,000	3,000

[a] Subbasin does not include the Willamette and Sandy river subbasins.
[b] Data are from Willis (1962). Sampling dates ranged from 1 March - 15 June.

Table 4 (AI-l). Non-harvest recoveries of coded wire tagged hatchery coho salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Klickitat River	mainstem Col. R.[c] below Bonneville 1986	Hatchery Returns --	2	2
Lewis River	mainstem Col. R.[c] below Bonneville 1985	Hatchery Returns --	1	1
Little White Salmon River	mainstem Col. R.[c] below Bonneville 1979	Hatchery Returns	1	1
	1980		--	--
	1981		--	--
	1982	--	--	--
	1983		--	--
	1984	--	2	2
	1985		7	7
Nehalem River	mainstem Col. R.[c] below Bonneville 1986	Hatchery Returns --	3	3
Umatilla River	mainstem Col. R.[c] below Bonneville 1988	Hatchery Returns	1	1
Washougal River	mainstem Col. R.[c] below Bonneville 1986	Hatchery Returns --	1	1

Table 4 (AI-l). (cont.) Non-harvest recoveries of coded wire tagged hatchery coho salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
	mainstem Col. R.[c]			
Yakima River	below Bonneville	Hatchery Returns		
	1980	--	1	1
Alsea River	Big Creek	Hatchery Returns		
	1988	--	1	1
Cowlitz River	Big Creek	Hatchery Returns		
	1980	--	4	4
Grays River	Big Creek	Hatchery Returns		
	1979	--	1	1
	1980	--	--	--
	1981	--	--	--
	1982	--	--	--
	1983	--	1	1
	1984	--	4	4
	1985	--	--	--
	1986	--	15	15
	1987	--	1	1
	1988	--	3	3
Grays River	Big Creek	Spawning Grounds		
	1982	--	1	1
Nehalem River	Big Creek	Hatchery Returns		
	1987	--	1	1

Table 4 (AI-l). (cont.) Non-harvest recoveries of coded wire tagged hatchery coho salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Offshore Oregon coast	Big Creek	Hatchery Returns		
	1984	--	7	7
	1985	--	--	--
	1986	--	--	--
	1987	--	1	1
Umpqua River	Big Creek	Hatchery Returns		
	1987	--	1	1
Offshore Oregon coast	Klaskanine ponds	Hatchery Returns		
	1987	--	1	1
Offshore Oregon coast	Klaskanine Hat.	Hatchery Returns		
	1988	--	1	1
mainstem Col. R. below Bonneville	mainstem Col. R.[c] below Bonneville	Hatchery Returns		
	1980	--	1	1
	1981	--	--	--
	1982	--	--	--
	1983	--	1	1
	1984	--	1	1
	1985	--	16	26
	1986	--	24	24

Table 4 (AI-l). (cont.) Non-harvest recoveries of coded wire tagged hatchery coho salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run	Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Col. R. Tribs.[d] below Bonneville	Col. R. Tribs.[d] below Bonneville	1984	Hatchery Returns --	33	35
Col. R. Tribs.[d] below Bonneville	Col. R. Tribs.[d] below Bonneville	1982	Spawning Grounds --	1	1
Big Creek	Big Creek	1981	Hatchery Returns --	1,310	1,310
		1982	--	1,465	1,467
		1983	--	39	39
		1984	--	364	364
		1985	--	369	369
		1986	--	1,599	1,599
		1987	--	506	512
		1988	--	252	252
Big Creek	Big Creek	1981	Spawning Grounds --	1	1
Klaskanine River	Klaskanine River	1983	Hatchery Returns --	37	37
		1984	--	99	100
		1985	--	136	137
		1986	--	233	233
		1987	--	102	1 0 2
		1988	--	128	128

Table 4 (AI-l). (cont.) Non-harvest recoveries of coded wire tagged hatchery coho salmon in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)

[a] Based on the following tag codes: 63-16-48, 63-17-58, 63-19-13, 63-19-28, 63-21-06, 63-23-63, 63-27-33, 63-30-16, 63-30-30, 63-31-32, 63-32-59, 63-32-60, 63-32-62, 63-32-63, 63-35-32, 63-42-47, 63-42-49, 63-42-52. Based on the following tag codes from fish of unknown race (assumed to be fall coho): 05-06-38, 05-06-60, 05-09-32, 05-09-43, 05-12-24, 05-12-27, 05-12-33, 05-12-35, 05-12-36, 05-12-38, 05-12-40, 05-52-01, 07-12-11, 07-12-13, 07-12-14, 07-13-09, 07-13-10, 07-13-11, 07-13-12, 07-13-14, 07-13-15, 07-14-09, 07-14-10, 07-14-11, 07-14-12, 07-14-14, 07-14-15, 07-15-10, 07-15-13, 07-15-14, 07-U-15, 07-19-52, 07-19-53, 07-19-54, 07-19-55, 07-19-56, 07-19-57, 07-21-22, 07-21-23, 07-21-24, 07-21-25, 07-21-26, 07-21-44, 07-22-38, 07-24-30, 07-24-31, 07-24-34, 07-24-47, 07-24-48, 07-24-49, 07-24-51, 07-26-37, 07-26-43, 07-26-48, 07-26-49, 07-26-54, 07-27-25, 07-27-43, 07-27-44, 07-27-45, 07-28-01, 07-28-08, 07-28-17, 07-28-18, 07-28-19, 07-28-21, 07-28-22, 07-29-49, 07-30-29, 07-30-30, 07-30-31, 07-30-32, 07-30-56, 07-30-57, 07-30-58, 07-30-59, 07-31-41, 07-31-42, 07-32-04, 07-32-53, 07-33-03, 07-33-04, 07-33-05, 07-33-06, 07-33-07, 07-33-08, 07-33-09, 07-33-10, 07-33-11, 07-34-15, 07-34-44, 07-34-45, 07-34-46, 07-35-32, 07-35-33, 07-35-34, 07-35-47, 07-35-48, 07-35-49, 07-36-04, 07-36-14, 07-36-15, 07-36-25, 07-39-60, 07-39-62, 07-42-26, 07-42-28, 07-42-31, 09-01-01, 09-01-02, 09-01-03, 09-01-04, 09-01-05, 09-01-07, 09-01-08, 09-01-11, 09-01-12, 09-01-13, 09-01-14, 09-01-15, 09-02-01, 09-02-02, 09-02-03, 09-02-06, 09-02-07, 09-02-08, 09-02-10, 09-02-11, 09-02-12, 09-02-13, 09-02-14, 09-02-15, 09-03-01, 09-03-02, 09-03-03.

[b] Estimates are modified from the Pacific States Marine Fisheries Commission coded wire tag database.

[c] Estimates are primarily returns to North Bonneville ladder and Bonneville Hatchery.

[d] Release/recovery sites include Oregon tributaries below Bonneville Dam excluding sites located in the Klaskanine, Willamette, and Sandy river subbasins and in the Big, Gnat, and Tanner creek subbasins.

Table 5 (AI-2). Non-harvest recoveries of coded wire ta ged hatchery late run coho salmon in the lower Columbia River subbaein (mouth to Bonneville Dam)[a,%]. Estimates are for fish collected below Bonneville Dam and excluding fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Washougal River	mainstem Col. R.[c] below Bonneville	Hatchery Returns		
	1983	--	1	1
	1984	--	--	--
	1985	--	2	2
Columbia River Tributaries (WA) below Bonneville	Big Creek	Hatchery Returns		
	1982	--	1	1
Elokomin River	Big Creek	Hatchery Returns		
	1986	--	3	3
	1987	--	--	--
	1988	--	1	1
Grays River	Big Creek	Hatchery Returns		
	1979	--	2	2

[a] Based on the following tag codes: 13-16-01, 63-16-61, 63-23-03, 63-25-28, 63-29-43, 63-29-50, 63-32-53, 63-32-54, 63-36-59.

[b] Estimates are modified from the Pacific States Marine Fisheries Commission coded wire tag database.

[c] Estimates are primarily returns to North Bonneville ladder and Bonneville Hatchery.

[d] Release/recovery sites include Oregon tributaries below Bonneville Dam excluding sites located in the Klaskanine, Willamette, and Sandy river subbasins and in the Big, Gnat, and Tanner creek subbasins.

Table 6 (AC). Age composition (freshwater.ocean) by brood year for coho salmon collected in Gnat Creek[a,b,c].

Brood Year	N	Age Composition (%)								
		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1953	156	--	--	--	--	--	52	48	--	--
1954	269	--	--	--	--	--	55	45	--	--
1955	159	--	--	--	--	--	56	44	--	--
1956	159	--	--	--	--	--	63	37	--	--
1957	61	--	--	--	--	--	72	28	--	--
1958	94	--	--	--	--	--	74	26	--	--

[a] Estimates for the 1953-58 brood year are modified from Willis (1962).
[b] Coho were aged based on a combination of factors associated with size and sex of the fish and all fish were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Ase Structure).
[c] Stock of origin unknown. Samples may include both naturally and hatchery produced fish.

Table 7 (AC-a). Age composition (freshwater.ocean) by run year for coho salmon collected in Gnat Creek[a,b,c].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1955	174	- -	- -	- -	- -	- -	46	53	- -	- -
1956	224	- -	- -	--	__	__	67	33	- -	- -
1957	209	--	--	--	--	--	43	57	- -	- -
1958	170	- -	- -	- -	- -	- -	59	41	- -	- -
1959	103	- -	- -	- -	- -	- -	43	57	- -	- -
1960	87	- -	- -	--	__	__	80	20	--	--
1961	79	--	--	--	--	--	70	30	- -	- -

a Estimates for the 1955-61 run years are from Willis (1962).

b Coho were aged based on a combination of factors associated with size and sex of the fish and all fish were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Age Structure).

c Stock of origin unknown. Samples may include both naturally and hatchery produced fish.

Table 8 (AS-a). Percent females by brood year and age class (freshwater.ocean) for coho salmon collected in Gnat Creek[a,b,c].

Females (%)

Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1952	--	--	. .	--	. .	--	28	. .	--
N	--	--	. .	--	. .	. .	93	--	. .
st. dev.	--	--	. .	--	. .	--	--	. .	--
1953	--	--	. .	. .	. .	0	39	. .	. .
N	--	--	. .	. .	. .	81	75	. .	. .
st. dev.	--	--	. .	. .	. .	--	--	. .	. .
1954	--	--	--	. .	--	0	56	. .	. .
N	--	--	. .	--	. .	149	120	. .	--
st. dev.	--	--	. .	. .	. .	--	--	. .	. .
1955	--	--	. .	. .	. .	0	57	. .	. .
N	--	--	. .	. .	--	89	70	--	. .
st. dev.	--	--	. .	. .	--	--	--	. .	. .
1956	--	--	. .	. .	--	0	76	. .	. .
N	--	--	. .	. .	--	100	59	. .	. .
st. dev.	--	--	. .	. .	--	--	--	--	. .
1957	--	--	. .	. .	--	0	47	. .	. .
N	--	--	. .	. .	--	44	17	. .	. .
st. dev.	--	--	. .	. .	--	--	--	. .	. .

Table 8 (AS-a). (cont.) Percent females by brood year and age class (freshwater.ocean) for coho salmon collected in Gnat Creek[a,b,c].

	Females (%)								
Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1958	--	--	--	--	--	0	67	--	--
N	--	--	--	--	--	70	24	--	--
st. dev.	--	--	--	--	--	--	--	--	--
1959	--	--	--	--	--	0	--	--	--
N	--	--	--	--	--	55	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--

[a] Estimates for the 1952-59 broods are from Willis (1962).
[b] Coho were aged based on a combination of factors associated with size and sex of the fish and all fish were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Aae Structure).
[c] Stock of origin unknown. Samples may include both naturally and hatchery produced fish.

Table 9 (SL). Lengths (mm) of wild coho salmon smolts that migrated out of Gnat Creek in the lower Columbia River subbasin (mouth to Bonneville Dam)[a].

Location and Brood Year	No. Fish	Fork Length (ave.)	Length (range)	Reference
Gnat Creek 1954	1,391	112	--	Willis (1962)
Gnat Creek 1955	868	111	--	Willis (1962)
Gnat Creek 1956	444	101	--	Willis (1962)
Gnat Creek 1957	949	120	--	Willis (1962)
Gnat Creek 1958	1,050	121	--	Willis (1962)
Gnat Creek 1959	3,176	115	--	Willis (1962)
Cedar Creek 1961	688	99	--	Niska and Willis (1963)
Big Creek 1961	595	116	--	Niska and Willis (1963)
NFk Klaskanine R. 1961	798	115	--	Niska and Willis (1963)

[a] Subbasin does not include the Willamette and Sandy river subbasins.

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LOWER COLUMBIA RIVER SUBBASIN

Hatchery Produced Coho Salmon

ORIGIN

Records indicate that hatchery fish were released in the lower Columbia River subbasin well before the late 1970's (Letter from Bob Buckman dated 8/12/92, Oregon Department of Fish and Wildlife, Astoria, Oregon). Hatchery releases are summarized beginning with the 1978 brood release but records may be incomplete prior to the 1983 brood release (Table 1). Hatchery fish were primarily released into the subbasin in an attempt to increase harvest opportunities in both ocean and subbasin fisheries (Washington Department of Fisheries et al. 1990).

The two primary stocks of coho released into the subbasin are the lower Columbia River early run stock (LCER), which is sometimes classified as the Toutle stock, and the Cowlitz stock. Hatchery programs in Oregon almost exclusively utilize the LCER stock. The LCER stock is considered to be linked in varying degree to the native Toutle River stock of hatchery coho (Howell et al. 1985). Native Toutle River stock fish were first used to develop the hatchery program at Toutle River Hatchery. Surplus eggs from Toutle River Hatchery were transferred to Bonneville Hatchery, and subsequently from Bonneville Hatchery to other Oregon hatchery facilities, to implement Oregon's hatchery program in the subbasin (Howell et al. 1985). Although the LCER stock is considered to be of Toutle River ancestry, it is believed that the LCER stock is probably a mixture of various early run coho populations because of the extensive transferring of eggs between most Columbia River hatchery facilities (Howell et al. 1985). Several sub-stocks of the LCER stock have been released into the subbasin. They include the Klaskanine, Sandy, and Clackamas river sub-stocks and the Big, Tanner, and Eagle creek sub-stocks (Table 1).

DISTRIBUTION

Subbasin

Hatchery coho have been released throughout most of the lower Columbia River subbasin but primarily have been released into the Big Creek drainage and the Klaskanine and Youngs river drainages; which are also the location of Oregon hatchery facilities in the subbasin. Other release locations in the subbasin include the mainstem Columbia River and Tanner, Milton, and Tucker creeks.

PRODUCTION

Releases

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Big Creek, Klaskanine, Sandy, and the Clatsop Economic Development Commission (CEDC) hatcheries (Table 1). Annual estimates of fry releases, prior to 1983, may be incomplete. Beginning with the 1983 estimate, annual numbers released ranged from 65,000 to 786,370 fish (Table 1). Size at release ranged from 1,180.0 to 313.0 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Big Creek, Klaskanine, and Sandy hatcheries (Table 1). Annual estimates of fingerling releases, prior to 1983, may be incomplete. Beginning with the 1983 estimate, annual numbers released ranged from 16,468 to 2,637,646 fish (Table 1). Size at release ranged from 223.0 to 20.2 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Big Creek, Klaskanine, Sandy, and CEDC hatcheries and Trojan Pond. Annual estimates of smolt releases, prior to 1983, may be incomplete. Beginning with the 1983 estimate, annual numbers released ranged from 3,674,616 to 7,992,106 fish (Table 1). Size at release ranged from 20.0 to 8.5 fish per pound (Table 1).

Harvest

Sport

Columbia R. (tribs.): Although estimates of sport harvest of hatchery produced coho are not available by brood year, estimates by run year are available in Howell et al. (1985) for the combined harvest of hatchery and naturally produced fish.

ADULT LIFE HISTORY

Escapement

Columbia R. (mainstem)

Timing: "Early run coho enter the Columbia River by mid-August and begin returning to the lower Columbia hatcheries in early September" (Howell et al. 1985).

Columbia R. (tribs.)

Timing: Early run coho primarily migrate through the mainstem Columbia River from August to mid-September (Howell et al. 1985).

Hatchery Facilities

Timing: Approximately half of the coho run has returned to Bonneville Hatchery by mid- to late September and to other Oregon hatchery facilities by late October to early November (Howell et al. 1985). "The earlier overall time of return at Bonneville Hatchery is the result of an early pulse of fish returning in August and September. This early segment of the run has persisted at Bonneville Hatchery even though the adults are not used for broodstock" (Howell et al. 1985).

Median date of spawning at hatchery facilities located in Oregon is early to mid-November (Howell et al. 1985).

Numbers: Estimates of spawner escapement are available at Bonneville (Table 2), Klaskanine (Table 3), Big Creek (Table 4), and the CEDC (Table 5) hatchery facilities. Escapement, by age category, was determined in most years based on a visual classification

of jack and adult fish. Jacks were distinguished from adults based on size. Prior to the 1990 return year, the general rule was to classify fish as jacks if they were less than 20 inches in fork length. Beginning in 1990, the cutoff was changed so that fish less than 18 inches in fork length were considered to be jacks. All jacks were assumed to be males and were designated as two year old fish and all adults were designated as three year old fish. Scale analysis was used in selected years to adjust estimates in each age category to account for smaller than normal adult fish returning in selected run years.

All returning hatchery coho salmon were assigned to a given brood year based on the assumption that all hatchery fish migrate as age 1+ smolts whether they are released as sub-yearling or yearling smolts. This assumption is based on several factors: 1) that sub-yearlings not programmed to be raised to the size of yearling releases have a high mortality rate, 2) that although sub-yearlings programmed to be raised to the size of yearling releases are recovered in the Columbia River these release groups represent only a small percentage of total releases (personal communication on 8/11/92 with Don Swartz, Oregon Department of Fish and Wildlife, Clackamas, Oregon), and 3) that yearling juveniles migrate as age 1+ smolts. These assumptions are based on data that indicates most downstream migrant age 0+ smolts do not survive (Willis 1962) and data from an analysis of coho scales (Oregon Department of Fish and Wildlife unpublished data) that indicates virtually all returning hatchery coho migrated as age 1+ smolts (personal communication on 7/30/92 with Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon). Freshwater age was designated as 2 years for juveniles migrating as age 1+ smolts. Ocean age was designated as age 1 for jacks (total age 2) and age 2 for adults (total age 3) for purposes of presenting age in the standardized format of this report; even though jacks return in the same year in which they migrate as smolts and adults do not spend two complete years in the ocean (personal communication on 8/10/92 with Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon).

Stock of origin is unknown but virtually all returning fish are believed to be either marked or unmarked progeny of LCER stock hatchery fish. This assumption is based on data from spawning ground surveys which indicates that limited natural production occurs in tributary streams located on Oregon's side of the subbasin (personal communication on 7/30/92, Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon; see LOWER COLUMBIA RIVER SUBBASIN, Naturally Produced Coho Salmon, Origin).

Annual estimates of spawner escapement for age 2 fish ranged from 263 to 19,619 at Bonneville Hatchery (Table 2), 745 to 15,171 at Klaskanine Hatchery (Table 3), 152 to 3,663 at Big Creek Hatchery (Table 4), and 0 to 3,108 at the CEDC hatchery facility (Table 5).

Annual estimates of spawner escapement for age 3 fish ranged from 3,848 to 44,310 at Bonneville Hatchery (Table 2), 499 to 19,462 at Klaskanine Hatchery (Table 3), 476 to 18,425 at Big Creek Hatchery (Table 4), and 0 to 376 at the CEDC hatchery facility (Table 5).

Age Structure

Age structure was estimated for coho salmon returning to the Bonneville (Table 6), Klaskanine (Table 7), Big Creek (Table 8), and CEDC (Table 9) hatchery facilities. Age structure was determined based on estimates of brood returns by age category (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities). Stock of origin is unknown but virtually all returning fish are believed to be either marked or unmarked progeny of LCER stock hatchery fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Coho salmon at Bonneville and Big Creek hatcheries primarily return as age 3 fish (Tables 6 and 8). Age structure at Klaskanine Hatchery and the CEDC hatchery facilities varied widely (Tables 7 and 9).

Fecundity

Mean fecundity was estimated for coho salmon returning to Bonneville (Table 10), Klaskanine (Table 11), Big Creek (Table 12), and CEDC (Table 13) hatchery facilities. All females were classified as adult fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities). Stock of origin is unknown but virtually all returning fish are believed to be either marked or unmarked progeny of LCER stock hatchery fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Annual estimates of mean fecundity ranged from 1,579 to 3,261 eggs per female for adult fish (Tables 10-13).

Mark Recoveries

Coded wire tagged hatchery coho, released as juvenile fish in the lower Columbia River subbasin, were recovered over a wide geographical area in both the Columbia River Basin and in subbasins located on the Oregon and Washington coast (Table 14). Columbia River subbasins in which coded wire tagged subbasin hatchery production releases were recovered include the Washougal, Sandy, Grays, and Deschutes river subbasins (Table 14). Subbasins, located outside of the Columbia River Basin, in which coded wire tagged subbasin hatchery production releases were recovered include the Nehalem and Elk river subbasins located on the Oregon coast and the Nemah River subbasin located on the Washington coast (Table 14).

BIOCHEMICAL-GENETIC CHARACTERISTICS

Phenotypic characters (isozyme gene frequencies, life history and morphology) of coho salmon from Oregon, Washington and California were compared "using agglomerative and divisive cluster analyses. Early coho from Bonneville, Big Creek and Sandy river hatcheries were profiled along with cowlitz hatchery late coho. Although Columbia River coho tended to cluster together within broad comparisons, further segregation into early and late stocks did not occur" (Howell et al. 1985).

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile coho for subbasin hatchery production (Tables 15 and 16). Parasites include ***Epistylis sp.*** and ***Trichodina spp.*** Bacterial diseases include ***Yersinia ruckeri*** (Enteric redmouth), ***Cytophaga psychrophila*** (cold water disease), and ***Clostridium botulinum*** (botulism). Viral diseases include Viral Erythropoietic Necrosis (VEN) and Erythrocytic Inclusion Body Syndrome (EIBS). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see SANDY RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES.

Table 1 (TR). Hatchery releases of coho salmon into the Lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CUT/ Fin clip[c]
1978	Tanner Cr	Cascade	fing.	04/28/80	--	21.0	63,000	Tanner Cr	--
1978	Tanner Cr	Cascade	fing.	04/28/80	--	23.5	60,290	Tanner Cr	
1978	Tanner Cr	Cascade	fing.	04/28/80	--	23.5	25,837	Tanner Cr	AD-CUT
1978	Big Cr[d]	Big Creek	smolt	04/21/80	--	18.3	488,304	Big Creek	--
1978	Big Cr[d]	Big Creek	smolt	07/07/80	--	18.4	28,787	gig Creek	--
1978	Big Cr[d]	Big Creek	smolt	07/07/80	--	18.4	58,446	Big Creek	AD-CUT
1978	Kleskanine R.	Klaskanine	smolt	05/01/80	--	17.1	1,410,045	NFk Klaskanine River	--
1978	Tanner Cr	Bonneville	smolt	03/28/80	--	17.4	2,074,417	Tanner Cr	--
1978	Tanner Cr	Cascade	smolt	04/28/80	--	2.1	19,950	Tamer Cr	--
1979	Big Cr[d]	Big Creek	fry	03/01/80	--	1,023	7,493	Big Creek	--
1979	Sandy R.[e]	Bonneville	fing.	05/28/80	05/29/80	235.0	335,300	Beaver Creek	--
1979	Sandy R.[e]	Bonneville	fing.	05/29/80	--	235.0	204,400	Clatskanie River	--
1979	Sandy R.[e]	Bonneville	fing.	05/28/80	--	210.0	60,000	Goble Creek	--
1979	Sandy R.[e]	Bonneville	fing.	05/30/80	--	235.0	143,350	Lewis and Clark River	--
1979	Sandy R.[e]	Bonneville	fing.	05/28/80	--	210.0	20,000	Merrill Creek	--
1979	Sandy R.[e]	Bonneville	fing.	06/03/80	--	235.0	45,600	Milton Creek	--
	Big Cr[d]	Big Creek	smolt	04/20/81	--	17.9	174,103	Big Creek	--
1979	Big Cr[d]	Big Creek	smolt	05/07/80	06/06/80	18.0	58,570	Big Creek	--
1979	Big Cr[d]	Big Creek	smolt	05/07/80	06/06/80	18.0	116,269	Big Creek	AD-CUT
1979	Big Cr[d]	Big Creek	smolt	04/20/81	--	18.4	134,691	Big Creek	--
		Big Creek	smolt	04/20/81	--	18.4	14,965	Big Creek	AD-CUT
1979	Big Cr[d]	Big Creek	smolt	06/08/81	--	18.5	52,714	Big Creek	--
1979	Big Cr[d]	Big Creek	smolt	06/08/81	--	18.5	5,857	Big Creek	AD-CWT
1979	Big Cr[d]	Big Creek	smolt	07/06/81	--	19.1	53,152	Big Creek	--
		Big Creek	smolt	07/06/81	--	19.1	5,905	Big Creek	AD-CUT
1979	Big Cr[d]	Big Creek	smolt	05/05/81	--	19.2	52,515	Big Creek	--
1979	Big Cr[d]	Big Creek	smolt	05/05/81	--	19.2	5,834	Big Creek	AD-CUT
1979	Eagle Cr[f]	Klaskanine	smolt	04/13/81	--	18.3	331,888	NFk Klaskanine River	--
1979	Klaskanine R.	Klaskanine	smolt	03/18/81	--	16.9	1,143,389	NFk Klaskanine River	--
1979	Tanner Cr	Bonneville	smolt	04/15/81	--	14.5	2,193,214	Tanner Cr	--
1979	Tanner Cr	Bonneville	smolt	06/08/81	--	15.8	134,603	Tanner Cr	--
1979	Tanner Cr	Bonneville	smolt	06/08/81	--	15.8	4,162	Tanner Cr	AD-CUT
1979	Tanner Cr	Bonneville	smolt	05/06/81	07/06/81	16.6	294,889	Tanner Cr	--
1979	Tanner Cr	Bonneville	smolt	05/06/81	07/06/81	16.6	9,119	Tanner Cr	AD-CUT
1979	Tanner Cr	Cascade	smolt	07/20/81	--	11.0	34,540	Tanner Cr	--
1979	Tanner Cr	Klaskanine	smolt	04/13/81	--	16.0	1,014,454	NFk Klaskanine River	--
1980	Big Cr[d]	Big Creek	fry	02/11/81	--	985.0	41,475	Bear Creek	--
1980	Sandy R.[e]	Oxbow (Herman)	fry	03/06/81	--	1,200	517,608	Lewis and Clark River	--
1980	Sandy R.[e]	Oxbow (Herman)	fry	03/05/81	--	1,200	86,392	Roaring Creek	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CUT/ Fin clip[c]
1980	Sandy R.[e]	Sandy	fry	03/16/81	--	1,140	142,366	Bear Creek	--
1980	Sandy R.[e]	Sandy	fry	03/16/81	--	1,140	523,204	Beaver Creek	--
1980	Sandy R.[e]	Sandy	fry	03/16/81	--	1,140	142,692	Columbia R-1	--
1980	Sandy R.[e]	Sandy	fry	03/16/81	--	1,140	23,769	Lost Creek	--
1980	Sandy R.[e]	Sandy	fry	03/11/81	--	1,120	70,668	Milton Creek	--
1980	Sandy R.[e]	Sandy	fry	03/12/81	--	1,130	393,197	SFk Klaskanine River	--
1980	Sandy R.[e]	Sandy	fry	03/16/81	--	1,140	163,971	Ualluski River	--
1980	Tanner Cr	Cascade	fry	03/28/81	03/30/81	1,200	781,264	Clatskanie River	—
1980	Tanner Cr	Cascade	fry	03/30/81	--	1,200	37,011	Conyers Creek	--
1980	Tanner Cr	Cascade	fry	03/30/81	--	1,200	111,033	Fall Creek	--
1980	Tanner Cr	Cascade	fry	03/28/81	--	1,200	12,437	Fertile Valley Creek	--
1980	Tanner Cr	Cascade	fry	03/28/81	--	1,200	236,474	Goble Creek	--
1980	Tanner Cr	Cascade	fry	03/28/81	--	1,200	37,338	Merrill Creek	--
1980	Tanner Cr	Cascade	fry	03/30/81	--	1,200	37,011	Roaring Creek	--
1980	Tanner Cr	Cascade	fry	03/20/81	--	1,200	488,674	SFk Klaskanine River	--
1980	Tanner Cr	Cascade	fry	03/21/81	--	1,201	478,824	SFk Klaskanine River	--
1980	Tanner Cr	Cascade	fry	03/30/81	--	1,200	61,685	Uest Creek	--
1980	Tanner Cr	Oxbow (Herman)	fry	03/02/81	--	1,200	60,140	Johnson Creek	--
1980	Tanner Cr	Oxbow (Herman)	fry	03/02/81	--	1,200	60,140	SFk Lewis and Clark River	--
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,143	Big Creek	—
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,020	Big Creek	07-12-11
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	912	Big Creek	07-12-12
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,113	Big Creek	07-12-13
1980	Big Cr[d]	Big Creek	molt	04/28/82	--	15.4	1,406	Big Creek	07-12-14
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	999	Big Creek	07-12-15
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,391	Big Creek	07-13-09
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,332	Big Creek	07-13-10
1980	Big Cr[d]	Big Creek	molt	04/28/82	--	15.4	1,372	Big Creek	07-13-11
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,183	Big Creek	07-13-12
1980	Big Cr[d]	Big Creek	s-molt	04/28/82	--	15.4	1,030	Big Creek	07-13-13
1980	Big Cr[d]	Big Creek	molt	04/28/82	--	15.4	1,277	Big Creek	07-13-14
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1.214	Big Creek	07-13-15
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,169	Big Creek	07-14-09
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,286	Big Creek	07-14-10
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,366	Big Creek	07-14-11
1980	Big Cr[d]	Big Creek	molt	04/28/82	--	15.4	940	Big Creek	07-14-12
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,013	Big Creek	07-14-13
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,240	Big Creek	07-14-14
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,290	Big Creek	07-14-15

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbesin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nunber Released	Release Location	CWT/ Fin clip'
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,328	Big Creek	07-15-W
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,208	Big Creek	07-15-10
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,091	Big Creek	07-15-11
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	99	Big Creek	07-15-12
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,487	Big Creek	07-15-13
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,335	Big Creek	07-15-14
1980	gig Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,199	Big Creek	07-15-15
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,339	Big Creek	09-01-01
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,391	Big Creek	09-01-02
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,365	Big Creek	09-01-03
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,218	Big Creek	09-01-04
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,016	Big Creek	09-01-05
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,166	Big Creek	W-01-06
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,185	Big Creek	09-01-07
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,251	Big Creek	09-01-08
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,239	Big Creek	W-01-09
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,190	Big Creek	09-01-10
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,282	Big Creek	09-01-11
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,210	Big Creek	09-01-12
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	155	Big Creek	09-01-13
1980	Big Cr[d]	Big Creek	molt	04/28/82	--	15.4	1,430	Big Creek	w-01-14
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,264	Big Creek	09-01-15
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,157	Big Creek	W-02-01
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,311	Big Creek	09-02-02
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,107	Big Creek	09-02-03
1980	Big Cr[d]	Big Creek	molt	04/28/82	--	15.4	1,188	Big Creek	09-02-04
1980	Big Cr[d]	Big Creek	molt	04/28/82	--	15.4	1,193	Big Creek	09-02-05
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	994	Big Creek	09-02-06
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,306	Big Creek	09-02-07
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,375	Big Creek	09-02-08
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,102	Big Creek	09-02-09
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,096	Big Creek	09-02-10
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,348	Big Creek	09-02-11
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,331	Big Creek	09-02-12
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,277	Big Creek	09-02-13
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,276	Big Creek	09-02-14
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	853	Big Creek	W-02-15
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,493	Big Creek	w-03-01
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	992	Big Creek	W-03-02

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Coltiia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT/ Fin clip'
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,168	Big Creek	09-03-03
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.4	1,076	Big Creek	09-03-04
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.6	168,916	Big Creek	--
1980	Big Cr[d]	Big Creek	smolt	04/28/82	--	15.6	25,912	Big Creek	07-26-49
1980	Big Cr[d]	Big Creek	smolt	06/03/82	--	16.1	401,635	Big Creek	--
1980	Big Cr[d]	Big Creek	smolt	06/03/82	--	16.1	26,547	Big Creek	07-26-48
1980	Eagle Cr[f]	CEDC	smolt	04/05/82	--	16.0	300,000	SFk Klaskanine River	--
1980	Eagle Cr[f]	Klaskanine	molt	06/03/82	--	16.7	27,722	NFk Klaskanine River	07-24-30
1980	Eagle Cr[f]	Klaskanine	smolt	06/03/82	--	16.7	26,637	NFk Klaskanine River	07-24-34
1980	Eagle Cr[f]	Cascade	smolt	06/09/82	--	16.9	2,527	Columbia R-l	07-24-27
1980	Eagle Cr[f]	Cascade	smolt	06/09/82	--	16.9	2,543	Coltiia R-l	07-24-31
1980	Eagle Cr[f]	Cascade	smolt	06/03/82	--	18.8	27,395	Columbia R-l	07-24-28
1980	Eagle Cr[f]	Cascade	smolt	06/03/82	--	18.8	27,414	Coltiia R-l	07-24-32
1980	Eagle Cr[f]	Cascade	smolt	05/25/82	--	18.5	28,093	Tanner Cr	07-24-29
1980	Eagle Cr[f]	Cascade	smolt	05/25/82	--	18.5	28,074	Tanner Cr	07-24-33
1980	Klaskanine R.	Klaskanine	smolt	04/15/82	--	17.9	1,435,133	NFk Klaskanine River	--
1980	Tanner Cr	Bonneville	smolt	04/15/82	--	14.2	1,858,567	Tanner Cr	--
1981	Big Cr[d]	Big Creek	fry	02/11/82	--	1,193	39,369	Bear Creek	--
1981	Big Cr[d]	Big Creek	fry	01/30/82	--	1,100	4,400	Big Creek	--
1981	Big Cr[d]	Big Creek	fry	02/17/82	--	1,109	3,327	Big Creek	--
1981	Big Cr[d]	Big Creek	fry	02/11/82	--	1,193	39,369	Marys Creek	--
1981	Klaskanine R.	Klaskanine	fry	04/01/82	--	472.0	353,950	Youngs River	--
1981	Big Cr[d]	Klaskanine	fing.	06/01/82	--	160.0	40,140	SFk Klaskanine River	--
1981	Big Cr[d]	Klaskanine	fing.	06/01/82	--	180.0	118,220	SFk Klaskanine River	--
1981	Klaskanine R.	Klaskanine	fing.	06/01/82	--	160.0	39,820	SFk Klaskanine River	--
1981	Klaskanine R.	Klaskanine	fing.	06/01/82	--	180.0	117,500	SFk Klaskanine River	--
1981	Sandy R.[e]	Bonneville	fins.	06/08/82	--	185.0	131,500	Clatskanie River	--
1981	Sandy R.[e]	Bonneville	fing.	06/08/82	--	193.4	90,290	Clatskanie River	--
1981	Sandy R.[e]	Bonneville	fing.	06/09/82	--	197.0	127,950	Clatskanie River	--
1981	Sandy R.[e]	Bonneville	fing.	06/08/82	--	193.4	10,041	Conyers Creek	--
1981	Sandy R.[e]	Bonneville	fins.	06/09/82	--	191.0	45,016	Goble Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/10/82	--	196.0	68,913	Lewis and Clark River	--
1981	Sandy R.[e]	Bonneville	fing.	06/10/82	--	198.0	10,083	Marys Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/09/82	--	191.0	20,020	Merrill Creek	--
1981	Sandy R.[e]	Bonneville	fins.	06/08/82	--	217.0	56,203	Milton Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/08/82	--	193.4	55,506	Scout Camp Lake	--
1981	Sandy R.[e]	Bonneville	fing.	06/10/82	--	198.0	85,770	SFk Klaskanine River	--
1981	Sandy R.[e]	Bonneville	fins.	06/10/82	--	198.0	58,489	Walluski River	--
1981	Big Cr[d]	Big Creek	smolt	05/02/83	--	15.2	275,918	Big Creek	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT/ Fin clip'
1981	Big Cr[d]	Big Creek	smolt	05/02/83	--	15.2	26,623	Big Creek	07-24-47
1981	Big Cr[d]	Big Creek	smolt	06/01/83	--	15.9	412,438	Big Creek	--
1981	Big Cr[d]	Big Creek	smolt	06/01/83	--	15.9	27,261	Big Creek	07-24-48
1981	Big Cr[d]	Klaskanine	smolt	06/01/83	--	16.5	146,735	NFk Klaskanine River	--
1981	Eagle Cr[f]	CEDC	smolt	04/05/83	--	15.0	287,390	Tucker Creek	--
1981	Eagle Cr[f]	CEDC	smolt	04/05/83	--	15.0	27,385	Tucker Creek	07-24-51
1981	Klaskanine R.	Klaskanine	smolt	04/04/83	--	15.5	1,324,220	NFk Klaskanine River	--
1981	Klaskanine R.	Klaskanine	smolt	04/04/83	--	15.5	27,024	NFk Klaskanine River	07-24-49
1981	Sandy R.[e]	Cascade	smolt	06/02/83	--	18.5	40,690	Columbia R-l	07-27-46
1981	Sandy R.[e]	Cascade	smolt	05/24/83	--	17.9	44,021	Tanner Cr	07-27-47
1981	Sandy R.[e]	Big Creek	smolt	06/06/83	--	13.0	35,802	Columbia R-l	07-27-42
1981	Sandy R.[e]	Klaskanine	smolt	06/01/83	--	16.5	633,331	NFk Klaskanine River	--
1981	Sandy R.[e]	Klaskanine	smolt	06/01/83	--	16.5	44,753	NFk Klaskanine River	07-26-43
1981	Tanner Cr	Bonneville	smolt	05/02/83	--	15.0	1,500,693	Tanner Cr	--
1981	Tanner Cr	Bonneville	smolt	05/02/83	--	15.0	27,507	Tanner Cr	07-26-06
1981	Tanner Cr	Bonneville	smolt	05/31/83	--	16.2	246,059	Tanner Cr	--
1981	Tanner Cr	Bonneville	smolt	05/31/83	--	16.2	27,948	Tanner Cr	07-26-07
1982	Big Cr[d]	STEP	fry	02/20/83	--	1,089	19,602	Walluski River	--
1982	Big Cr[d]	STEP	fry	02/19/83	--	1,102	23,468	Walluski River	--
1982	Big Cr[d]	STEP	fry	03/01/83	--	1,100	22,000	West Creek	--
1982	Big Cr[d]	Big Creek	fry	02/02/83	--	1,180	29,500	Feris Creek	--
1982	Big Cr[d]	Big Creek	fry	02/02/83		1,180	29.500	Fertile Valley Creek	--
1982	Big Cr[d]	Big Creek	fry	02/02/83	--	1,180	40,120	Marys Creek	--
1982	Big Cr[d]	Big Creek	fry	02/02/83	--	1,180	29,500	Mill Creek	--
1982	Big Cr[d]	Big Creek	fry	02/02/83	--	1,180	129,800	Walluski River	--
1982	Klaskanine R.	Klaskanine	fry	03/04/83	--	1,052	112,564	NFk Klaskanine River	--
1982	Klaskanine R.	Klaskanine	fry	03/04/83	--	1,052	350,316	SFk Klaskanine River	--
1982	Sandy R.[e]	Cascade	fing.	05/23/83	--	198.0	104,937	Beaver Creek	--
1982	Sandy R.[e]	Cascade	fing.	05/24/83	--	215.0	72,405	Beaver Creek	--
1982	Sandy R.[e]	Cascade	fing.	05/23/83	--	194.0	143,532	Clatskanie River	--
1982	Sandy R.[e]	Cascade	fing.	05/23/83	--	198.0	25,542	Clatskanie River	--
1982	Sandy R.[e]	Cascade	fing.	05/24/83	--	205.0	66,600	Clatskanie River	--
1982	Sandy R.[e]	Cascade	fing.	05/24/83	05/25/83	215.0	107,430	Clatskanie River	--
1982	Sandy R.[e]	Cascade	fing.	05/24/83	--	205.0	15,375	Conyers Creek	--
1982	Sandy R.[e]	Cascade	fing.	05/25/83	--	215.0	30,100	Goble Creek	--
1982	Sandy R.[e]	Cascade	fing.	05/19/83	--	189.d	123,217	Lewis and Clark River	--
1982	Sandy R.[e]	Cascade	fing.	05/24/83	--	215.0	4,925	Lost Creek	--
1982	Sandy R.[e]	Cascade	fing.	05/25/83	--	215.0	19,995	Merrill Creek	--
1982	Sandy R.[e]	Cascade	fing.	05/20/83	--	209.0	131,670	Milton Creek	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip'
1982	Sandy R.[e]	Cascade	fing.	05/24/83	--	205.0	59,435	Scout Camp Lake	--
1982	Sandy R.[e]	Cascade	fing.	05/20/83	--	195.0	105,490	Youngs River	--
1982	Big Cr[d]	Big Creek	smolt	06/01/84	--	11.6	430,740	Big Creek	--
1982	Big Cr[d]	Big Creek	smolt	06/01/84	--	11.6	27,982	Big Creek	07-28-19
1982	Big Cr[d]	Big Creek	smolt	06/06/84	--	11.7	89,681	Big Creek	--
1982	Big Cr[d]	Big Creek	smolt	05/01/84	--	14.7	126,217	Big Creek	--
1982	Big Cr[d]	Big Creek	smolt	05/01/84	--	14.7	26,233	Big Creek	07-28-17
1982	Big Cr[d]	Big Creek	smolt	05/01/84	--	14.7	27,875	Big Creek	07-28-18
1982	Eagle Cr[f]	CEDC	smolt	04/04/84	--	9.5	66,805	Tucker Creek	--
1982	Eagle Cr[f]	CEDC	smolt	04/04/84	--	9.5	26,628	Tucker Creek	07-31-41
1982	Eagle Cr[f]	CEDC	smolt	04/04/84	--	16.3	181,531	Tucker Creek	--
1982	Eagle Cr[f]	CEDC	smolt	04/04/84	--	16.3	26,408	Tucker Creek	07-31-42
1982	Klaskanine R.	Klaskanine	smolt	04/10/84	--	9.6	1,264,234	NFk Klaskanine River	--
1982	Tanner Cr	Bonneville	smolt	07/06/84	--	11.2	112,743	Tanner Cr	--
1982	Tanner Cr	Bonneville	smolt	07/06/84	--	11.2	4,331	Tanner Cr	07-30-14
1982	Tanner Cr	Bonneville	smolt	06/20/84	--	14.4	465,481	Tanner Cr	--
1982	Tanner Cr	Bonneville	smolt	06/20/84	--	14.4	17,884	Tanner Cr	07-30-14
1982	Tanner Cr	Bonneville	smolt	05/01/84	--	15.2	652,316	Tanner Cr	--
1982	Tanner Cr	Bonneville	smolt	05/01/84	--	15.2	22,959	Tanner Cr	07-30-15
1982	Tanner Cr	Bonneville	smolt	05/31/84	--	15.3	464,539	Tanner Cr	--
1982	Tanner Cr	Cascade	smolt	05/25/84	--	12.7	43,150	Columbia R-1	07-29-49
1982	Tanner Cr	Cascade	smolt	05/18/84	--	12.8	44,086	Tanner Cr	07-29-48
1982	Tanner Cr	Uahkeena Pond	smolt	06/30/84	--	14.7	2,093,295	Columbia R-2	--
1982	Tanner Cr	Big Creek	smolt	05/31/84	--	12.0	44,654	Colunbia R-1	07-29-47
1982	Tanner Cr	Big Creek	smolt	05/31/84	--	12.1	38,800	Columbia R-1	07-29-45
1982	Tanner Cr	Big Creek	smolt	05/30/84	--	12.4	42,547	Columbia R-1	07-29-44
1982	Tanner Cr	Big Creek	smolt	05/29/84	--	12.5	41,859	Columbia R-1	07-29-46
1982	Tanner Cr	Klaskanine	smolt	05/19/84	--	13.0	1,174,199	NFk Klaskanine River	--
1982	Tanner Cr	Trojan Pond	smolt	06/05/84	--	15.4	149,149	Columbia R-1	--
1982	Tanner Cr	Trojan Pond	smolt	04/05/84	--	15.9	125,535	Columbia R-1	--
1982	Tanner Cr	Trojan Pond	smolt	04/05/84	--	15.9	1,268	Columbia R-1	07-28-22
1983	Cowlitz R.	Oxbow (Herman)	fry	05/24/84	--	313.0	109,037	Clatskanie River	--
1983	Cowlitz R.	Oxbow (Herman)	fry	05/25/84	--	313.0	6,260	Fertile Valley Creek	
1983	Cowlitz R.	Oxbow (Herman1	fry	05/25/84	--	313.0	20,032	Goble Creek	--
1983	Cowlitz R.	Oxbow (Herman)	fry	05/25/84	--	313.0	10,016	Merrill Creek	
1983	Cowlitz R.	Oxbow (Herman)	fry	06/28/84	--	362.5	55,463	Milton Creek	--
1983	Cowlitz R.	Oxbow (Herman)	fry	05/24/84	--	313.0	59,683	Scout Camp Lake	--
1983	Cowlitz R.	Oxbow (Herman)	fry	05/24/84	--	313.0	61,651	SFk Klaskanine River	--
1983	Cowlitz R.	Oxbow (Herman)	fry	05/24/84	--	313.0	110,176	Youngs River	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip'
1983	Big Cr[d]	Big Creek	smolt	06/03/85	--	9.8	159,054	Big Creek	--
1983	Big Cr[d]	Big Creek	smolt	06/03/85	--	9.8	26,756	Big Creek	07-30-32
1983	Big Cr[d]	Big Creek	smolt	05/01/85	--	14.6	65,461	Big Creek	--
1983	Big Cr[d]	Big Creek	smolt	05/01/85	--	14.6	26,998	Big Creek	07-30-30
1983	Big Cr[d]	Big Creek	smolt	06/03/85	--	15.1	337,872	Big Creek	--
1983	Big Cr[d]	Big Creek	smolt	06/03/85	--	15.1	27,790	Big Creek	07-30-31
1983	Klaskanine R.	Klaskanine	smolt	04/10/85	--	11.0	1,334,393	NFk Klaskanine River	--
1983	Klaskanine R.	Klaskanine	smolt	04/10/85	--	11.0	24,459	NFk Klaskanine River	07-28-01
1983	Tanner Cr	Bonneville	smolt	06/10/85	--	14.3	850,610	Tanner Cr	--
1983	Tanner Cr	Bonneville	smolt	06/10/85	--	14.3	26,307	Tanner Cr	07-28-04
1983	Tanner Cr	Bonneville	smolt	05/09/85	--	14.6	335,829	Tanner Cr	--
1983	Tanner Cr	Bonneville	smolt	05/01/85	--	15.0	834,433	Tanner Cr	--
1983	Tanner Cr	Bonneville	smolt	05/01/85	--	15.0	25,807	Tanner Cr	07-28-02
1983	Tanner Cr	Cascade	smolt	05/24/85	--	15.5	39,980	Columbia R-l	07-32-04
1983	Tanner Cr	Cascade	smolt	05/17/85	--	14.2	39,760	Tanner Cr	07-32-08
1983	Tanner Cr	Uahkeena Pond	smolt	06/13/85	--	19.1	2,089,975	Columbia R-2	--
1983	Tanner Cr	Uahkeena Pond	smolt	06/13/85	--	19.1	21,110	Columbia R-2	07-26-54
1983	Tanner Cr	CEDC	smolt	04/01/85	--	13.4	73,898	Tucker Creek	--
1983	Tanner Cr	CEDC	smolt	04/01/85	--	13.4	24,632	Tucker Creek	07-33-44
1983	Tanner Cr	CEDC	smolt	04/01/85	--	16.3	178,211	Tucker Creek	--
1983	Tanner Cr	CEDC	smolt	04/01/85	--	16.3	25,458	Tucker Creek	07-33-43
1983	Tanner Cr	Klaskanine	smolt	05/16/85	--	14.2	1,374,225	NFk Klaskanine River	--
1983	Tanner Cr	Klaskanine	smolt	05/16/85	--	14.2	23,765	NFk Klaskanine River	07-30-29
1984	Big Cr[d]	Klaskanine	fing.	05/15/85	--	156.0	58,542	Bear Creek	--
1984	Big Cr[d]	Klaskanine	fing.	05/14/85	05/15/85	156.0	170,320	Beaver Creek	--
1984	Big Cr[d]	Klaskanine	fing.	05/13/85	05/15/85	156.0	221,563	Clatskanie River	--
1984	Big Cr[d]	Klaskanine	fing.	05/14/85	--	156.0	9,984	Fall Creek	--
1984	Big Cr[d]	Klaskanine	fins.	05/13/85	--	156.0	21,986	Goble Creek	--
1984	Big Cr[d]	Klaskanine	fing.	05/13/85	--	156.0	5,996	Merrill Creek	--
1984	Big Cr[d]	Klaskanine	fing.	05/14/85	--	156.0	4,972	Mill Creek	--
1984	Big Cr[d]	Klaskanine	fing.	05/15/85	--	156.0	53,505	NFk Klaskanine River	--
1984	Big Cr[d]	Klaskanine	fing.	05/14/85	--	156.0	39,798	Scout Camp Lake	--
1984	Big Cr[d]	Klaskanine	fing.	05/15/85	--	156.0	64,955	SFk Klaskanine River	--
1984	Big Cr[d]	Klaskanine	fins.	05/16/85	--	156.0	86,262	SFk Lewis and Clark River	--
1984	Big Cr[d]	Klaskanine	fing.	05/15/85	--	156.0	59,998	Walluski River	--
1984	Big Cr[d]	Klaskanine	fing.	05/13/85	--	156.0	118.510	Youngs River	--
1984	Klaskanine R.	STEP	fing.	04/15/85	--	200.0	2;ooo	Youngs River	--
1984	Big Cr[d]	Big Creek	smolt	06/03/86	--	9.8	33,675	Big Creek	--
1984	Big Cr[d]	Big Creek	smolt	06/03/86	--	9.8	26,138	Big Creek	07-30-57

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbssin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip'
1984	Big Cr[d]	Big Creek	smolt	06/03/86	--	13.8	228,741	Big Creek	--
1984	Big Cr[d]	Big Creek	smolt	06/03/86		13.8	25,698	Big Creek	07-30-58
1984	Big Cr[d]	Big Creek	smolt	04/30/86	--	15.0	153,787	Big Creek	--
1984	Big Cr[d]	Big Creek	smolt	04/30/86	--	15.0	25,870	Big Creek	07-30-56
1984	Big Cr[d]	Big Creek	smolt	05/29/86		13.0	33,018	Columbia R-1	07-36-29
1984	Big Cr[d]	Big Creek	smolt	05/20/86	--	12.9	36,894	Tanner Cr	07-36-30
1984	Klaskanine R.	CEDC	smolt	04/15/86	--	12.5	4,775	Tucker Creek	07-38-43
1984	Klaskanine R.	CEDC	smolt	04/15/86	--	12.5	5,013	Tucker Creek	07-38-44
1984	Klaskanine R.	CEDC	smolt	04/15/86	--	12.5	4,613	Tucker Creek	07-38-45
1984	Klaskanine R.	Klaskanine	smolt	04/07/86	--	12.5	1,067,839	NFk Klaskanine River	--
1984	Klaskanine R.	Klaskanine	smolt	04/07/86	--	12.5	9,472	NFk Klaskanine River	07-33-09
1984	Klaskanine R.	Klaskanine	smolt	04/07/86	--	12.5	10,399	NFk Klaskanine River	07-33-10
1984	Klaskanine R.	Klaskanine	smolt	04/07/86	--	12.5	10,415	NFk Klaskanine River	07-33-11
1984	Sandy R.[e]	Trojan Pond	smolt	06/02/86	--	15.6	248,446	Columbia R-1	
1984	Tanner Cr	Bonneville	smolt	05/05/86	--	12.1	259,849	Tanner Cr	--
1984	Tanner Cr	Bonnevi lle	smolt	05/05/86	--	12.1	26,328	Tanner Cr	07-30-61
1984	Tanner Cr	Bonneville	smolt	06/10/86	--	12.5	681,550	Tanner Cr	--
1984	Tanner Cr	Bonneville	smolt	06/10/86	--	12.5	17,475	Tanner Cr	07-30-62
1984	Tanner Cr	Bonneville	smolt	06/13/86	--	14.0	354,853	Tanner Cr	--
1984	Tanner Cr	Bonneville	smolt	06/13/86	--	14.0	7,241	Tanner Cr	07-30-62
1984	Tanner Cr	Bonneville	smolt	06/06/86	--	15.3	383,412	Tanner Cr	--
1984	Tanner Cr	Bonneville	smolt	06/06/86	--	15.3	10,234	Tanner Cr	07-30-62
1984	Tanner Cr	Wahkeena Pond	smolt	06/23/86	--	14.6	2,210,787	Columbia R-2	--
1984	Tanner Cr	Wahkeena Pond	smolt	06/23/86	--	14.6	49,731	Columbia R-2	07-32-51
1984	Tanner Cr	Big Creek	smolt	06/03/86	--	13.5	813,232	Big Creek	--
1984	Tanner Cr	Big Creek	smolt	06/03/86	--	13.5	10,693	Big Creek	07-33-03
1984	Tanner Cr	Big Creek	smolt	06/03/86	--	13.5	9,974	Big Creek	07-33-04
1984	Tanner Cr	Big Creek	smolt	06/03/86	--	13.5	10,535	Big Creek	07-33-05
1984	Tanner Cr	CEDC	smolt	04/15/86	--	12.5	330,581	Tucker Creek	--
1984	Tanner Cr	CEDC	smolt	04/15/86	--	12.5	10,818	Tucker Creek	07-38-47
1984	Tanner Cr	CEDC	smolt	04/15/86	--	12.5	9,715	Tucker Creek	07-38-48
1984	Tanner Cr	CEDC	smolt	04/15/86	--	12.5	10,556	Tucker Creek	07-38-49
1984	Tanner Cr	CEDC	smolt	04/15/86	--	12.5	9,325	Tucker Creek	07-38-50
1984	Tanner Cr	CEDC	smolt	04/15/86	--	12.5	9,241	Tucker Creek	07-38-51
1984	Tanner Cr	CEDC	smolt	04/15/86	--	12.5	9,140	Tucker Creek	07-38-52
1984	Tanner Cr	Klaskanine	smolt	05/07/86	--	13.8	800,281	NFk Klaskanine River	--
1984	Tanner Cr	Klaskanine	smolt	05/07/86	--	13.8	10,260	NFk Klaskanine River	07-33-06
1984	Tanner Cr	Klaskanine	smolt	05/07/86		13.8	10,881	NFk Klaskanine River	07-33-07
1984	Tanner Cr	Klaskanine	smolt	05/07/86		13.8	10,621	NFk Klaskanine River	07-33-08

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT/ Fin clip'
1985	Klaskanine R.	Klaskanine	fing.	07/08/86	--	146.0	51,830	NFk Klaskanine River	--
1985	Tanner Cr	Wahkeena Pond	fing.	04/26/87	--	34.0	97,547	Columbia R-2	--
1985	Tanner Cr	Wahkeena Pond	fing.	04/26/87	--	34.0	985	Columbia R-2	07-41-07
1985	Big Cr[d]	Big Creek	smolt	06/01/87	--	10.1	29,344	Big Creek	--
1985	Big Cr[d]	Big Creek	smolt	06/01/87	--	10.1	26,656	Big Creek	07-35-48
1985	Big Cr[d]	Big Creek	smolt	06/01/87	--	15.0	11,444	Big Creek	--
1985	Big Cr[d]	Big Creek	smolt	06/01/87	--	15.0	1,487	Big Creek	07-35-49
1985	Big Cr[d]	Big Creek	smolt	05/01/87	06/01/87	15.3	136,940	Big Creek	--
1985	Big Cr[d]	Big Creek	smolt	05/01/87	--	15.3	26,260	Big Creek	07-35-47
1985	Big Cr[d]	Big Creek	smolt	05/25/87	--	15.6	185,731	Big Creek	--
1985	Big Cr[d]	Big Creek	smolt	05/25/87	--	15.6	24,609	Big Creek	07-35-49
1985	Big Cr[d]	Big Creek	smolt	02/20/87	--	18.0	13,292	Big Creek	--
1985	Big Cr[d]	Big Creek	smolt	05/19/87	--	13.6	38,556	Columbia R-1	07-39-63
1985	Big Cr[d]	Big Creek	smolt	05/12/87	--	13.8	11,730	Tanner Cr	07-39-58
1985	Big Cr[d]	Big Creek	smolt	05/12/87	--	13.9	26,549	Tanner Cr	07-39-58
1985	Klaskanine R.	Klaskanine	smolt	04/27/87	--	11.7	1,143,652	NFk Klaskanine River	--
1985	Sandy R.[e]	Klaskanine	smolt	05/26/87	--	12.5	73,925	NFk Klaskanine River	--
1985	Tanner Cr	Bonneville	smolt	06/01/87	--	11.3	312,102	Tanner Cr	--
1985	Tanner Cr	Bonnevi lle	smolt	06/01/87	--	11.3	25,305	Tanner Cr	07-35-50
1985	Tanner Cr	Bonneville	smolt	06/03/87	--	15.7	710,219	Tanner Cr	--
1985	Tanner Cr	Bonneville	smolt	06/03/87	--	15.7	21,965	Tanner Cr	07-35-52
1985	Tanner Cr	Bonneville	smolt	04/17/87	--	15.8	733,212	Tanner Cr	--
1985	Tanner Cr	Bonneville	smolt	04/17/87	--	15.8	22,676	Tanner Cr	07-35-51
1985	Tanner Cr	Cascade	smolt	05/11/87	--	13.6	38,952	Tanner Cr	--
1985	Tanner Cr	Cascade	smolt	05/11/87	--	13.8	13,750	Tanner Cr	--
1985	Tanner Cr	Cascade	smolt	05/11/87	--	14.1	19,576	Tanner Cr	--
1985	Tanner Cr	Cascade	smolt	05/11/87	--	14.1	12,995	Tanner Cr	07-36-16
1985	Tanner Cr	Cascade	smolt	05/11/87	--	14.5	27,160	Tanner Cr	--
1985	Tanner Cr	Cascade	smolt	05/11/87	--	14.5	18,030	Tanner Cr	07-36-16
1985	Tanner Cr	CEDC	smolt	04/12/87	--	10.3	299,524	Tucker Creek	--
1985	Tanner Cr	Klaskanine	smolt	05/26/87	--	12.5	269,420	NFk Klaskanine River	--
1985	Tanner Cr	Klaskanine	smolt	05/26/87	--	12.5	91,390	NFk Klaskanine River	07-36-14
1985	Tanner Cr	Klaskanine	smolt	05/26/87	--	12.5	91,616	NFk Klaskanine River	07-36-15
1986	Big Cr[d]	Big Creek	fing.	03/26/87	--	184.0	9,936	Big Creek	--
1986	Clackamas R.[g]	Eagle Creek	fing.	04/12/88	04/13/88	20.2	97,938	Klaskanine River	--
1986	Clackamas R.[g]	Eagle Creek	fing.	04/15/88	--	20.3	19,986	Klaskanine River	--
1986	Clackamas R.[g]	Eagle Creek	fing.	04/14/88	04/14/88	20.5	106,623	Klaskanine River	--
1986	Clackamas R.[g]	Eagle Creek	fing.	04/11/88	--	20.6	41,922	Klaskanine River	--
1986	Clackamas R.[g]	Eagle Creek	fing.	04/15/88	04/15/88	20.8	138,435	Klaskanine River	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT/ Fin clip'
1986	Clackamas R.[g]	Eagle Creek	fing.	04/12/88	--	20.2	73,197	Youngs River	--
1986	Clackamas R.[g]	Eagle Creek	fing.	04/15/88	--	20.3	43,614	Youngs River	--
1986	Clackamas R.[g]	Eagle Creek	fing.	04/11/88	--	20.6	37,596	Youngs River	--
1986	Clackamas R.[g]	Eagle Creek	fing.	04/14/88	--	21.3	22,259	Youngs River	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	223.0	42,370	Bear Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	208.0	9,984	Beaver Creek	--
1986	Tanner Cr	Bonneville	fing.	05/27/87	--	217.0	140,950	Beaver Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	208.0	129,373	Clatskanie River	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	215.0	81,700	Clatskanie River	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	215.0	4,945	Fall Creek	--
1986	Tanner Cr	Bonneville	fing.	05/27/87	--	219.0	29,978	Goble Creek	--
1986	Tanner Cr	Bonneville	fins.	05/26/87	--	211.0	21,100	Horsetail Creek	--
1986	Tanner Cr	Bonneville	fing.	05/26/87	--	211.0	43,255	Latourell Creek	--
1986	Tanner Cr	Bonneville	fing.	05/29/87	--	218.0	50,140	Lewis and Clark River	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	215.0	13,115	Lost Creek	--
1986	Tanner Cr	Bonneville'"	fing.	05/28/87	--	221.0	49,725	Hilton Creek	--
1986	Tanner Cr	Bonneville	fing.	05/26/87	--	211.0	43,255	Hultnomah Creek	--
1986	Tanner Cr	Bonneville	fing.	05/29/87	--	218.0	41,638	NFk Klaskanine River	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	215.0	39,990	Scout Camp Lake	--
1986	Tanner Cr	Bonneville	fing.	05/29/87	--	218.0	100,062	SFk Klaskanine River	--
1986	Tanner Cr	Bonneville	fing.	05/27/87	--	219.0	102,253	Tide Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	223.0	62,440	Ualluski River	--
1986	Tanner Cr	Bonneville	fing.	05/29/87	--	218.0	141,675	Youngs River	--
1986	Tanner Cr	Wahkeena Pond	fing.	06/03/88	--	29.0	38,702	Columbia R-2	--
1986	Tanner Cr	Wahkeena Pond	fing.	06/03/88	--	29.0	130	Columbia R-2	07-35-14
1986	Tanner Cr	Wahkeena Pond	fing.	06/03/88	--	29.0	130	Colunbia R-2	07-35-15
1986	Tanner Cr	Wahkeena Pond	fing.	06/03/88	--	29.0	130	Columbia R-2	07-35-16
1986	Big Cr[d]	Big Creek	smolt	06/01/88	--	10.0	30,306	Big Creek	--
1986	Big Cr[d]	Big Creek	smolt	06/01/88	--	10.0	23,517	Big Creek	07-42-26
1986	Big Cr[d]	Big Creek	smolt	06/01/88	--	14.2	20,277	Big Creek	--
1986	Big Cr[d]	Big Creek	smolt	06/01/88	06/02/88	14.6	133,366	Big Creek	--
1986	Big Cr[d]	Big Creek	smolt	06/02/88	--	14.6	22,487	Big Creek	07-42-28
1986	Big Cr[d]	Big Creek	smolt	06/03/88	--	14.7	191,712	Big Creek	--
1986	Big Cr[d]	Big Creek	smolt	05/02/88	--	15.0	65,628	Big Creek	--
1986	Big Cr[d]	Big Creek	smolt	05/02/88	--	15.0	25,872	Big Creek	07-42-31
1986	Big Cr[d]	Big Creek	smolt	06/01/88	--	15.5	75,957	Big Creek	--
1986	Big Cr[d]	CEDC	smolt	04/08/88	--	9.2	113,256	Tucker Creek	--
1986	Big Cr[d]	CEDC	smolt	04/08/88	--	9.2	25,708	Tucker Creek	07-45-51
1986	Big Cr[d]	CEDC	smolt	12/15/87	--	17.0	49,283	Youngs River	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbesin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT/ Fin clip'
1986	Clackamas R.[g]	Eagle Creek	smolt	04/14/88	--	19.6	59,780	Klaskanine River	--
1986	Clackames R.[g]	Eagle Creek	smolt	04/13/88	--	19.9	60,523	Klaskanine River	--
1986	Clackames R.[g]	Eagle Creek	smolt	04/13/88	--	19.5	43,547	Youngs River	--
1986	Clackames R.[g]	Eagle Creek	smolt	04/14/88	--	19.6	19,991	Youngs River	--
1986	Klaskanine R.	Klaskanine	smolt	04/30/88	05/09/88	9.2	807,451	NFk Klaskanine River	--
1986	Klaskanine R.	Klaskanine	smolt	04/30/88	05/09/88	9.2	9,962	NFk Klaskanine River	07-35-32
1986	Klaskanine R.	Klaskanine	smolt	04/30/88	05/09/88	9.2	10,962	NFk Klaskanine River	07-35-33
1986	Klaskanine R.	Klaskanine	smolt	04/30/88	05/09/88	9.2	11,383	NFk Klaskanine River	07-35-34
1986	Tanner Cr	Bonneville	smolt	04/26/88	--	13.0	765,872	Tanner Cr	--
1986	Tanner Cr	Bonneville	smolt	04/26/88	--	13.0	25,318	Tanner Cr	07-42-37
1986	Tanner Cr	Bonneville	smolt	06/01/88	--	13.8	721,304	Tanner Cr	--
1986	Tanner Cr	Bonneville	smolt	06/01/88	--	13.8	22,308	Tanner Cr	07-42-32
1986	Tanner Cr	Bonneville	smolt	06/01/88	--	13.9	322,387	Tanner Cr	--
1986	Tanner Cr	Bonneville	smolt	06/01/88	--	13.9	26,894	Tanner Cr	07-42-35
1987	Big Cr[d]	Big Creek	fing.	07/01/88	--	22.3	17,200	Big Creek	--
1987	Big Cr[d]	Big Creek	fing.	07/01/88	--	22.3	24,853	Big Creek	07-44-10
1987	Sandy R.[e]	Eagle Creek	fing.	04/12/89	--	21.0	43,995	Klaskanine River	--
1987	Sandy R.[e]	Eagle Creek	fing.	04/12/89	04/13/89	21.0	204,630	Youngs River	--
1987	Sandy R.[e]	Sandy	fing.	06/20/88	--	163.0	65,514	Beaver Creek	--
1987	Sandy R.[e]	Sandy	fing.	06/20/88	--	163.0	72.530	Clatskanie River	--
1987	Sandy R.[e]	CEDC	fry	04/04/88	--	645.0	65;000	Tucker Creek	--
1987	Big Cr[d]	Big Creek	smolt	06/01/89	--	9.7	55,020	Big Creek	--
1987	Big Cr[d]	Big Creek ,	smolt	06/01/89	--	9.9	33,935	Big Creek	--
1987	Big Cr[d]	Big Creek	smolt	06/01/89	--	9.9	22,622	Big Creek	07-42-44
1987	Big Cr[d]	Big Creek	smolt	06/01/89	--	10.5	55,029	Big Creek	--
1987	Big Cr[d]	Big Creek	smolt	08/01/88	--	11.5	15,773	Big Creek	--
1987	Big Cr[d]	Big Creek	smolt	08/01/88	--	11.5	23,075	Big Creek	07-44-12
1987	Big Cr[d]	Big Creek	smolt	06/01/89	--	13.8	227,972	Big Creek	--
1987	Big Cr[d]	Big Creek	smolt	06/01/89	--	14.2	29,461	Big Creek	--
1987	Big Cr[d]	Big Creek	smolt	06/05/89	--	14.9	58,410	Big Creek	--
1987	Big Cr[d]	Big Creek	smolt	06/05/89	--	14.9	22,714	Big Creek	07-42-47
1987	Big Cr[d]	Klaskanine	smolt	05/16/89	--	15.2	1,062,487	NFk Klaskanine River	--
1987	Big Cr[d]	Klaskanine	smolt	05/16/89	--	15.2	10,421	NFk Klaskanine River	07-41-56
1987	Big Cr[d]	Klaskanine	smolt	05/16/89	--	15.2	10,334	NFk Klaskanine River	07-41-57
1987	Big Cr[d]	Klaskanine	smolt	05/16/89	--	15.2	10,626	NFk Klaskanine River	07-41-58
1987	Clackames R.[g]	Eagle Creek	smolt	04/17/89	04/18/89	19.0	96,115	Klaskanine River	--
1987	Clackames R.[g]	Eagle Creek	smolt	04/14/89	--	20.0	50,600	Klaskanine River	--
1987	Clackames R.[g]	Eagle Creek	smolt	04/17/89	--	19.0	104,975	Youngs River	--
1987	Clackamas R.[g]	Eagle Creek	smolt	04/14/89	--	20.0	60,480	Youngs River	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip'
1987	Sandy R.[e]	Eagle Creek	smolt	04/13/89	--	19.0	27,740	Youngs River	07-47-44
1987	Sandy R.[e]	CEDC	smolt	05/10/89	--	11.5	125,907	Youngs River	--
1987	Sandy R.[e]	CEDC	smolt	05/10/89	--	11.5	28,579	Youngs River	07-45-01
1987	Sandy R.[e]	Sandy	smolt	05/27/89	--	13.6	1,496	Colwnbia R-2	--
1987	Tanner Cr	Bonneville	smolt	06/01/89	--	12.1	3253649	Tanner Cr	--
1987	Tanner Cr	Bonneville	smolt	06/01/89	--	12.1	28.317	Tanner Cr	07-47-03
1987	Tanner Cr	Bonneville	smolt	05/24/89	--	14.6	583,322	Tanner Cr	--
1987	Tanner Cr	Bonneville	smolt	05/24/89	--	14.6	18,040	Tanner Cr	07-47-0s
1987	Tanner Cr	Bonneville	smolt	04/20/89	--	17.7	777,952	Tanner Cr	--
1987	Tanner Cr	Bonneville	smolt	04/20/89	--	17.7	25,717	Tanner Cr	07-47-06
1987	Tanner Cr	Wahkeena Pond	smolt	06/16/89	--	15.4	593,999	Columbia R-2	--
1987	Tanner Cr	Wahkeena Pond	smolt	06/16/89	--	15.4	2,000	Columbia R-2	07-41-46
1987	Tanner Cr	Wahkeena Pond	smolt	06/16/89	--	15.4	2;ooo	Columbia R-2	07-41-47
1987	Tanner Cr	Wahkeena Pond	smolt	06/16/89	--	15.4	2,000	Columbia R-2	07-41-48
1987	Tanner Cr	CEDC	smolt	05/10/89	--	11.4	246,675	SFk Klaskanine River	--
1987	Tanner Cr	CEDC	smolt	05/10/89	--	11.4	28,325	SFk Klaskanine River	07-44-63
1988	Big Cr[d]	Big Creek	fins.	06/29/89	--	23.2	23,399	Big Creek	--
1988	Big Cr[d]	Big Creek	fing.	06/29/89	--	23.2	27,578	Big Creek	07-45-02
1988	Big Cr[d]	Big Creek	smolt	05/31/90	--	9.1	36,108	Big Creek	--
1988	Big Cr[d]	Big Creek	smolt	05/31/90	--	9.1	27,652	Big Creek	07-48-46
1988	Big Cr[d]	Big Creek	smolt	05/31/90	--	9.2	63,692	Big Creek	--
1988	Big Cr[d]	Big Creek	smolt	05/31/90	--	9.3	65,715	Big Creek	--
1988	Big Cr[d]	Big Creek	smolt	07/31/89	--	12.6	18,204	Big Creek	--
1988	Big Cr[d]	Big Creek	smolt	07/31/89	--	12.6	21,839	Big Creek	07-47-12
1988	Big Cr[d]	Big Creek	smolt	05/31/90	--	13.3	72,746	Big Creek	--
1988	Big Cr[d]	Big Creek	smolt	05/31/90	--	13.3	27,902	Big Creek	07-48-45
1988	Big Cr[d]	Big Creek	smolt	05/31/90	--	14.2	30.069	Big Creek	--
1988	Big Cr[d]	Big Creek	snlolt	05/31/90	--	15.0	219,529	Big Creek	--
1988	Clackamas R.[g]	CEDC	smolt	04/29/90	04/30/90	12.4	344,877	Youngs River	--
1988	Clackamas R.[g]	CEDC	smolt	04/30/90	05/18/90	13.0	387,202	Youngs River	--
1988	Clackamas R.[g]	CEDC	smolt	05/18/90	--	13.0	23,002	Youngs River	07-43-07
1988	Clackamas R.[g]	CEDC	smolt	05/18/90	--	13.0	24,694	Youngs River	07-43-08
1988	Klaskanine R.	Klaskanine	smolt	05/31/90	--	12.9	1,362,464	NFk Klaskanine River	--
1988	Klaskanine R.	Klaskanine	smolt	05/31/90	--	12.9	10,299	NFk Klaskanine River	07-42-19
1988	Klaskanine R.	Klaskanine	smolt	05/31/90	--	12.9	10,888	NFk Klaskanine River	07-42-20
1988	Klaskanine R.	Klaskanine	snlolt	05/31/90	--	12.9	10,904	NFk Klaskanine River	07-42-21
1988	Sandy R.[e]	Oxbow (Herman)	snlolt	05/14/90	--	14.7	1,040,430	Columbia R-2	--
1988	Sandy R.[e]	Oxbow (Herman)	smolt	05/14/90	--	14.7	4,212	Columbia R-2	07-42-09
1988	Sandy R.[e]	Oxbow (Herman)	smolt	05/14/90	--	14.7	4,212	Columbia R-2	07-42-10

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip'
1988	Sandy R.[e]	Oxbow (Herman)	smolt	05/14/90	--	14.7	4,212	Columbia R-2	07-42-11
1988	Sandy R.[e]	CEDC	smolt	05/02/90	--	11.5	3,841	Blind SL	--
1988	Sandy R.[e]	CEDC	smolt	05/13/90	--	11.7	752.044	SFk Klaskanine River	--
1988	Sandy R.[e]	CEDC	smolt	05/13/90	--	11.7	27,276	SFk Klaskanine River	07-51-28
1988	Tanner Cr	Bomeville	smolt	06/19/90	--	9.7	322,626	Tamer Cr	--
1988	Tanner Cr	Bonneville	smolt	06/19/90	--	9.7	28.436	Tamer Cr	07-49-45
1988	Tanner Cr	Bonneville	smolt	04/25/90	--	13.7	680,584	Tamer Cr	--
1988	Tanner Cr	Bonneville	smolt	04/25/90	--	13.7	21,048	Tamer Cr	07-50-29
1988	Tanner Cr	Bomeville	smolt	06/01/90	--	14.3	579,559	Tamer Cr	--
1988	Tanner Cr	Bonnevi lle	smolt	06/01/90	--	14.3	17,924	Tamer Cr	07-49-46
1989	Big Cr[d]	Bomevi lle	fing.	05/07/90	--	102.8	2,334,074	Tamer Cr	--
1989	Big Cr[d]	Big Creek	fing.	07/02/90	--	20.5	30,203	Big Creek	--
1989	Big Cr[d]	Big Creek	fing.	07/02/90	--	20.5	26,476	Big Creek	07-51-13
1989	Tanner Cr	Bomevi lle	fing.	05/07/90	--	109.1	246,893	Tamer Cr	--
1989	Big Cr[d]	Big Creek	smolt	06/03/91	--	9.8	156,271	Big Creek	--
1989	Big Cr[d]	Big Creek	smolt	06/03/91	--	9.8	25,053	Big Creek	07-54-26
1989	Big Cr[d]	Big Creek	smolt	07/31/90	--	12.0	29,976	Big Creek	--
1989	Big Cr[d]	Big Creek	smolt	07/31/90	--	12.0	27,142	Big Creek	07-51-12
1989	Big Cr[d]	Big Creek	smolt	06/03/91	--	14.0	95,200	Big Creek	--
1989	Big Cr[d]	Big Creek	smolt	06/03/91	--	14.0	26,419	Big Creek	07-54-27
1989	Big Cr[d]	Big Creek	smolt	06/10/91	--	14.7	218.042	Big Creek	--
1989	Big Cr[d]	CEDC	smolt	05/09/91	--	8.5	6,513	Youngs River	--
1989	Clackames R.[g]	CEDC	smolt	07/01/91	--	15.3	12,181	Blind SL	LV
1989	Clackames R.[g]	CEDC	smolt	05/27/91	05/31/91	13.5	476,230	Youngs River	--
1989	Clackamas R.[g]	CEDC	smolt	05/27/91	05/31/91	13.5	29,319	Youngs River	07-55-55
1989	Clackamas R.[g]	CEDC	smolt	05/12/91	05/16/91	15.3	480,968	Youngs River	--
1989	Clackamss R.[g]	CEDC	smolt	05/12/91	05/16/91	15.3	26,916	Youngs River	07-55-58
1989	Clackamss R.[g]	CEDC	smolt	04/15/91	04/17/91	15.5	539,022	Youngs River	--
1989	Clackames R.[g]	CEDC	smolt	04/15/91	04/17/91	15.5	25,989	Youngs River	07-55-59
1989	Clackamas R.[g]	CEDC	smolt	04/29/91	05/06/91	15.6	530,129	Youngs River	--
1989	Clackamas R.[g]	CEDC	smolt	04/29/91	05/06/91	15.6	28,488	Youngs River	07-55-54
1989	Sandy R.[e]	CEDC	smolt	05/08/91	--	12.8	757,624	SFk Klaskanine River	--
1989	Sandy R.[e]	CEDC	smolt	05/08/91	--	12.8	27,478	SFk Klaskanine River	07-55-48
1989	Sandy R.[e]	Trojan Pond	smolt	05/20/91	--	16.4	92,543	Colunbia R-l	--
1989	Sandy R.[e]	Trojan Pond	smolt	05/20/91	--	16.4	28,112	Columbia R-l	07-55-39
1989	Tanner Cr	Bonneville	smolt	05/31/91	--	10.7	260,832	Tanner Cr	--
1989	Tanner Cr	Bonneville	smolt	05/31/91	--	10.7	22,065	Tamer Cr	07-55-49
1989	Tanner Cr	Bomevi lle	smolt	04/30/91	--	13.9	785,403	Tamer Cr	--
1989	Tamer Cr	Bomeville	smolt	04/30/91	--	13.9	26,802	Tamer Cr	07-55-50

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[c]
1989	Tanner Cr	Bonneville	smolt	05/31/91	--	14.4	607,899	Tanner Cr	--
1989	Tanner Cr	Bonneville	smolt	05/31/91	--	14.4	21,395	Tanner Cr	07-55-51
1989	Tanner Cr	Oxbow (Herman)	smolt	03/31/91	--	19.1	1,084,889	Columbia R-2	--
1989	Tanner Cr	Oxbow (Herman)	smolt	03/31/91	--	19.1	5,135	Columbia R-2	07-48-61
1989	Tanner Cr	Oxbow (Herman)	smolt	03/31/91	--	19.1	5,135	Colunbia R-2	07-48-62
1989	Tanner Cr	Oxbow (Herman)	smolt	03/31/91	--	19.1	5,135	Columbia R-2	07-48-63
1990	Klaskanine R.	STEP	fing.	06/08/91	--	43.0	11,008	Youngs River	--
1990	Tanner Cr	NMFS	fing.	10/18/91	--	21.0	5,460	Columbia R-2	--

a Estimates are from Oregon Department of Fish and Wildlife (unpublished data); records for the 1978-81 brood years may be incomplete. Records prior to the 1978 brood release are available from Oregon Department of Fish and Wildlife (unpublished data) and have not as yet been summarized in the standardized format of this report.

b All of the stocks listed are sub-stocks of the Lower Columbia River Early Run (LCER) stock.

c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary clip; RM = right maxillary clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the mark, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

d Big Creek Hatchery stock.

e Sandy Fish Hatchery stock.

f Cascade Fish Hatchery stock.

g Clackamas River early run (Eagle Creek Hatchery).

Table 2 (RH-1). Total escapement of LCER stock hatchery coho salmon to Bonneville Hatchery by brood year[a,b,c].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1966	--	3,906	--	--		--	3,906
1967	13,664	44,310	--	--	--	57,974	44,310
1968	19,619	38,662	--		--	58,281	38,662
1969	11,693	10,800	--	--		22,493	10,800
1970	5,008	10,574	--	--		15,582	10,574
1971	6,717	38,457	--	--		45,174	38,457
1972	2,557	13,427	--			15,984	13,427
1973	4,662	26,330	--		--	30,992	26,330
1974	1,598	3,848				5,446	3,848
1975	14,059	41,294	--	--	--	55,353	41,294
1976	3,546	20,669	--	--	--	24,215	20,669
1977	4,551	23,529	--	--	--	28,080	23,529
1978	4,788	7,977	--			12,765	7,977
1979	2,403	33,778	--			36,181	33,778
1980	5,843	8,920[d]	--	--	--	14,763	8,920
1981	1,156[d]	14,488	--	--	--	15,644	14,488
1982	263	23,702	--	--	--	23,965	23,702
1983	581	53,669	--		--	54,250	53,669
1984	3,250	11,417	--	--		14,667	11,417
1985	636	11,024	--		--	11,660	11,024
1986	1,526	40,148[d]	--		--	41,674	40,148
1987	1,889[d]	12,281[e]	--		--	14,170	12,281
1988	1,519[e]	24,686[f]	--	--	--	26,205	24,686
1989	410[f]	--	--		--	--	--

[a] Unless otherwise footed, estimates are modified from Washington Department of Fisheries and Oregon Department of Fish and Wildlife (1992).

[b] Estimates include returns to Wahkeena Pond.

[c] Unlese otherwise footnoted, returning fish were visually classified as jack or adult fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

[d] Scale analysis was used to adjust estimates to account for smaller than normal adult fish returning to the facility. Data are from Oregon Department of Fish and Wildlife (unpublished data).

[e] Preliminary estimate.

[f] Preliminary estimate. Data are from Oregon Department of Fish and Wildlife (unpublished data).

Table 3 (RH-2). Total escapement of LCER stock hatchery coho salmon to Klaskanine Hatchery by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1966	--	2,761				--	2,761
1967	11,776	3,903	--	--	--	15,679	3,903
1968	9,039	3,042	--		--	12,081	3,042
1969	5,476	2,521	--	--	--	7,997	2,521
1970	3,735	1,104	--		--	4,839	1,104
1971	15,171	2,235	--		--	17,406	2,235
1972	2,250	687	--	--		2,937	687
1973	9,224	2,343	--		--	11,567	2,343
1974	2,203	499	--		--	2,702	499
1975	5,397	1,942	--			7,339	1,942
1976	7,201	5,487	--		--	12,688	5,487
1977	3,434	1,127	--	--	--	4,561	1,127
1978	745	916	--		--	1,661	916
1979	814	1,771	--		--	2,585	1,771
1980	1,447	1,638'	--		--	3,085	1,638
1981	1,552'	4,228[c]	--		--	5,780	4,228
1982	2,646[c]	4,152	--			6,798	4,152
1983	7,749	19,462	--			27,211	19,462
1984	3,217	974	--		--	4,191	974
1985	7,794	3,143	--		--	10,937	3,143
1986	4,627	3,211[c]	--		--	7,838	3,211
1987	2,303'	1,730[d]	--		--	4,033	1,730
1988	3,360[d]	4; 397[e]	--		--	7,757	4,397
1989	1,700[e]	--	--	--		--	--

[a] Unless otherwise footed, estimates are modified from Washington Department of Fisheries and Oregon Department of Fish and Wildlife (1992).

[b] Unless otherwise footnoted, returning fish were visually classified as jack or adult fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

[c] Scale analysis was used to adjust estimates to account for smaller than normal adult fish returning to the facility. Data are from Oregon Department of Fish and Wildlife (unpublished data).

[d] Preliminary estimate.

[e] Preliminary estimate. Data are from Oregon Department of Fish and Wildlife (unpublished data).

Table 4 (RB-3). Total escapement of LCER stock hatchery coho salmon to Big Creek Hatchery by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1966	--	8,213			--	--	8,213
1967	3,169	6,211			--	9,380	6,211
1968	3,663	5,864		--	--	9,527	5,864
1969	1,305	3,051				4,356	3,051
1970	2,477	833				3,310	833
1971	2,969	1,586				4,555	1,586
1972	329	802				1,131	802
1973	1,329	2,176				3,505	2,176
1974	333	476				809	476
1975	2,664	5,437				8,101	5,437
1976	858	3,897				4,755	3,897
1977	295	4,797				5,092	4,797
1978	221	3,320				3,541	3,320
1979	152	2,336	--			2,488	2,336
1980	160	1,231'				1,391	1,231
1981	236[c]	5,950				6,186	5,950
1982	173	9,124				9,297	9,124
1983	761	18,425				19,186	18,425
1984	672	6,785				7,457	6,785
1985	225	1,542				1,767	1,542
1986	163	9,240[c]				9,403	9,240
1987	774c	4,703[d]			--	5,477	4,703
1988	986[d]	5,948[e]				6,934	5,948
1989	436[e]	--				--	--

[a] Unless otherwise footed, estimates are modified from Washington Department of Fisheries and Oregon Department of Fish and Wildlife (1992).

[b] Unless otherwise footnoted, returning fish were visually classified as jack or adult fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

[c] Scale analysis was used to adjust estimates to account for smaller than normal adult fish returning to the facility. Data are from Oregon Department of Fish and Wildlife (unpublished data).

[d] Preliminary estimate.

[e] Preliminary estimate. Data are from Oregon Department of Fish and Wildlife (unpublished data).

Table 5 (RH-4). Total escapement of LCER stock hatchery coho salmon to the Clatsop Economic Development Commission's hatchery facilities by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1981	--	177					177
1982	130	20	--	--	--	150	20
1983	71	347	a-	--	--	418	347
1984	73	14	--	--	--	87	14
1985	330	0	--	--	--	330	0'
1986	0	118[c]	--	--	--	118	118
1987	1,264'	376[d]	--	--	--	1,640	376
1988	3,108[d]	326[e]	--	--	--	3,434	326
1989	650[e]	--	--	--	--	--	--

[a] Unless otherwise footed, estimates are modified from Washington Department of Fisheries and Oregon Department of Fish and Wildlife (1992).

[b] Unless otherwise footnoted, returning fish were visually classified as jack or adult fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

[c] Scale analysis was used to adjust estimates to account for smaller than normal adult fish returning to the facility. Data are from Oregon Department of Fish and Wildlife (unpublished data).

[d] Preliminary estimate.

[e] Preliminary estimate. Data are from Oregon Department of Fish and Wildlife (unpublished data).

Table 6 (AC-l). Age composition (freshwater.ocean) by brood year for LCER stock hatchery coho salmon returning to Bonneville Hatchery[a].

Brood Year	N	Age Composition (%)								
		1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3
1967	57,974	--	--	--	24	76	--		--	
1968	58,281	--	--	--	34	66	--	--	--	
1969	22,493	--	--	--	52	48	--	--	--	
1970	15,582	--	--	--	32	68	--		--	
1971	45,174	--		--	15	85	--		--	
1972	15,984	--	--	--	16	84	--	--	--	
1973	30,992	--	--	--	15	85	--	--	--	
1974	5,446	--	--	--	29	71	--	--	--	
1975	55,353	--			25	75			--	--
1976	24,215	--			15	85			--	
1977	28,080	--	--		16	84	--	--	--	
1978	12,765	--	--		38	62	--	--	--	
1979	36,181	--	--	--	7	93	--	--	--	
1980	14,763	--	--		40	60		--	--	
1981	15,644	--	--	--	7	93			--	--
1982	23,965	--	--	--	1	99	--		--	--
1983	54,250	--	--	--	1	99	--	--	--	--
1984	14,667	--	--	--	22	78	--	--	--	--
1985	11,660	--			5	95	--		--	--
1986	41,674	--		--	4	96	--	--		--
1987	14,170	--	--	--	13	87	--	--	--	--
1988	26,205	--	--	--	6	94	--	--	--	--

[a] Estimates of age structure are based on brood returns to Bonneville Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 7 (AC-2). Age composition (freshwater.ocean) by brood year for LCER stock hatchery coho salmon returning to Klaskanine Hatchery[a].

Brood Year	N	Age Composition (%) 1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3
1967	15,679	--	--	--	75	25	--	--	--	--
1968	12,081	--	. .	--	75	25	. .	--	--	--
1969	7,997	--	. .	--	68	32	. .	--	--	--
1970	4,839	--	--	--	77	23	. .	--	--	--
1971	17,406	--	. .	--	87	13	. .	--	--	--
1972	2,937	--	. .	--	77	23	. .	--	--	--
1973	11,567	--	. .	--	80	20	. .	--	--	--
1974	2,702	--	. .	--	82	18	--	--	--	--
1975	7,339	--	--	--	74	26	--	--	--	--
1976	12,688	--	--	--	57	43	--	--	--	--
1977	4,561	--	. .	--	75	25	--	--	--	--
1978	1,661	--	--	--	45	55	--	--	--	--
1979	2,585	--	--	--	31	69	--	--	--	--
1980	3,085	--	. .	--	47	53	--	--	--	--
1981	5,780	--	. .	--	27	73	--	--	--	--
1982	6,798	--	. .	--	39	61	--	--	--	--
1983	27,211	--	--	--	28	72	--	--	. .	--
1984	4,191	--	. .	--	77	23	--	--	. .	--
1985	10,937	--	--	--	71	29	--	--	. .	--
1986	7,838	--	. .	--	59	41	--	--	--	--
1987	4,033	--	. .	--	57	43	--	--	--	--
1988	7,757	--	. .	--	43	57	--	--	--	--

[a] Estimates of age structure are based on brood returns to Klaskanine Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 8 (AC-3). Age composition (freshwater.ocean) by brood year for LCER stock hatchery coho salmon returning to Big Creek Hatchery[a].

Brood Year	N	Age Composition (%)								
		1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3
1967	9,380	--	--	--	34	66	--			--
1968	9,527	--	--	--	38	62	--			--
1969	4,356	--	--	--	30	70	--			--
1970	3,310	--	--	--	75	25	--	--		
1971	4,555		--	--	65	35	--			--
1972	1,131	--	--	--	29	71	--			--
1973	3,505	--	--	--	38	62				--
1974	809	--	--	--	41	59				--
1975	8,101	--		--	33	67				
1976	4,755	--	--		18	82				
1977	5,092	--	--		6	94	--			--
1978	3,541	--	--		6	94	--			--
1979	2,488	--	--	--	6	94	--		--	--
1980	1,391	--	--		12	88				
1981	6,186				4	96	--			--
1982	9,297	--	--	--	2	98	--	--		--
1983	19,186	--	--	--	4	96	--	--		--
1984	7,457	--	--	--	9	91	--	--		--
1985	1,767	--		--	13	87		--		
1986	9,403			--	2	98		--		--
1987	5,477	--	--	--	14	86	--	--	--	--
1988	6,934	--	--	--	14	86	--	--	--	--

[a] Estimates of age structure are based on brood returns to Big Creek Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 9 (AC-4). Age composition (freshwater.ocean) by brood year for LCER stock hatchery coho salmon returning to the Clatsop Economic Development Commission's hatchery facilities[a].

Brood Year	N	Age Composition (%)								
		1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3
1982	150	--	--	--	87	13	--	--	--	--
1983	418	--	--	--	17	83	--	--	--	--
1984	87	--	--	--	84	16	--	--	--	--
1985	330	--	--	--	100	0	--	--	--	--
1986	118	--	--	--	0	100	--	--	--	--
1987	1,640	--	--	--	77	23	--	--	--	--
1988	3,434	--	--	--	91	9	--	--	--	--

[a] Estimates of age structure are based on brood returns to the Clatsop Economic Development Commission's hatchery facilities (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 10 (AF-1). Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to Bonneville Hatchery[a,b].

	Mean Fecundity									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1975	--	--	--		--	2,220	--	--	--	
N	--	--	--		--	3,213		--	--	--
st. dev.	--	--	--	--	--	--		--	--	
1976	--	--	--		--	2,948		--	--	
N	--	--	--		--	2,605		--	--	
st. dev.	--	--	--	--	--	--		--	--	
1977	--	--	--		--	2,480		--	--	
N	--	--	--	--	--	2,838	--	-^	--	
st. dev.	--	--	--	--	--	--	--	--	--	
1978	--	--	--	--	--	2,778	--	--	--	--
N	--	--	--		--	457	--	--	--	
st. dev.	--	--	--	--	--	--	--	--	--	
1979	--	--	--	--	--	2,605	--	--	--	
N	--	--	--	--	--	1,427	--	--	--	
st. dev.	--	--	--	--	--	--	--	--	--	
1980	--	--	--	--	--	--	--	--	--	--
N	--	--	--	--	--	--	--	--	--	
st. dev.	--	--	--	--	--	--	--	--	--	

Table 10 (AF-1). (cont.) Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to Bonneville Hatchery[a,b].

Mean Fecundity

Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1981										
N										
st. dev.										
1982										
N										
st. dev.										
1983						2,099				
N						214				
st. dev.										
1984						2,337				
N						419				
st. dev.										
1985						2,575				
N						65				
st. dev.										
1986						2,313				
N						124				
st. dev.										

(cont.)

Table 10 (AF-1). (cont.) Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to Bonneville Hatchery[a,b].

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[a] Estimates for the 1975-79 brood years were modified from Howell et al. (1985) and for the 1983-86 brood years are from Oregon Department of Fish and Wildlife (unpublished data).

[b] Data available by total age only; all coho salmon were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Fecundity).

Table 11 (AF-2). Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to Klaskanine Hatchery[a,b].

	Mean Fecundity									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1975	--	--		--		2,270	--			--
N	--	--		--		922	--			--
at. dev.	--	--		--	--	--	--			
1976	--		--			2,699	--			
N	--	--				1,326	--			--
st. dev.	--			--		--	--	--		
1977	--			--		2,281	--			--
N	--		--	--		518	--			--
st. dev.	--					--	--			--
1978	--			--		2,495	--			--
N	--			--		474	--			--
st. dev.	--			--		--	--			--
1979				--		2,576	--			
N				--		888	--			
st. dev.	--			--		--	--			
1980	--			--		1,840	--		--	--
N				--	--	761	--			--
st. dev.				--		--	--			--
1981	--			--		3,223		--		--
N	--			--		733	--			--
st. dev.	--			--		--	--		--	--

Table 11 (AF-2). (cont.) Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to Klaskanine Hatchery[a,b].

Mean Fecundity

Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1982	--	--	--	--	. .	3,134	--	--	--	. .
N	--	--	--	. .	--	1,013	--	--	--	. .
st. dev.	--	--	--	. .	. .	--	--	--		--
1983	--	--	--	. .	. .	2,210	--	--		. .
N	--	--	--	. .	--	925	--	--		. .
st. dev.	--	--		. .	. .	--		--		. .
1984	--	--		. .	. .	3,183	--	--	--	--
N	--	--		. .	. .	71	--	--	--	. .
st. dev.	--	--		. .	. .	--	--	--	--	. .
1985	--	--	--	. .	. .	2,298	--	--		. .
N	--	--	--	. .	. .	1,495	--	--	--	. .
st. dev.	--	--	--	. .	. .	--	--	--	--	. .
1986	--	--	--	. .	. .	1,762	--	--		. .
N	--	--	--	. .	. .	924		--		
st. dev.	--	--	--	. .	. .	--	--	--	--	--
1987	--	--		. .	. .	1,906		--	--	--
N	--	--	--	. .	. .	745		--	--	--
st. dev.	--	--	--	. .	. .	--	--	--	--	--

Table 11 (AF-2). (cont.) Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to Klaskanine Hatchery[a,b].

	Mean Fecundity									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1988	--	--	--	--		1,746	--	--	--	
N	--	--	--	--	--	1,670	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--

[a] Estimates for the 1975-79 brood years were modified from Howell et al. (1985) and for the 1980-88 brood years are from Oregon Department of Fish and Wildlife (unpublished data).

[b] Data available by total age only; all coho salmon were assumed to have migrated as age 1+ smolta (see ADULT LIFE HISTORY, Fecundity).

Table 12 (AF-3). Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to Big Creek Hatchery[a,b].

	Mean Fecundity									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1975					--	2,438	--			
N						542	--			
st. dev.						--	--			--
1976						2,237	--			
N			--			297	--			
st. dev.						--	--			
1977						2,778	--		--	
N		--				886	--			
st. dev.						--	--			
1978						2,794	--			
N			--			1,265	--			
st. dev.						--	--			
1979						2,550	--			
N						535	--			--
st. dev.				--		--	--			--
1980						1,916				--
N			--			416	--			--
st. dev.						--	--			--
1981	--	--				3,158	--			--
N					--	967	--	--	--	
st. dev.	--		--			--	--			--

Table 12 (AF-3). (cont.) Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to Big Creek Hatchery[a,b].

	Mean Fecundity									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1982	--	--		--		3,261				--
N	--	--		--		415			--	--
st. dev.	--	--		--		--			--	--
1983	--	--		--		2,595				--
N	--	--		--	--	681				--
st. dev.	--	--		--		--				--
1984	--	--		--		2,441	--			--
N	--	--		--		2,181				--
st. dev.	--	--		--		--				--
1985	--	--	--	--		2,502				--
N	--	--		--		463	--			--
st. dev.	--	--		--		--			--	--
1986	--	--				2,138				--
N	--	--		--		2,754				--
st. dev.	--	--		--		--				--
1987	--	--		--		2,222			--	--
N	--	--				1,376			--	--
at. dev.	--	--				--		--	--	--

Table 12 (AF-3). (cont.) Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to Big Creek Hatchery[a,b].

	Mean Fecundity									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1988	--	--	--	--	--	2,351	--	--	--	--
N	--	--	--	--	--	377	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--

[a] Estimates for the 1975-79 brood years were modified from Howell et al. (1985) and estimates for the 1980-88 brood years are from Oregon Department of Fish and Wildlife (unpublished data).

[b] Data available by total age only; all coho salmon were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Fecundity).

Table 13 (AF-4). Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to the CEDC hatchery facilities[a,b].

Mean Fecundity

Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1981	--	--			--	3,025		--	--	--
N	--	--	--		--	64		--	--	--
st. dev.	--	--			--	--		--	--	--
1982	--	--			--	2,323		--	--	--
N	--	--	--		--	6	--	--	--	--
st. dev.	--	--		--	--	--	--	--	--	--
1983	--	--			--	1,806	--	--	--	--
N	--	--			--	76	--	--	--	--
st. dev.	--	--			--	--	--	--	--	--
1984	--	--			--	2,306	--	--	--	--
N	--	--			--	3	--	--	--	--
st. dev.	--	--			--	--	--	--	--	--
1985	--	--			--	--	--	--	--	--
N	--	--			--	--	--	--	--	--
st. dev.	--	--	--		--	--	--	--	--	--
1986	--	--	--		--	1,579	--	--	--	--
N	--	--	--		--	59	--	--	--	--
et. dev.	--	--	--		--	--	--	--	--	--

Table 13 (AF-4). (cont.) Mean fecundity by brood year and age class (freshwater.ocean) for LCER stock hatchery coho returning to the CEDC hatchery facilities[a,b].

	Mean Fecundity									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1987	--			--	--	2,115	--	--	--	--
N	--	--	--	--	--	171	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--
1988	--	--	--	--	--	1,977	--	--	--	--
N	--	--	--	--	--	179	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--

a Estimates are from Oregon Department of Fish and Wildlife (unpublished data).
b Data available by total age only; all coho salmon were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Fecundity).

Table 14 (AE). Emigration of coded wire tagged hatchery coho salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Columbia River estuary	Big Creek Hat.	Hatchery Returns		
	1979	--	3	3
mainstem Col. R. below Bonneville	Anadromous Inc., Oregon	Hatchery Returns		
	1985	--	1	1
mainstem Col. R. below Bonneville	Big Creek Hat.	Hatchery Returns		
	1982	--	4	4
	1983	--	--	--
	1984	--	5	5
	1985	--	76	76
	1986	--	112	112
	1987		52	52
	1988		29	29
mainstem Cal. R. below Bonneville	Big Creek	Spawning Grounds		
	1985	--	1	1
mainstem Col. R. below Bonneville	Cascade Hat.	Hatchery Returns		
	1984	--	2	2
	1985	--	1	1
	1986	--	19	19
	1987	--	1	1

Table 14 (AE). (cont.) Emigration of coded wire tagged hatchery coho salmon released as juveniles in the lower Columbia River eubbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
mainstem Col. R. below Bonneville	Columbia River Tributaries (WA) below Bonneville 1985	Spawning Grounds		1
mainstem Col. R. below Bonneville	Cowlitz Hatchery 1986	Hatchery Returns	--	5
mainstem Col. R. below Bonneville	Elk River Hat. 1987	Hatchery Returns	--	1
mainstem Col. R. below Bonneville	Elokomin Hatchery 1986	Hatchery Returns		8
mainstem Col. R. below Bonneville	Elokomin River 1984	Spawning Grounds	--	1
mainstem Col. R. below Bonneville	Grays River Hat. 1984	Hatchery Returns	--	1
	1985		--	2
	1986		--	2

Table 14 (AE). (cont.) Emigration of coded wire tagged hatchery coho salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run	Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
mainstem Col. R. below Bonneville	Klaskanine	Hat.	Hatchery Returns		
		1984	--	2	2
		1985	--	5	5
		1986	--	21	21
		1987		--	--
		1988	--	1	1
mainstem Col. R. below Bonneville	Klaskanine	ponds	Hatchery Returns		
		1986	--	2	2
		1987	--	1	1
mainstem Col. R. below Bonneville	Lewis River		Spawning Grounds		
		1985		2	2
		1986		1	1
mainstem Col. R. below Bonneville	Lower Kalama	Hat.	Hatchery Returns		
		1985	--	7	7
mainstem Col. R. below Bonneville	Naselle	Hat.	Hatchery Returns		
		1986	--	1	1

Table 14 (AE). (cont.) Emigration of coded wire tagged hatchery coho salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
mainstem Col. R. below Bonneville	Nehalem Hat.	Hatchery Returns		
	1985	--	1	1
	1986	--	4	4
mainstem Col. R. below Bonneville	Nehalem River	Spawning Grounds		
	1984	--	1	1
mainstem Col. R. below Bonneville	Nemah Hat.	Hatchery Returns		
	1985	--	1	1
	1986	--	3	3
	1987	--	1	1
mainstem Col. R. below Bonneville	Salmon River Hat.	Hatchery Returns		
	1982	--	1	1
	1983	--	--	--
	1984	--	--	--
	1985	--	1	1
	1986	--	21	21
mainstem Col. R. below Bonneville	Salmon River	Spawning Grounds		
	1986	--	5	34

Table 14 (AE). (cont.) Emigration of coded wire tagged hatchery coho salmon released as juveniles in the lower Columbia River subbasfn (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run	Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
mainstem Col. R. below Bonneville	Sandy Hatchery	Hatchery Returns			
		1985		2	2
mainstem Col. R. below Bonneville	Siletz Hat.	Hatchery Returns			
		1985	--	1	1
mainstem Col. R. below Bonneville	Washougal Hat.	Hatchery Returns			
		1985		1	1
		1986		1	1
mainstem Col. R. below Bonneville	Washougal River	Spawning Grounds			
		1986	--	1	1
Col. R. Tribs.[d] below Bonneville	Big Creek Hat.	Hatchery Returns			
		1986		1	1
Col. R. Tribs.[d] below Bonneville	Klaskanine Hat.	Hatchery Returns			
		1985	--	1	1
		1986	--	--	--
		1987		--	--
		1988		23	23

Table 14 (AE). (cont.) Emigration of coded wire tagged hatchery coho salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Col. R. Tribs.[d] below Bonneville	Klaskanine ponds	Hatchery Returns		
	1985	--	16	16
	1986	--	67	67
	1987	--	1	1
Col. R. Tribs.[d] below Bonneville	Nehalem Hatchery	Hatchery Returns		
	1984	--	1	1
Big Creek	Elokomin Hat.	Hatchery Returns		
	1987	--	1	1
Big Creek	Klaskanine Hat.	Hatchery Returns		
	1983	--	1	1
Big Creek	Nehalem Hat.	Hatchery Returns		
	1984	--	1	1
Big Creek	Salmon River Hat.	Hatchery Returns		
	1984	--	1	1
Klaskanine River	Anadromous Inc., Oregon	Hatchery Returns		
	1983		1	1

Table 14 (AE). (cont.) Emigration of coded wire tagged hatchery coho salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run	Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Klaskanine River	Big Creek Hat.		Hatchery Returns		
		1982	--	6	6
		1983	--	2	2
		1984	--	12	12
		1985	--	25	25
		1986	--	45	45
		1987	--	6	6
		1988	--	10	10
Klaskanine River	Big Creek		Spawning Grounds		
		1985	--	1	1
Klaskanine River	Grays River Hat.		Hatchery Returns		
		1984	--	1	1
Tanner Creek	Big Creek Hat.		Hatchery Returns		
		1984	--	1	1
Tanner Creek	Bonneville Hat.		Hatchery Returns		
		1982	--	2,575	2,575
		1983	--	143	143
		1984	--	264	264
		1985	--	1,110	1,121
		1986	--	1,841	1,859
		1987	--	257	257
		1988	--	456	459

Table 14 (AE). (cont.) Emigration of coded wire tagged hatchery coho salmon released as juveniles in the lower Columbia River subbaein (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Tanner Creek	Cascade Hat.	Hatchery Returns		
	1982	--	576	576
	1983	--	--	--
	1984	--	177	179
	1985	--	1	1
	1986	--	320	320
	1987	--	153	153
	1988	--	204	204
	Columbia River Tributaries (WA)			
Tanner Creek	below Bonneville	Spawning Grounds		
	1984		1	1
Tanner Creek	Fall Creek Hat.	Hatchery Returns		
	1985	--	1	1
Tanner Creek	Nehalem Hat.	Hatchery Returns		
	1985		1	1
Tanner Creek	Round Butte Hat.	Trap Returns		
	1983	--	1	1
Tanner Creek	Sandy Hatchery	Hatchery Returns		
	1984		1	1
	1985		1	1

Table 14 (AE). (cont.) Emigration of coded wire tagged hatchery coho salmon released as juveniles in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates exclude juvenile fish released into the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Tanner Creek	Washougal Hat. 1984	Hatchery Returns --	1	1

a Based on the following tag codes: ORGNOR*2, ORORLB, ORRDOR. Based on the following tag codes from fish of unknown race (assumed to be fall coho): 07-21-27, 07-21-28, 07-21-29, 07-21-30, 07-21-31, 07-21-32, 07-24-28, 07-24-29, 07-24-30, 07-24-32, 07-24-33, 07-24-34, 07-24-49, 07-24-51, 07-26-06, 07-26-07, 07-26-37, 07-26-43, 07-26-48, 07-26-49, 07-26-54, 07-27-25, 07-27-42, 07-27-46, 07-27-47, 07-28-01,07-28-02, 07-28-04, 07-28-21, 07-28-22, 07-29-44, 07-29-45, 07-29-46, 07-29-47, 07-29-48, 07-29-49, 07-30-14, 07-30-15, 07-30-29, 07-30-61, 07-30-62, 07-30-63, 07-31-42, 07-32-04, 07-32-05, 07-32-06, 07-32-07, 07-32-08, 07-32-09, 07-32-52, 07-33-03, 07-33-06, 07-33-08, 07-33-43, 07-33-44, 07-34-45, 07-34-46, 07-35-50, 07-35-51, 07-35-52, 07-36-14, 07-36-15, 07-36-16, 07-36-26, 07-36-27, 07-36-28, 07-36-29, 07-36-30, 07-36-31, 07-38-43, 07-38-45, 07-38-47, 07-38-50, 07-38-51, 07-38-52, 07-39-58, 07-39-63, 07-42-32, 07-42-35, 07-42-37, 07-45-51.

b Estimates are modified from the Pacific States Marine Fisheries Commission coded wire tag database.

c Estimates are primarily returns to North Bonneville ladder and Bonneville Hatchery.

d Release/recovery sites include Oregon tributaries below Bonneville Dam excluding sites located in the Klaskanine, Willamette, and Sandy river subbasins and in the Big, Gnat, and Tanner creek subbasins.

Table 15 (TD-1). Parasites and diseases of LCER stock coho salmon at hatchery facilities located in the lower Columbia River subbasin (mouth to Bonneville Dam)[a].

Disease type	Hatchery	Specific Pathogen
Parasite	Bonneville	*Epistylis sp.*
Parasite	Bonneville	Costia *(Ichthyobodo sp.)*
Parasite	Bonneville	*Trichodina spp.*
Parasite	Klaskanine	Costia *(Ichthyobodo sp.)*
Parasite	Klaskanine	*Trichodina spp.*
Parasite	Klaskanine	*Epistylis sp.*
Parasite	Klaskanine	*Scyphidia*
Parasites	Klaskanine	Microsporidans (*Loma sp.*)
Parasite	Big Creek	*Plistophora*
Parasite	Big Creek	Costia *(Ichthyobodo sp.)*
Parasite	Big Creek[b]	*Epistylis spp.*
Parasite	Big Creek	*Dermocystidium*
Bacteria	Bonneville	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Bonneville	Furunculosis *(Aeromonas salmonicida)*
Bacteria	Bonneville	*Aeromonas spp.*
Bacteria	Bonneville	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	Bonneville	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Bonneville[b]	*Pseudomonas spp.*
Bacteria	Big Creek	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Big Creek	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Big Creek	*Aeromonas spp.*
Bacteria	Big Creek	*Ichthyophthirius sp.* (ICH)
Bacteria	Big Creek[b]	*Pseudomonas spp.*
Bacteria	Klaskanine	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Klaskanine	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Klaskanine	Botulism *(Clostridium botulinum)*

Table 15 (TD-1). (cont.) Parasites and diseases of LCER stock coho salmon at hatchery facilities located in the lower Columbia River subbasin (mouth to Bonneville Dam)[a].

Disease type	Hatchery	Specific Pathogen
Bacteria	Klaskanine	*Aeromonas spp.*
Bacteria	Klaskanine[b]	*Pseudomonas spp.*
Virus	Bonneville	Viral Erythropoietic Necrosis (VEN)
Virus	Bonneville[b]	Erythrocytic Inclusion Body Syndrome (EIBS)
Virus	Big Creek	Viral Erythropoietic Necrosis (VEN)
Virus	Big Creek[b]	Erythrocytic Inclusion Body Syndrome (EIBS)
Virus	Klaskanine[b]	Erythrocytic Inclusion Body Syndrome (EIBS)
Fungi	Bonneville	External fungi

[a] Except where footnoted, data are from Oregon Department of Fish and Wildlife (unpublished data).
[b] Personal communication on 4/8/92 with T. Kreps, Oregon Department of Fish and Wildlife, Fish Pathology, Clackamas, Oregon.

Table 16 (TD-2). Parasites and diseases of LCER stock adult coho at hatchery facilities located in the lower Columbia River subbasin (mouth to Bonneville Dam)[a].

Disease type	Hatchery	Specific Pathogen
Parasite	Big Creek	*Ceratomyxa shasta*
Parasite	Klaskanine	*Ceratomyxa shasta*

[a] Personal communication on 4/8/92 with T. Kreps, Oregon Department of Fish and Wildlife, Fish Pathology, Clackamas, Oregon.

REFERENCES

Howell, P.J., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Washington Department of Fisheries and Oregon Department of Fish and Wildlife. 1992. Columbia River Fish Runs and Fisheries, 1938-91. Status Report, Portland, Oregon. (draft report.)

Willis, R.A. 1962. Gnat Creek weir studies. Final Report of Fish Commission of Oregon, Research Division (Contract No. 14-17-001-469), Portland, Oregon.

LOWER COLUMBIA RIVER SUBBASIN

Naturally Produced Chum Salmon

GEOGRAPHIC LOCATION

The Oregon side of the lower Columbia River subbasin is defined for management purposes as the mainstem Columbia River between the mouth and Bonneville Dam (WP 146), and tributaries on the Oregon side, except for the Willamette and Sandy river subbasins (Washington Department of Fisheries et al. 1990). The "lower Columbia River subbasin" is used throughout this document to refer to the Oregon side as defined above.

ORIGIN

Chum salmon are indigenous to the lower Columbia River subbasin. Although once abundant in the subbasin, loss of habitat has contributed towards a major decline in the population (Fulton 1970, as cited by Howell et al. 1985). The subbasin has been supplemented with hatchery fish in an attempt to increase run sizes of naturally produced fish to the subbasin. Runs have not, however, increased in response to a combination of hatchery supplementation and reduced fishing exploitation (Fulton 1970, as cited by Howell et al. 1985). Hatchery production was phased out with the 1984 brood release of hatchery fish (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Chum Salmon, ORIGIN) and only a remnant population currently exists on Oregon's side of the subbasin.

DISTRIBUTION

Subbasin

Chum salmon primarily spawn in tributaries of the lower Columbia River subbasin located on the Washington side, although some natural production does occur in tributaries located on the Oregon side (Howell et al. 1985). Spawning areas in Oregon that were historically important in the production of chum salmon include the Lewis and Clark, Youngs, Klaskanine, and Clatskanie rivers, and Bear, Big, Gnat, and Milton creeks (Fulton 1970, as cited by Howell et al. 1985).

PRODUCTION

Harvest

Sport

Columbia R. (tribs.): Recreational harvest of naturally produced chum salmon is allowed but no harvest has been recorded in the last 20 years (Howell et al. 1985).

ADULT LIFE HISTORY

Escapement

Columbia R. (mainstem)

Timing: "Chum enter the Columbia River in mid-October through November" (Chaney and Perry 1976, as cited by Howell et al. 1985).

REFERENCES

Chaney, E., and L.E. Perry. 1976. Columbia Basin salmon and steelhead analysis. Summary report of the Pacific Northwest Regional Commission. (As reported in Howell et al. 1985.)

Fulton, L.A. 1970. Spawning areas and abundance of steelhead trout and coho, sockeye, and chum salmon in the Columbia River basin--Past and present. United States Department of Commerce, Special Scientific Report, Fisheries No. 618, Washington, D.C. (As reported in Howell et al. 1985.)

Howell, P.J., K. Jones, D. Scamecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Washington Department of Fisheries, Washington Department of Wildlife, and Oregon Department of Fish and Wildlife. 1990. Salmon and steelhead production plan (lower Columbia River subbasin). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon.

LOWER COLUMBIA RIVER SUBBASIN

Hatchery Produced Chum Salmon

ORIGIN

The first recorded release of hatchery chum salmon on Oregon's side of the lower Columbia River subbasin was in 1961 (Table 1). Hatchery fish were released into the subbasin in an attempt to increase run sizes (Washington Department of Fisheries et al. 1990). Hatchery broodstock was primarily developed from native stocks of chum salmon (Howell et al. 1985). In 1984, however, George Adams (Hood Canal) stock was transferred to Big Creek Hatchery (Howell et al. 1985).

Oregon's hatchery production program was discontinued after the 1984 brood release, although the Salmon and Trout Enhancement Program (STEP) continued to release fry into the subbasin as late as 1990. The STEP program for chum salmon was discontinued after the 1990 release because no adults were returning to Big Creek Hatchery; the source of eggs for STEP. Several sub-stocks have been released into the subbasin. They include the Big Creek, Klaskanine River, and Carson/Cowlitz sub-stocks (Table 1).

DISTRIBUTION

Subbasin

Chum were released into the North and South forks of the Klaskanine River, the Youngs River, and Tucker, Mill, and Big creeks (Table 1).

PRODUCTION

Releases

Egg

There are no records of egg releases into the subbasin.

Fry

There are no records of hatchery fry releases into the subbasin. Information on STEP releases into the subbasin is available from Oregon Department of Fish and Wildlife (unpublished data).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Big Creek, Klaskanine, and the Clatsop Economic Development Commission (CEDC; Table 1). Annual numbers released ranged from 33,836 to 1,878,050 fish (Table 1). Size at release ranged from 1,376 to 5.1 fish per pound (Table 1).

Smolt

There are no records of smolt releases into the subbasin.

Jack and Adult

There are no records of adult releases into the subbasin.

Harvest

Sport

Columbia R. (tribs.): Sport harvest of hatchery produced chum is allowed in the subbasin but no catch has been recorded in the last 20 years (Howell et al. 1985).

ADULT LIFE HISTORY

Escapement

Hatchery Facilities

Timing: "Adults return to Big Creek and Klaskanine hatcheries in November and December" (Howell et al. 1985). Median dates of spawning at Big Creek hatchery ranged from mid to late November (Howell et al. 1985). Median date of spawning at Klaskanine Hatchery for the 1981 brood was 10 December (Howell et al. 1985).

Fecundity

Estimates of mean fecundity are available at Big Creek (Table 2) and Klaskanine (Table 3) hatcheries.

Annual estimates of mean fecundity ranged from 1,667 to 2,900 eggs per female (Tables 2 and 3).

DISEASES

Limited information is available on diseases affecting chum at hatchery production facilities. Ectoparasites, cold water disease, and miscellaneous bacteria have been detected at Big Creek Hatchery but there have been no major disease problems associated with the parasites and bacteria detected at the facilities (Howell et al. 1985). No viruses have been detected in chum salmon at Oregon hatchery facilities (Howell et al. 1985).

Table 1 (TR). Hatchery releases of chum salmon into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT/ Fin clip[b]
1960	--	Big Creek	fing.	02/15/61[c]	--	1,140	218,926	Big Creek	
1961		Big Creek	fing.	04/15/62[c]	--	549	314,577	Big Creek	
1962	--	Big Creek	fing.	03/15/63[c]	--	640	280,894	Big Creek	
1963	--	Big Creek	fing.	02/15/64[c]	03/15/64[c]	1,200	319,464	Big Creek	
1964	--	Big Creek	fing.	01/01/65	12/31/65[d]	1,200	173,866	Big Creek	--
1965	--	Big Creek	fing.	05/15/66[c]	--	154	315,367	Big Creek	--
1966	--	Big Creek	fing.	05/15/67[c]	--	1,347	371,971	Big Creek	--
1968		Big Creek	fing.	04/01/69	--	344	82,641	Big Creek	
1975	--	Klaskanine	fing.	04/15/76[c]	--	514	961,278	Nfk Klaskanine	--
1975	--	Big Creek	fing.	04/15/76[c]	--	391	41,426	Big Creek	--
1977		Big Creek	fing.	04/15/78[c]	--	320	41,009	Big Creek	
1978		Klaskanine	fing.	04/15/79[c]	--	378	907,409	Nfk Klaskanine	
1978	--	Big Creek	fing.	04/15/79[c]	--	359	6,478	Big Creek	
1979	Cowlitz[e]	Klaskanine	fing.	04/03/80	--	5.1	755,210	NFk Klaskanine River	--
1980	--	CEDC	fing.	05/01/81	--	200	500,000	Youngs Bay	--
1980	Big Cr[f]	Big Creek	fing.	03/31/81	--	336.0	21,768	Big Creek	
1980	Big Cr[f]	Big Creek	fing.	03/24/81	--	381.0	13,146	Big Creek	--
1980	Big Cr[f]	Big Creek	fing.	04/14/81	--	382.0	9,550	Big Creek	--
1981	Big Cr[f]	Big Creek	fing.	03/15/82	--	1,164	3,492	Big Creek	--
1981	Big Cr[f]	Big Creek	fing.	02/25/82	--	1,213	9,704	Big Creek	--
1981	Big Cr[f]	Big Creek	fing.	03/02/82	--	1,376	20,640	Big Creek	--
1982	Big Cr[f]	STEP	fing.	04/15/83	--	200.0	18,096	Youngs River	
1982	Big Cr[f]	STEP	fing.	04/15/83	--	200.0	5,104	Youngs River	LV
1982	Big Cr[f]	Big Creek	fing.	02/18/83	--	1,057	5,285	Big Creek	--
1982	Big Cr[f]	Big Creek	fing.	02/22/83	--	1,193	9,544	Big Creek	--
1982	Big Cr[f]	Big Creek	fing.	03/29/83	--	630.0	66,150	Hill Creek	--
1983	Big Cr[f]	Big Creek	fing.	04/05/84	--	357.0	69,365	Big Creek	--
1983	Klaskanine R.	CEDC	fing.	05/29/84	--	216.0	5,184	SFk Klaskanine River	--
1983	Klaskanine R.	CEDC	fing.	06/22/84	--	143.0	10,010	Youngs River	--
1984	Cowlitz[e]	CEDC	fing.	05/06/85	--	380.0	953,420	Tucker Creek	--
1984	Cowlitz[e]	Klaskanine	fing.	04/19/85	--	370.0	924,630	NFk Klaskanine River	--

[a] Estimates are from Oregon Department of Fish and Wildlife (unpublished data).

[b] D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = Left maxillary clip; = right maxillary clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknoun); FB = freeze brand; CB = cold brand. For cold brands, the Location of the brand follous in parentheses, and the mark, is listed after a colon. Cold brand Locations are described as being on the right or Left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

(cont.)

Table 1 (TR). (cont.) Hatchery releases of chum salmon into the lower Columbia River subbasin by brood year and if marked, by coded uire tag code'.

c Day(s) of release unknoun; standardized to the 15th of the month.
d Month(s) and day(s) of release unknoun; standardized to the first and last day of the year.
e Carson/Cowlitz (Washington) stock.
f Big Creek Hatchery stock.

Table 2 (AF-a). Mean fecundity (eggs per female), by run year, for chum salmon at Big Creek Hatchery[a].

Run Year	Mean Fecundity
1978	2,900
1979	--
1980	2,673
1981	2,700
1982	--
1983	2,425

[a] Estimates for the 1978-83 run years are from Howell et al. (1985).

Table 3 (AF-b). Mean fecundity (eggs per female), by run year, for chum salmon at Klaskanine Hatchery[a].

Run Year	Mean Fecundity
1981	1,667

[a] Estimate for the 1981 run year is from Howell et al. (1985).

REFERENCES

Howell, P.J., K. Jones, D. Scamecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Washington Department of Fisheries, Washington Department of Wildlife, and Oregon Department of Fish and Wildlife. 1990. Salmon and steelhead production plan (lower Columbia River subbasin). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon.

LOWER COLUMBIA RIVER SUBBASIN

Naturally Produced Summer Steelhead

GEOGRAPHIC LOCATION

The Oregon side of the lower Columbia River subbasin is defined for management purposes as the mainstem Columbia River between the mouth and Bonneville Dam (146), and tributaries on the Oregon side, except for the Willamette and Sandy river subbasins (Washington Department of Fisheries et al. 1990). The "lower Columbia River subbasin" is used throughout this document to refer to the Oregon side as defined above.

ORIGIN

Summer steelhead are not indigenous to the lower Columbia River subbasin. The subbasin has been supplemented with hatchery fish in an attempt to establish a self-sustaining population. The Skamania and Hatchery Deschutes stocks are the only stocks that have been introduced into the subbasin.

DISTRIBUTION

Subbasin

Only a limited amount of spawning and rearing habitat is considered suitable for the production of summer steelhead. Approximately 0.5 miles of spawning and rearing habitat is located in McCord Creek and 0.8 miles of spawning and rearing habitat in Moffett Creek. Both creeks are tributaries to the Columbia River. The habitat in both creeks is rated as "good" quality (Tables 1 and 2).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of lower Columbia River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	100.0	0.0	0.0	--	0.8	--
Acres (%)	0.0	100.0	0.0	0.0	--	0.8	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Rating8 of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of,rearing only habitat by quality of lower Columbia River subbasin summer steelhead,production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	0.0	0.0	0.0	0.0	--	0.0	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

REFERENCES

Washington Department of Fisheries, Washington Department of Wildlife, and Oregon Department of Fish and Wildlife. 1990. Salmon and steelhead production plan (lower Columbia River subbasin). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon.

LOWER COLUMBIA RIVER SUBBASIN

Hatchery Produced Summer Steelhead Salmon

ORIGIN

The first recorded release of hatchery summer steelhead into the lower Columbia River subbasin was in 1975 (Table 1). Hatchery fish were released into the subbasin in an attempt to establish a self sustaining population and to sustain a fishery. The only stock used for subbasin hatchery production is the Skamania stock of summer steelhead (Table 1). The only other stock released into the subbasin was the Hatchery Deschutes stock of summer steelhead. Releases were from excess production (i.e. gradeouts) from Round Butte Hatchery (RBH); located in the Deschutes River subbasin.

DISTRIBUTION

Subbasin

Summer steelhead have been released into the Clatskanie and mainstem Columbia rivers, Gnat Creek, Blue and Benson lakes, and Haldeman and Mirror Ponds (Table 1).

PRODUCTION

Releases

Egg

There are no records of egg releases into the subbasin.

Fry

There are no records of fry releases into the subbasin.

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Gnat Creek and Roaring River hatcheries (Table 1). Annual estimates of fingerling releases, prior to 1982, may be incomplete. Beginning with the 1982 estimate, annual numbers released ranged from 445 to 82,778 fish (Table 1). Size at release ranged from 51.0 to 17.0 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Gnat Creek, Trojan Pond, and Round Butte Hatchery (Table 1). Annual estimates of smolt releases, prior to 1982, may be incomplete. Beginning with the 1982 estimate, annual numbers released ranged from 2,000 to 8,509 fish (Table 1). Size at release ranged from 14.0 to 5.0 fish per pound (Table 1).

Adult

There are no records of adult releases into the subbasin.

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile summer steelhead for subbasin hatchery production (Table 2). Parasites include ***Ichthyobodo sp.*** (Costia) and ***Trichodina spp.*** Bacterial diseases include ***Renibacterium salmoninarum*** (bacterial kidney disease) and ***Cytophaga psychrophila*** (cold water disease). No viral disease agents have been detected in summer steelhead reared at lower Columbia River hatchery facilities. For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see SANTIAM RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES and see DESCHUTES RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES.

Table 1 (TR). Hatchery releases of summer steelhead into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT/ Fin clip[b]
197s	Skamsni a	Roaring River	fing.	01/01/75	12/31/75[c]	9.0	25,256	Gnat Cr.	--
1979	Skamania	Gnat Creek	fing.	01/01/79	12/31/79[c]	9.0	36,206	Gnat Cr.	--
1979	Deschutes R.	Round Butte	smolt	05/07/80	05/09/80	3.9	27,280	Columbia R-2	RP
1980	Skamania R.	Gnat Creek	f ing.	09/30/80		40.0	39,718	Gnat Creek	--
1980	Skamania R.	Gnat Creek	smolt	04/27/81	--	6.0	5,010	Clatskanie River	--
1981	Skamenia R.	Trojan Pond	smolt	04/30/82	--	5.0	2,000	Columbia R-l	--
1986	Skamania R.	Gnat Creek	smolt	04/29/87	--	5.1	5,534	Columbia R-l	AD
1987	Skamania R.	Gnat Creek	f ing.	01/28/88	--	44.7	445	Haldeman Pond	--
1988	Skamsnia R.	Gnat Creek	smolt	01/23/89	_	14.0	8,005	Blue Lake	--
1988	Skamania R.	Gnat Creek	sfnolt	01/23/89	--	14.0	504	Haldeman Pond	--
1989	Skamania R.	Gnat Creek	f ing.	01/22/90	--	17.0	14,960	Benson Lake	--
1989	Skamsnia R.	Gnat Creek	f ing.	01/22/90	01/23/90	17.0	55,420	Mirror Pond	--
1990	Skamsnia R.	Gnat Creek	fing.	12/17/90	--	17.6	12,408	Gnat Creek	--
1991	Skamania R.	Gnat Creek	f ing.	12/27/91	--	51.0	8,160	Blue Lake	--
1991	Skamania R.	Gnat Creek	fing.	12/24/91	--	51.0	33.660	Gnat Creek	--

a Estimates are from Oregon Department of Fish and Wildlife (unpublished data). Records prior to the 1981 brood release may be incomplete.

b D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = Left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary clip; AP = right maxillary clip; AD+ = adipose fin clip plus coded wire tag (tag code unknoun); AD-CUT = adipose fin clip plus coded uire tag (tag code unknoun); FB = freeze brand; CB = cold brand. For cold brands, the Location of the brand follows in parentheses, and the mark, is listed after a colon. Cold brand locations are described as being on the right or Left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark uas "U4". The "AU" code has not been identified.

C Day(s) and month(s) of release unknown; standardized to the first and last day of the release year.

Table 2 (TD). Parasites and diseases of summer steelhead at hatchery facilities located *in* the lower Columbia River subbasin (mouth to Bonneville Dam)".

Disease Type	Hatchery	Specific Pathogen
Parasite	Klaskanine	Costia *(Ichthyobodo sp.)*
Parasite	Klaskanine	Gyrodactylus
Parasite	Klaskanine	*Epistylis sp.*
Parasite	Klaskanine	*Trichodina spp.*
Parasite	Klaskanine	*Scyphidia*
Parasite	Gnat Creek	*Epistylis sp.*
Parasite	Gnat Creek	Costia *(Ichthyobodo sp.)*
Parasite	Gnat Creek	*Trichodina spp.*
Parasite	Trojan pond	*Ceratomyxa shasta*
Parasite	Trojan pond	*Trichodina spp.*
Parasite	Trojan pond	*Gyrodactylus*
Parasite	Trojan pond	*Epistylis sp.*
Bacteria	Klaskanine	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Klaskanine	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Gnat Creek	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Gnat Creek	*Aeromonas spp.*
Bacteria	Gnat Creek	*Pseudomonas spp.*
Bacteria	Gnat Creek	Bacterial gill disease
Bacteria	Gnat Creek	*Ichthyophthirius sp.* (ICH)
Bacteria	Gnat Creek	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	Trojan pond	Botulism *(Clostridium botulinum)*
Bacteria	Trojan pond	Furunculosis *(Aeromonas salmonicida)*
Bacteria	Trojan pond	*Ichthyophthirius sp.* (ICH)
Bacteria	Trojan pond	*Aeromonas spp.*
Bacteria	Trojan pond	*Pseudomonas spp.*
Bacteria	Trojan pond	Coldwater disease *(Cytophaga psychrophila)*

[a] Data are from Oregon Department of Fish and Wildlife (unpublished data).

LOWER COLUMBIA RIVER SUBBASIN

Naturally Produced Winter Steelhead

GEOGRAPHIC LOCATION

The Oregon side of the lower Columbia River subbasin is defined for management purposes as the mainstem Columbia River between the mouth and Bonneville Dam (146), and tributaries on the Oregon side, except for the Willamette and Sandy river subbasins (Washington Department of Fisheries et al. 1990). The "lower Columbia River subbasin" is used throughout this document to refer to the Oregon side as defined above.

ORIGIN

Winter steelhead are indigenous to the lower Columbia river subbasin. The subbasin has annually been supplemented with hatchery fish beginning as early as 1971 (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Winter Steelhead). The only recorded stock used for hatchery supplementation on Oregon's side of the subbasin is the Big Creek stock. The effect that hatchery supplementation has had on the native population is unknown (Howell et al. 1985).

DISTRIBUTION

Subbasin

Spawning and rearing habitat is distributed throughout Oregon's side of the subbasin. Natural production occurs in the Lewis and Clark, Klaskanine, and Clatskanie rivers, and in Big and Gnat creeks (Oregon Department of Fish and Wildlife, unpublished data). The quality of habitat considered suitable for spawning and rearing varies throughout the subbasin (Tables 1 and 2).

PRODUCTION

Harvest

Sport

Columbia R. (tribs.): Although estimates of sport harvest of naturally produced winter steelhead are not available by brood year, estimates by run year are available in Howell et al. (1985) for the combined harvest of naturally and hatchery produced fish.

ADULT LIFE HISTORY

Escapement

Columbia R. (tribs.)

Numbers: No brood year specific estimates are available. Run year specific estimates to Gnat Creek are available in Willis (1962).

Spawning Area

Timing: "Based on timing of downstream kelts past the Gnat Creek weir, spawning in Gnat Creek appears to have occurred primarily from March through May" (Howell et al. 1985).

Strays

Little information is available on the extent to which wild or hatchery fish stray into the subbasin. The only records available are from twelve coded wire tagged hatchery winter steelhead released as juveniles in the Elokomin River subbasin (Table 3). The fish were recovered in Big Creek (Table 3).

JUVENILE LIFE HISTORY

Migration Timing,

Downstream migration in Gnat Creek peaked in April and May for age 2+ fish and lesser peaks for age 1+ and 0+ fish occurred in June and November, respectively (Kruse undated, as cited by Howell et al. 1985). "However, the number of 0+ steelhead reported was inflated since small cutthroat trout and steelhead could not be distinguished" (Howell et al. 1985). Most winter steelhead in Gnat Creek migrate as age 2+ smolts (Howell et al. 1985).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of lower Columbia River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	14.0	41.0	37.0	8.0	--	240.3	--
Acres (%)	14.0	48.0	33.0	6.0	--	336.5	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of lower Columbia River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	51.0	5.0	7.0	38.0	--	57.4	--
Acres (%)	66.0	2.0	1.0	31.0	--	938.3	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 3 (AI). Non-harvest recoveries of coded wire tagged hatchery winter steelhead in the lower Columbia River subbasin (mouth to Bonneville Dam)[a,b]. Estimates are for fish collected below Bonneville Dam and exclude fish collected in the Willamette and Sandy river subbasins.

Hatchery/Release site	Recovery site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Elokomin River	Big Creek Hatchery Returns			
	1987	--	6	6
	1988	--	6	6

[a] Based on the following tag codes: 63-35-62, 63-36-01, 63-36-02, 63-37-37, 63-37-40, 63-37-41, 63-37-43.
[b] Estimate8 are modified from the Pacific States Marine Fisheries Commission coded wire tag database.

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LOWER COLUMBIA RIVER SUBBASIN

Hatchery Produced Winter Steelhead

ORIGIN

Records indicate that hatchery fish were released in the lower Columbia River subbasin prior to the early 1970s (Letter from Bob Buckrnan dated 8/12/92, Oregon Department of Fish and Wildlife, Astoria, Oregon). Hatchery releases are summarized beginning with the 1970 brood release but records may be incomplete prior to the 1983 brood release (Table 1). The Big Creek stock is the only hatchery stock recorded as having been introduced into lower Columbia River subbasin tributaries (Table 1).

DISTRIBUTION

Subbasin

Winter steelhead have been released at various sites located in the lower Columbia River subbasin (Table 1). Hatchery fish are primarily released into the Klaskanine River subbasin and the Gnat and Big creek subbasins. Hatchery fish are also released into the Lewis and Clark River subbasin and the Clatskanie River subbasin.

PRODUCTION

Releases

Fry

The only hatchery facility in which fry were reared or acclimated prior to release in the subbasin is Big Creek Hatchery (Table 1). Annual estimates of fry releases, prior to 1982, may be incomplete. Beginning with the 1982 estimate, annual numbers released ranged from 72,818 to 193,304 fish (Table 1). Size at release ranged from 1,978 to 1,669 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Big Creek and Gnat Creek hatcheries (Table 1). Annual estimates of fingerling releases, prior to 1982, may be incomplete. Beginning with the 1982 estimate, annual numbers released ranged from 5,180 to 22,896 fish (Table 1). Size at release ranged from 41.0 to 15.6 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Big Creek, Klaskanine, and Gnat Creek hatcheries (Table 1). Annual estimates of smolt releases, prior to 1982, may be incomplete. Beginning with the 1982 estimate, annual numbers released ranged from 130,160 to 224,257 fish (Table 1). Size at release ranged from 6.9 to 4.2 fish per pound (Table 1).

Harvest

Sport

Columbia R. (tribs.): Although estimates of sport harvest of hatchery produced winter steelhead are not available, by brood year, estimates by run year are available in Howell et al. (1985) for the combined harvest of naturally and hatchery produced fish.

ADULT LIFE HISTORY

Age Structure

Age structure was estimated for Big Creek stock hatchery winter steelhead returning to Big Creek Hatchery. Ocean age was estimated based on scale analysis. All returning fish were assumed to have migrated in the year of release (i.e. age 1+). This assumption is based on the fact that subbasin hatchery production was primarily released as age 1+ smolts (Table 1); that most fingerlings were released in lakes and ponds (Table 1); and data which indicates that the survival rate from fingerling to returning adult spawner is low (Oregon Department of Fish and Wildlife 1986). Unmarked fish were classified as hatchery fish based on data from scale analysis that indicates few naturally produced fish return to Big Creek Hatchery; the fact that no fish are allowed to spawn above Big Creek Hatchery; and the fact that winter steelhead at Big Creek Hatchery are primarily early run stocks while naturally produced fish are primarily late run stocks (personal communication on 7/31/92, Ken Kenaston, Oregon Department of Fish and Wildlife, Corvallis, Oregon).

Annual estimates of age structure, by brood year, ranged from 71% to 82% 2 salt fish and from 18 % to 29 % 3 salt fish (Table 2).

BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile hatchery winter steelhead were sampled from Big Creek Hatchery in 1984 and 1985, and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele mobilities and allele frequencies were determined for 20 enzyme systems in each sample year (Appendix Table 4). One rare allele was detected, at the isocitrate dehydrogenase locus (Appendix Table 4).

Schreck et al. (1986) classified Columbia River Basin wild and hatchery steelhead into several clusters of similar stocks based on biochemical, morphological and life history characters. Columbia River Basin steelhead stocks segregated into two primary groups, those from west of the Cascade Mountains and those from east of the Cascades. Big Creek hatchery winter steelhead clustered with other stocks from west of the Cascades. This primary group consisted of 3 subgroups. At the subgroup level, Big Creek hatchery winter steelhead were more similar to other hatchery stocks of summer and winter steelhead than to other steelhead stocks from west of the Cascades. This subgroup was characterized by the earliest average spawning time; the lowest average head and maxillary length, the lowest number of scales in the lateral series and above the lateral line, and the highest average caudal peduncle length. This group also had the lowest frequency of the common malate dehydrogenase allele, and the greatest average frequencies of the common L-lactate dehydrogenase and dipeptidase alleles. The summer stocks placed in this group are all originally from the Skamania Hatchery stock of summer steelhead.

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile winter steelhead for subbasin hatchery production (Table 3). Parasites include ***Myxobolus sp.*** and ***Trichodina spp.*** Bacterial diseases include ***Yersinia ruckeri*** (Enteric redmouth) and ***Cytophaga psychrophila*** (cold water disease). Viral diseases include Infectious Hematopoietic Necrosis (IHN).

Table 1 (TR). Hatchery releases of winter steelhead into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock'	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[b]
1970	Big Creek	Big Creek	smolt	04/15/71[c]	--	6.7	54,907	Big Cr.	--
1970	Big Creek	Klaskanine	smolt	04/15/71[c]	--	7.0	54,929	Nfk. Klaskanine R.	--
1971	Big Creek	Big Creek	molt	04/15/72[c]	--	5.8	50,808	Big Cr.	--
1971	Big Creek	Klaskanine	molt	04/15/72[c]	--	6.7	50,783	Nfk. Klaskanine R.	--
1972	Big Creek	Klaskanine	smolt	04/15/73[c]	--	6.6	50,179	Nfk. Klaskanine R.	--
1972	Big Creek	Big Creek	smolt	04/15/73[c]	--	5.7	50,245	Big Cr.	--
1972	Big Creek	Big Creek	smolt	04/15/73[c]	--	6.1	16,291	Charlie Cr./Lewis & Clark R.	--
1972	Big Creek	Big Creek	smolt	04/15/73[c]	--	6.2	14,195	Sfk. Klaskanine R.	--
1972	Big Creek	Klaskanine	smolt	04/15/73[c]	--	6.7	9,005	Sfk. Klaskanine R.	--
1973	Big Creek	Klaskanine	smolt	04/15/73[c]	--	6.6	28,407	Sfk. Klaskanine R.	--
1973	Big Creek	Klaskanine	smolt	04/15/74[c]	--	6.6	28,778	Nfk. Klaskanine R.	--
1973	Big Creek	Big Creek	smolt	04/15/74[c]	--	6.3	49,601	Big Cr.	--
1974	Big Creek	Klaskanine	smolt	04/15/75[c]	--	6.1	51,647	Nfk. Klaskanine R.	--
1974	Big Creek	Klaskariine	fry.	04/15/74[c]	--	1,743	40,786	Youngs River	--
1974	Big Creek	Klaskanine	fry.	03/15/74[c]	--	2,002	178,178	Youngs River	--
1974	Big Creek	Big Creek	molt	04/15/75[c]	--	6.0	49,436	Big Cr.	--
1975	Big Creek	Klaskanine	molt	04/15/76[c]	--	5.7	32,762	Nfk. Klaskanine R.	--
1975	Big Creek	Gnat Creek	year.	12/15/75[c]	--	30.0	14,854	Milton Cr.	--
1975	Big Creek	Big Creek	fry.	03/15/75[c]	--	2,211	58,368	Youngs River	--
1975	Big Creek	Gnat Creek	molt	05/15/76[c]	--	8.0	30,000	Clatskanie R.	--
1975	Big Creek	Big Creek	molt	04/15/76[c]	--	6.4	51,892	Big Cr.	--
1975	Big Creek	Gnat Creek	molt	05/15/76[c]	--	7.7	50,013	Lewis & Clark R.	--
1975	Big Creek	Gnat Creek	molt	05/15/76[c]	--	7.7	30,029	Gnat Cr.	--
1976	Big Creek	Big Creek	smolt	04/15/77[c]	--	6.6	63,298	Big Cr.	--
1976	Big Creek	Gnat Creek	year.	11/15/76[c]	--	16.6	19,755	Milton Cr.	--
1976	Big Creek	Gnat Creek	smolt	04/15/77[c]	05/15/77[c]	6.8	33,050	Gnat Cr.	--
1976	Big Creek	Klaskanine	smolt	04/15/77[c]	--	5.7	61,079	Nfk. Klaskanine R.	--
1976	Big Creek	Gnat Creek	smolt	04/15/77[c]	--	6.1	30,000	Clatskanie R.	--
1976	Big Creek	Gnat Creek	smolt	04/15/77[c]	--	6.5	40,032	Lewis & Clark R.	--
1976	Big Creek	Gnat Creek	year.	11/15/76'	--	16.6	966	Haldeman/Sturgeon lakes	--
1977	Big Creek	Gnat Creek	smolt	04/15/78'	05/15/78[c]	6.2	45,999	Lewis & Clark R.	--
1977	Big Creek	Gnat Creek	smolt	04/15/78[c]	--	6.8	28,753	Clatskanie R.	--
1977	Big Creek	Gnat Creek	smolt	04/15/78'	05/15/78[c]	5.5	32,928	Gnat Cr.	--
1977	Big Creek	Big Creek	smolt	04/15/78[c]	--	5.6	56,981	Big Cr.	--
1977	Big Creek	Klaskanine	smolt	04/15/78'	--	5.7	29,977	Nfk. Klaskanine R.	--
1977	Big Creek	Klaskanine	smolt	04/15/78'	--	5.7	20,064	Sfk. Klaskanine R.	--
1978	Big Creek	Klaskanine	smolt	04/15/79[c]	--	6.2	30,002	Nfk. Klaskanine R.	--
1978	Big Creek	Klaskanine	smolt	04/15@	--	6.2	17,978	Lewis & Clark R.	--
1978	Big Creek	Klaskanine	smolt	04/15/79[c]	--	6.2	16,244	Sfk. Klaskanine R.	--

Table 1 (TR). (cont.) Hatchery releases of uinter stcelhead into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[b]
1978	Big Creek	Gnat Creek	smolt	04/15/79[c]	--	6.5	11,394	Clatskanie R.	--
1978	Big Creek	Gnat Creek	year.	09/15/78[c]	--	45.0	1,444	Haldeman/Sturgeon lakes	--
1978	Big Creek	gig Creek	smolt	04/15/79[c]	--	5.8	41,717	Big Cr.	--
1978	Big Creek	Big Creek	smolt	04/15/79[c]	--	5.8	7,449	Lewis & Clark R.	--
1978	Big Creek	Big Creek	fry.	03/15/78[c]	--	2,158	86,349	Gnat Cr.	--
1978	Big Creek	Gnat Creek	smolt	04/15/79[c]	--	6.4	30,186	Gnat Cr.	--
1978	Big Creek	Gnat Creek	smolt	04/15/79[c]	--	6.5	14,230	Lewis & Clark R.	--
1978	Big Creek	Gnat Creek	fry.	03/15/78[c]	--	1,653	292,587	Bear Cr.	--
1979	Big Creek	Klaskanine	smolt	04/15/80[c]	--	5.7	20,036	Sfk. Klaskanine R.	--
1979	Big Creek	Klaskanine	smolt	04/15/80[c]	--	5.6	30,854	Nfk. Klaskanine R.	--
1979	Big Creek	Gnat Creek	year.	09/15/79[c]	--	58.5	147,590	Gnat Cr.	--
1979	Big Creek	Gnat Creek	smolt	04/15/80[c]	--	6.5	52,244	Gnat Cr.	--
1979	Big Cr[illegible]d	Big Creek	smolt	04/14/80	--	6.2	52,397	Big Creek	--
1979	Big Cr[illegible]d	Gnat Creek	smolt	04/24/80	--	6.3	6,048	Clatskanie River	--
1979	Big Cr[illegible]d	Gnat Creek	smolt	04/24/80	--	6.7	6,566	Clatskanie River	--
		Gnat Creek	smolt	04/24/80	--	6.8	11,218	Clatskanie River	--
1979	gig Cr[illegible]d	Gnat Creek	smolt	04/21/80	--	6.4	18,720	Gnat Creek	--
1979	Big Cr[illegible]d	Gnat Creek	smolt	04/21/80	--	6.5	6,500	Gnat Creek	--
1979	Big Cr[illegible]d	Gnat Creek	smolt	04/24/80	--	7.0	3,150	Gnat Creek	--
		Gnat Creek	smolt	04/07/80	04/21/80	6.4	15,072	Lewis and Clark River	--
1979	Big Cr[illegible]d	Gnat Creek	smolt	04/24/80	--	6.8	4,760	Lewis and Clark River	--
1979	Big Cr[illegible]d	Gnat Creek	smolt	04/24/80	--	6.9	6,203	Lewis and Clark River	--
1979	Big Cr[illegible]d	Gnat Creek	smolt	04/23/80	--	7.3	14,234	Lewis and Clark River	--
1979	Big Cr[illegible]d	Klaskenine	smolt	04/17/80	--	5.6	30,854	NFk Klaskanine River	--
1979	Big Cr[illegible]d	Klaskanine	smolt	04/IS/80	--	5.7	20,036	Sfk Klaskanine River	--
1980	Big Cr[illegible]d	Big Creek	fry	03/19/80	--	2,122	65,000	Bear Creek	--
1980	Big Cr[illegible]d	Big Creek	fry	03/20/80	--	2,122	62,581	Clatskanie River	--
1980	Big Cr[illegible]d	Big Creek	smolt	04/20/81	--	5.9	53,167	Big Creek	--
1980	Big Cr[illegible]d	Gnat Creek	smolt	05/01/81	--	5.7	4,560	Clatskanie River	--
1980	Big Cr[illegible]d	Gnat Creek	smolt	04/24/81	--	6.6	5,940	Clatskanie River	--
1980	Big Cr[illegible]d	Gnat Creek	smolt	04/24/81	--	6.8	5,950	Clatskanie River	--
1980	Big Cr[illegible]d	Gnat Creek	smolt	04/24/81	--	7.0	8,120	Clatskanie River	--
1980	Big Cr[illegible]d	Gnat Creek	smolt	04/24/81	--	7.1	8,094	Clatskanie River	--
1980	Big Cr[illegible]d	Gnat Creek	smolt	04/23/81	--	5.4	13,346	Gnat Creek	--
1980	Big Cr[illegible]d	Gnat Creek	smolt	04/23/81	--	5.7	4,845	Lewis and Clark River	--
1980	gig Cr[illegible]d	Gnat Creek	smolt	04/24/81	--	6.1	5,368	Lewis and Clark River	--
1980	Big Cr[illegible]d	Gnat Creek	smolt	04/24/81	--	6.6	5,148	Lewis and Clark River	--
1980	Big Cr[illegible]d	Gnat Creek	smolt	04/23/81	--	6.9	5,658	Lewis and Clark River	--
1980	Big Cr[illegible]	Gnat Creek	smolt	04/24/81	--	7.0	9,178	Lewis and Clark River	--

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[b]
1980	Big. Cr[d]	Klaskanine	smolt	04/14/81	--	5.9	10,089	Lewis and Clark River	--
1980	Big Cr[d]	Klaskanine	smolt	04/14/81	--	5.9	30,584	NFk Klaskanine River	--
1980	Big Cr[d]	Klaskanine	smolt	04/14/81	--	5.9	17,022	SFk Klaskanine River	--
1981	Big Cr[d]	Big Creek	fry	03/26/81	--	2,060	5,604	Big Creek	--
1981	Big Cr[d]	Big Creek	smolt	04/21/82	--	5.7	2,633	Big Creek	--
1981	Big Cr[d]	Big Creek	smolt	04/14/82	--	6.0	36,522	Big Creek	--
1981	Big Cr[d]	Big Creek	smolt	04/21/82	--	5.7	17,768	Lewis and Clark River	--
1981	Big Cr[d]	Big Creek	smolt	04/21/82	--	5.7	6,065	SFk Klaskanine River	--
1981	Big Cr[d]	Gnat Creek	smolt	04/21/82	--	5.5	14,740	Clatskanie River	--
1981	Big Cr[d]	Gnat Creek	smolt	04/26/82	--	5.0	13,570	Gnat Creek	--
1981	Big Cr[d]	Klaskanine	smolt	04/15/82	--	5.9	24,880	NFk Klaskanine River	--
1981	Big Cr[d]	Klaskanine	smolt	04/15/82	--	5.9	13,982	SFk Klaskanine River	--
1982	Big Cr[d]	Gnat Creek	fing.	01/03/83	--	17.9	17,041	Gnat Creek	--
1982	Big Cr[d]	Gnat Creek	fing.	12/27/82	--	18.5	5,180	Little Creek	--
1982	Big Cr[d]	Big Creek	fry	03/30/82	--	1,669	193,304	Lewis and Clark River	--
1982	Big Cr[d]	Big Creek	smolt	04/15/83	--	5.6	8,008	Big Creek	--
1982	Big Cr[d]	Big Creek	smolt	04/11/83	--	5.8	42,085	Big Creek	--
1982	Big Cr[d]	Big Creek	smolt	04/11/83	--	5.6	2,968	Lewis and Clark River	--
1982	Big Cr[d]	Gnat Creek	smolt	05/11/83	--	6.0	28,195	Clatskanie River	--
1982	Big Cr[d]	Gnat Creek	smolt	05/13/83	--	5.8	23,739	Gnat Creek	--
1982	Big Cr[d]	Gnat Creek	smolt	05/13/83	--	6.4	3,904	Gnat Creek	--
1982	Big Cr[d]	Gnat Creek	smolt	05/12/83	--	5.9	13,272	Lewis and Clark River	--
1982	Big Cr[d]	Gnat Creek	smolt	05/12/83	--	6.0	5,280	Lewis and Clark River	--
1982	Big Cr[d]	Gnat Creek	smolt	05/13/83	--	6.4	8,576	Lewis and Clark River	--
1982	Big Cr[d]	Klaskanine	smolt	04/12/83	--	5.3	9,275	Lewis and Clark River	--
1982	Big Cr[d]	Klaskanine	smolt	04/12/83	--	5.3	32,887	NFk Klaskanine River	--
1982	Big Cr[d]	Klaskanine	smolt	04/11/83	04/12/83	5.3	27,664	SFk Klaskanine River	--
1983	Big Cr[d]	STEP	fry	04/10/83	--	1,700	24,346	Walluski River	--
1983	Big Cr[d]	STEP	fry	04/15/83	--	1,700	1,000	West Creek	--
1983	Big Cr[d]	Big Creek	fry	04/18/83	--	1,978	47,472	Big Creek	--
1983	Big Cr[d]	Big Creek	smolt	04/12/84	--	5.6	50,546	Big Creek	--
1983	Big Cr[d]	Big Creek	smolt	04/10/84	--	5.7	11,742	Leuis and Clark River	--
1983	Big Cr[d]	Gnat Creek	smolt	05/03/84	--	6.5	6,921	Clatskanie River	--
1983	Big Cr[d]	Gnat Creek	smolt	05/04/84	--	6.6	15,205	Clatskanie River	--
1983	Big Cr[d]	Gnat Creek	smolt	05/03/84	--	6.9	8,004	Clatskanie River	--
1983	Big Cr[d]	Gnat Creek	smolt	05/04/84	--	6.6	7,842	Columbia R-2	--
1983	Big Cr[d]	Gnat Creek	smolt	05/16/84	--	6.5	14,157	Gnat Creek	--
1983	Big Cr[d]	Gnat Creek	smolt	04/27/84	--	6.9	15,104	Gnat Creek	--
1983	Big Cr[d]	Gnat Creek	smolt	05/03/84	05/04/84	6.4	15,033	Lewis and Clark River	--

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[b]
1983	Big Crd	Klaskanine	smolt	04/27/84	--	5.1	13,053	Lewis and Clark River	--
1983	Big Crd	Klaskanine	snwlt	04/27/84	--	5.1	29,611	NFk Klaskanine River	--
1983	Big Crd	Klaskanine	smolt	04/25/84	04/26/84	5.1	29,988	SFk Klaskanine River	--
1984	Big Crd	Big Creek	smolt	04/19/85	--	4.8	28,923	Big Creek	--
1984	Big Crd	Big Creek	smolt	04/15/85	--	5.1	20,993	Big Creek	--
1984	Big Crd	Big Creek	smolt	04/17/85	--	5.0	12,996	Lewis and Clark River	--
1984	Big Crd	Gnat Creek	smolt	05/10/85	--	4.9	4,949	Clatskanie River	--
1984	Big Crd	Gnat Creek	smolt	05/16/85	05/28/85	5.0	10,400	Clatskanie River	--
1984	Big Crd	Gnat Creek	smolt	05/10/85	--	5.1	5,049	Clatskanie River	--
1984	Big Crd	Gnat Creek	smolt	05/17/85	--	5.2	4,036	Clatskanie River	--
1984	Big Crd	Gnat Creek	smolt	05/20/85	--	5.4	4,482	Clatskanie River	--
1984	Big Crd	Gnat Creek	smolt	05/17/85	--	5.5	1,045	Clatskanie River	--
1984	Big Crd	Gnat Creek	smolt	05/28/85	--	5.0	30,000	Gnat Creek	--
1984	Big Crd	Gnat Creek	smolt	05/16/85	--	5.0	4,510	Lewis and Clark River	--
1984	Big Crd	Gnat Creek	smolt	05/10/85	--	5.1	5,044	Lewis and Clark River	--
1984	Big Crd	Gnat Creek	smolt	05/17/85	--	5.2	9,418	Lewis and Clark River	--
1984	Big Crd	Klaskanine	smolt	04/29/85	--	5.2	7,935	Lewis and Clark River	--
1984	Big Crd	Klaskanine	smolt	04/29/85	--	5.2	23,218	NFk Klaskanine River	--
1984	Big Crd	Klaskanine	smolt	04/29/85	--	5.2	30,088	SFk Klaskanine River	--
1985	Big Crd	Big Creek	smolt	04/16/86	--	4.9	49,998	Big Creek	--
1985	Big Crd	Big Creek	smolt	04/08/86	--	5.3	5,618	Lewis and Clark River	--
1985	Big Crd	Big Creek	smolt	04/11/86	--	5.4	10,368	Lewis and Clark River	--
1985	Big Crd	Gnat Creek	smolt	04/28/86	--	5.0	7,195	Clatskanie River	--
1985	Big Crd	Gnat Creek	smolt	04/28/86	04/29/86	5.3	22,843	Clatskanie River	--
1985	Big Crd	Gnat Creek	smolt	05/09/86	--	5.0	30,000	Gnat Creek	--
1985	Big Crd	Gnat Creek	smolt	05/08/86	--	4.9	5,586	Lewis and Clark River	--
1985	Big Crd	Gnat Creek	smolt	04/28/86	04/29/86	5.0	11,450	Lewis and Clark River	--
1985	Big Crd	Klaskanine	smolt	04/08/86	--	5.0	6,990	Lewis and Clark River	--
1985	Big Crd	Klaskanine	smolt	04/08/86	--	5.0	29,360	NFk Klaskanine River	--
1985	Big Crd	Klaskanine	smolt	04/08/86	--	5.0	30,250	SFk Klaskanine River	--
1986	Big Crd	Big Creek	fing.	08/07/86	--	36.2	16,987	Big Creek	--
1986	Big Crd	Big Creek	smolt	04/15/87	--	5.0	49,792	Big Creek	--
1986	Big Crd	Big Creek	smolt	04/13/87	--	5.0	8,242	Lewis and Clark River	--
1986	Big Crd	Gnat Creek	smolt	04/21/87	--	5.8	5,100	Clatskanie River	--
1986	Big Crd	Gnat Creek	smolt	04/22/87	--	5.4	29,997	Gnat Creek	--
1986	Big Crd	Gnat Creek	smolt	04/21/87	--	5.8	4,956	Lewis and Clark River	--
1986	Big Crd	Klaskanine	smolt	04/14/87	--	5.2	29,380	NFk Klaskanine River	--
1986	Big Crd	Klaskanine	smolt	04/14/87	--	5.2	30,140	SFk Klaskanine River	--
1986	Big Crd	Trojan Pond	smolt	04/23/87	--	4.7	11,320	Clatskanie River	--

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the lower Columbia River subbasin by brood year and if marked, by coded uire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[b]
1986	Big Crd	Trojan Pond	smolt	04/23/87	04/24/87	4.8	26,869	Clatskanie River	··
1986	Big Crd	Trojan Pond	smolt	04/23/87	··	4.7	6,574	Lewis and Clark River	··
1986	Big Crd	Trojan Pond	smolt	04/23/87	··	4.8	4,916	Leuis and Clark River	··
1987	Big Crd	Big Creek	smolt	04/22/88	··	4.6	13,788	Big Creek	··
1987	Big Crd	Big Creek	smolt	04/14/88	··	4.9	43,603	Big Creek	··
1987	Big Crd	Gnat Creek	smolt	04/22/88	··	5.6	29,974	Clatskanie River	··
1987	Big Crd	Gnat Creek	smolt	04/27/88	··	5.8	30,276	Gnat Creek	··
1987	Big Crd	Gnat Creek	smolt	04/21/88	··	5.6	10,864	Lewis and Clark River	··
1987	Big Crd	Gnat Creek	smolt	04/25/88	··	5.8	7,998	Lewis and Clark River	··
1987	Big Crd	Gnat Creek	smolt	04/25/88	··	5.9	7,991	Leuis and Clark River	··
1987	Big Crd	Gnat Creek	smolt	04/21/88	··	6.2	13,136	Lewis and Clark River	··
1987	Big Crd	Klaskanine	smolt	04/06/88	··	5.5	36,548	NFk Klaskanine River	··
1987	Big Crd	Klaskanine	smolt	04/05/88	··	5.5	30,079	SFk Klaskanine River	··
1988	Big Crd	Big Creek	smolt	04/14/89	··	4.9	19,913	Big Creek	··
1988	Big Crd	Big Creek	smolt	04/14/89	··	5.0	21,155	Big Creek	··
1988	Big Crd	Big Creek	smolt	04/14/89	··	5.2	10,208	Big Creek	··
1988	Big Crd	Big Creek	smolt	04/14/89	··	5.2	10,010	Clatskanie River	··
1988	Big Crd	Gnat Creek	smolt	04/10/89	··	5.3	30,052	Gnat Creek	··
1988	Big Crd	Gnat Creek	smolt	04110189	··	5.3	13,326	Lewis and Clark River	··
1988	Big Crd	Gnat Creek	smolt	04/11/89	··	5.6	13,325	Lewis and Clark River	··
1988	Big Crd	Gnat Creek	smolt	04/10/89	04111189	5.7	13,332	Lewis and Clark River	··
1988	Big Crd	Klaskanine	smolt	04/07/89	··	5.2	31,190	NFk Klaskanine River	··
1988	Big Crd	Klaskanine	smolt	04/07/89	··	5.2	29,266	SFk Klaskanine River	··
1988	Big Crd	Trojan Pond	smolt	04/17/89	··	4.2	7,739	Clatskanie River	··
1989	Big Crd	Gnat Creek	fing.	12/19/89	··	41.0	10,245	Blue Lake	··
1989	Big Crd	Gnat Creek	fing.	12/19/89	··	41.0	410	Haldeman Pond	··
1989	Big Crd	Big Creek	smolt	04/16/90	··	4.7	31,880	Big Creek	AD
1989	Big Crd	Big Creek	smolt	04/16/90	··	4.9	20,937	Big Creek	AD
1989	Big Crd	Big Creek	smolt	04/13/90	··	5.2	5,356	Clatskanie River	AD
1989	Big Crd	Big Creek	smolt	04/13/90	··	5.3	4,638	Clatskanie River	AD
1989	Big Crd	Gnat Creek	smolt	05/09/90	··	5.4	1,782	Gnat Creek	AD
1989	Big Crd	Gnat Creek	smolt	04/17/90	··	5.8	30,096	Gnat Creek	AD
1989	Big Crd	Gnat Creek	smolt	04/25/90	··	5.5	8,583	Leuis and Clark River	AD
1989	Big Crd	Gnat Creek	smolt	04/26/90	··	5.6	6,549	Lewis and Clark River	AD
1989	Big Crd	Gnat Creek	smolt	04/25/90	04/26/90	5.7	10,693	Lewis and Clark River	AD
1989	Big Crd	Gnat Creek	smolt	04/23/90	04/25/90	5.8	14,127	Lewis and Clark River	AD
1989	Big Crd	Klaskanine	smolt	04/16/90	··	4.7	17,082	NFk Klaskanine River	AD
1989	Big Crd	Klaskanine	smolt	04/16/90	··	4.9	15,508	NFk Klaskanine River	AD
1989	Big Crd	Klaskanine	smolt	04116190	··	4.7	14,000	SFk Klaskanine River	AD

Table 1 (TR). (cont.) Hatchery releases of uinter steelhead into the lower Columbia River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[b]
1989	Big Cr[d]	Klaskanine	smolt	04/16/90	--	4.7	13,296	SFk Klaskanine River	AD
1989	Big Cr[d]	Trojan Pond	smolt	04/12/90	--	31.8	18,313	Clatskanie River	AD
1990	Big Cr[d]	Gnat Creek	fing.	01/08/91	--	[illegible]	22,896	Gnat creek	..
1990		Clackamas	fing.	10/17/90	--	15.6	6,911	Blue Lake	..
1990	Unknown Big Cr[d]	Big Creek	smolt	04115191	--	5.0	40,886	Big Creek	AD
1990	Big Cr[d]	Big Creek	smolt	04/15/91	--	5.1	20,890	Big Creek	AD
1990	Big Cr[d]	Gnat Creek	smolt	04/22/91	04/23/91	5.5	13,757	Clatskanie River	AD
1990	Big Cr[d]	Gnat Creek	smolt	04/22/91	--	5.4	6,844	Clatskanie River	AD
1990	Big Cr[d]	Gnat Creek	smolt	04/23/91	--	...	1,404	Gnat Creek	AD
1990	Big Cr[d]	Gnat Creek	smolt	04/15/91	--	5.7	30,005	Gnat Creek	AD
1990	Big Cr[d]	Gnat Creek	smolt	04/22/91	--	5.4	29,967	Lewis and Clark River	AD
1990	Big Cr[d]	Klaskenine	smolt	04/02/91	--	5.5	42,103	NFk Klaskanine River	AD
1990	Big Cr[d]	Klaskanine	smolt	04/02/91	--	5.5	13,995	SFk Klaskanine River	AD

[a] Estimates are from Oregon Department of Fish and Wildlife (unpublished data). Records prior to the 1982 brood release may be incomplete.

[b] D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip: LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary clip; RM = right maxillary clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded uire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the mark, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand uas applied at the right posterior position, and the actual mark uas "U4". The "AU" code has not been identified.

[c] Day(s) of release unknown; standardized to the 15th of the month.

[d] Big Creek Hatchery stock.

Table 2 (AC). Age composition (freshwater.ocean) by brood year for Big Creek stock hatchery winter steelhead returning to Big Creek Hatchery[a,b].

Brood Year	N	Age composition (%)								
		1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2
1985	511	--	82	18	0	--	--	--	--	--
1986	434	--	71	29	0	--	--	--	--	--

[a] Estimates are from Oregon Department of Fish and Wildlife (unpublished data).
[b] Data available by total age only; juveniles were assumed to migrate as age 1+ smolts (see ADULT LIFE HISTORY, Aae Structure).

Table 3 (TD). Parasites and diseases of winter steelhead at hatchery facilities located in the lower Columbia River subbasin (mouth to Bonneville Dam)[a].

Disease type	Hatchery	specific Pathogen
Parasite	Big Creek	Costia *(Ichthyobodo sp.)*
Parasite	Big Creek	*Myxobolus sp.*
Parasite	Big Creek	*Henneguya*
Parasite	Big Creek	*Gyrodactylus*
Parasite	Big Creek	*Epistylis sp.*
Parasite	Big Creek	*Trichodina spp.*
Parasite	Big Creek	*Scyphidia*
Parasite	Gnat Creek	Costia *(Ichthyobodo sp.)*
Parasite	Gnat Creek	*Gyrodactylus*
Parasite	Gnat Creek	*Trichodina spp.*
Parasite	Trojan pond	*Myxobolus sp.*
Parasite	Trojan pond	*Trichodina spp.*
Parasite	Trojan pond	*Gyrodactylus*
Parasite	Trojan pond	*Scyphidia*
Parasite	Klaskanine	*Epistyfis sp.*
Parasite	Klaskanine	*Scyphidia*
Parasite	Klaskanine	*Gyrodactylus*
Parasite	Klaskanine	*Trichodina spp.*
Parasite	Klaskanine	Costia *(Ichthyobodo sp.)*
Bacteria	Big Creek	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Big Creek	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	Big Creek[b]	*Pseudomonas spp.*
Bacteria	Gnat Creek	Bacterial gill disease
Bacteria	Gnat Creek	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Gnat Creek	*Ichthyophthirius sp.* (ICH)
Bacteria	Gnat Creek	*Aeromonas spp.*
Bacteria	Gnat Creek	*Pseudomonas spp.*

Table 3 (TD). (cont.) Parasites and diseases of winter steelhead at hatchery facilities located in the lower Columbia *River* subbasin (mouth to Bonneville Dam)[a].

Disease type	Hatchery	specific Pathogen
Bacteria	Trojan pond	*Ichthyophthirius sp.* (ICH)
Bacteria	Klaskanine[b]	*Pseudomonas spp.*
Bacteria	Klaskanine	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Klaskanine	coldwater disease *(Cytophaga psychrophila)*
Bacteria	Klaskanine	*Aeromonas spp.*
Virus	Trojan pond	Infectious Hematopoietic Necrosis (IHN)
Fungi	Gnat Creek	External fungi

[a] Data are from Oregon Department of Fish and Wildlife (unpublished data).
[b] Personal communication on 4/8/92 with T. Kreps, Oregon Department of Fish and Wildlife, Fish Pathology, Clackamae, Oregon.

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MAINSTEM WILLAMETTE RIVER SUBBASIN

Naturally Produced Spring Chinook Salmon

GEOGRAPHIC LOCATION

The mainstem Willamette River forms at the junction of the Coast Fork and Middle Fork rivers, and flows 187 miles to enter the Columbia River at River Mile (RM) 101.5 (Oregon Department of Fish and Wildlife 1990; Figure 1). The mainstem Willamette River subbasin, for purposes of subbasin planning, includes the mainstem Willamette River and its tributaries, excluding the Clackamas River, the Tualatin River, the Coast Range rivers, the Molalla and Pudding rivers, the Santiam and Calapooia rivers, the McKenzie River, the Coast Fork and Long Tom rivers, and the Middle Fork River subbasins.

ORIGIN

Spring chinook are native to the Willamette River subbasin, although natural production of native Willamette spring chinook has not been documented in the mainstem Willamette River subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Spring chinook primarily utilize the mainstem as a migration corridor and for juvenile rearing (Oregon Department of Fish and Wildlife 1990). Some natural production may occur above the mouth of the McKenzie River (Oregon Department of Fish and Wildlife 1990). Habitat in the mainstem Willamette River subbasin considered suitable for spawning and rearing is rated as "fair" quality (Tables '1 and 2).

Approximations of the temporal distribution of adult immigration, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 2. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: No brood year specific estimates of sport harvest are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Brood year specific estimates for the combined sport harvest of naturally and hatchery produced fish, caught in the mainstem Willamette River below Willamette Falls, are available in Bennett (1991). Run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data).

ADULT LIFE HISTORY

Escapement

Columbia River

Timing: Spring chinook bound for the Willamette River begin entering the Columbia River about the first of January with peak numbers entering in late March and the run tapering off by mid-May (Bennett 1991).

Numbers: No brood year specific estimates of escapement are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Brood year specific estimates of escapement for the combined run of naturally and hatchery produced fish that originated in the Willamette River drainage are available in Bennett (1991).

Subbasin

Timing: Spring chinook primarily migrate past Willamette Falls from mid-April through mid-June (Foster 1991).

Numbers: No brood year specific estimates of escapement are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Brood year specific estimates of escapement for the combined run of naturally and hatchery produced fish to the Willamette River are available in Foster (1991).

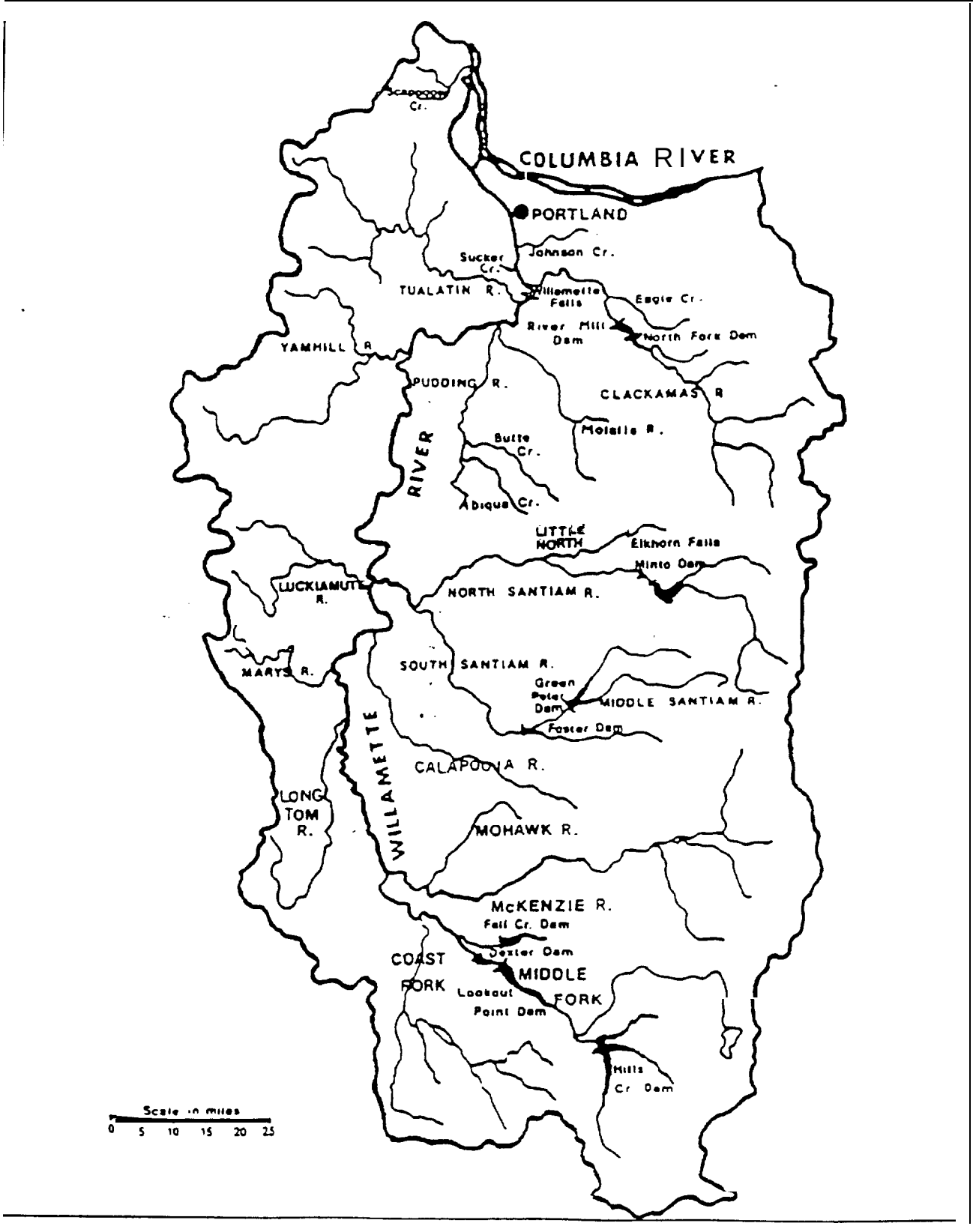
Strays

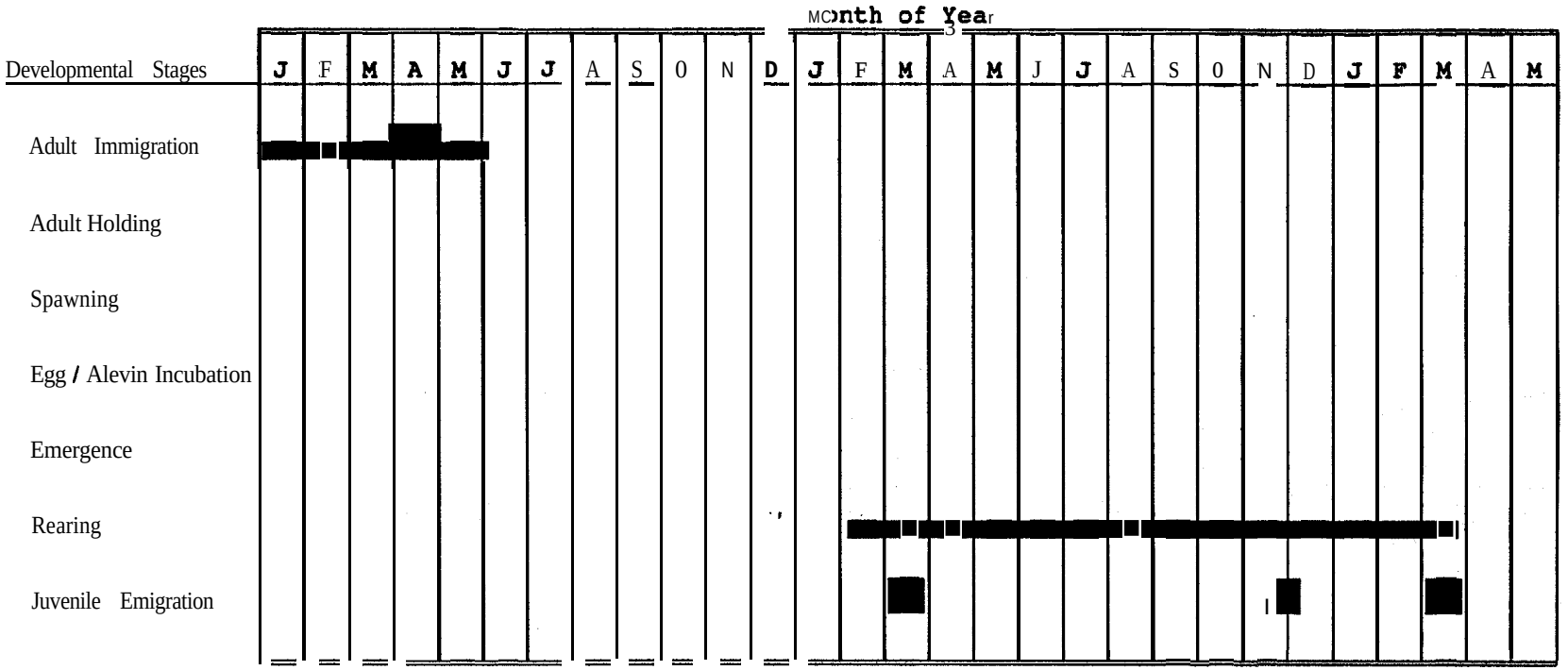
Coded wire tagged hatchery spring chinook, released as juveniles in the Clackamas, Santiam and Calapooia, McKenzie, and Middle Fork subbasins, were recovered in the mainstem Willamette River subbasin (Table 3). The mainstem Willamette is a necessary migration corridor to all of these subbasins.

Age Structure

No brood year specific estimates of age structure are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Brood year specific estimates of age structure for the combined harvest of naturally and hatchery produced fish in the lower Willamette River recreational fishery are available in Bennett (1991).

Figure 1. **The** Willamette **River** **subbasin,** based **on** Howell et al. 1985.





Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.
3. Lack of bars for a developmental stage indicates that the stage does not typically occur in the mainstem Willamette River.

Figure 2 (TT). Freshwater life history of wild Willamette spring chinook in the mainstem Willamette River (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Willamette River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi- dence
Mile5 (%)	0.0	0.0	100.0	0.0	--	15.2	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Willamette River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[a]	Poor[a]	Unknown	Total	Confi- dence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical feature5 such as waterfall barriers, as well as degradation caused by humans.

Table 3 (AI). Non-harvest recoveries of coded wire tagged hatchery spring chinook salmon in the mainstem Willamette River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Clackamas River	Willamette River	Trap Returns		
	1985	--	l	1
	1986	--	--	--
	1987	- -	6	9
	1988	- -	1	2
Santiam,Calapooia	Willamette River	Trap Returns		
	1988	--	2	4'
McKenzie River	Willamette River	Trap Returns		
	1982	--	1	1
	1983	a-	3	3
	1984	--	1	1
	1985	--	1	1
Middle Fork River	Willamette River	Trap Returns		
	1984	--	1	1
	1985	--	1	1
	1986	--	--	--
	1987	a-	1	2

a Based on the following tag codes from hatchery reared fish: 07-20-54, 07-22-37, 07-24-20, 07-25-21, 07-25-22, 07-27-24, 07-34-31, 07-36-57, 07-36-61. Based on the following tag codes from fish of unknown rearing type (assumed to be hatchery): 10-25-25, 10-25-26.

b Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

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MAINSTEM WILLAMETTE RIVER SUBBASIN

Hatchery Produced Spring Chinook Salmon

ORIGIN

The mainstem Willamette River has been supplemented with Willamette stock hatchery spring chinook since 1977 (Table 1). The subbasin is supplemented with hatchery smolts to increase recreational harvest opportunities below Willamette Falls (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery fish are primarily released below Willamette Falls as smolts (Table 1). Smolts are released in the fall and in the spring (Oregon Department of Fish and Wildlife 1990).

Approximations of the temporal distribution of adult immigration, adult holding, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. Estimates are for Hatchery Willamette stock spring chinook that spawn and rear in the wild. The methodology used to generate these approximations is unknown.

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

The only hatchery facility in which fry were reared or acclimated prior to release in the subbasin was Willamette Hatchery (Table 1). Annual numbers released ranged from 369,900 to 501,146 fish (Table 1). Size at release ranged from 711.0 to 201.0 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Marion Forks and Willamette hatcheries (Table 1). Annual numbers released ranged from 172,739 to 434,894 fish (Table 1). Size at release ranged from 114.3 to 18.2 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include McKenzie, Oak Ridge, South Santiam, Sandy, and Willamette hatcheries and Stayton Pond (Table 1). Annual numbers released ranged from 60,658 to 2,899,197 fish (Table 1). Size at release ranged from 14.5 to 4.2 fish per pound (Table 1).

Jack and Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: No brood year specific estimates of sport harvest are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasin. Brood year specific estimates for the combined sport harvest of naturally and hatchery produced fish, caught in the mainstem Willamette River below Willamette Falls, are available in Bennett (1991). Run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data).

ADULT LIFE HISTORY

Escapement

Columbia River

Timing: Spring chinook bound for the Willamette River begin entering the Columbia River about the first of January with peak numbers entering in late March and the run tapering off by mid-May (Bennett 1991).

Numbers: "No brood year specific estimates of escapement are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasin. Brood year specific estimates of escapement for the combined run of naturally and hatchery produced fish that originated in the Willamette River drainage are available in Bennett (1991).

Subbasin

Timing: Spring chinook primarily migrate past Willamette Falls from mid-April through mrd-June (Foster 1991).

Numbers: No brood year specific estimates of escapement are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasm. Brood year specific estimates of escapement for the combined run of naturally and hatchery produced fish to the Willamette River are available in Foster (1991).

Aee Structure

No brood year specific estimates of age structure are available for hatchery produced fish that originated in the mainstem Willamette River subbasin. Brood year specific estimates of age structure for the combined sport harvest of naturally and hatchery produced fish in the lower Willamette River recreational fishery are available in Bennett (1991).

Straying Rate

Results from 1975-78 experimental releases indicate that the straying rate of hatchery Willamette spring chinook released as smolts into the lower mainstem was 52.1% and

87.1% for fall and spring releases, respectively (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Mark Recoveries

Coded wire tagged hatchery spring chinook,. released as juveniles into the mainstem Willamette River subbasin, were recovered in various tributaries; including the McKenzie and Middle Fork river subbasins, the Santiam and Calapooia rivers subbasm, and in the Elk River on the southern Oregon coast (Table 2).

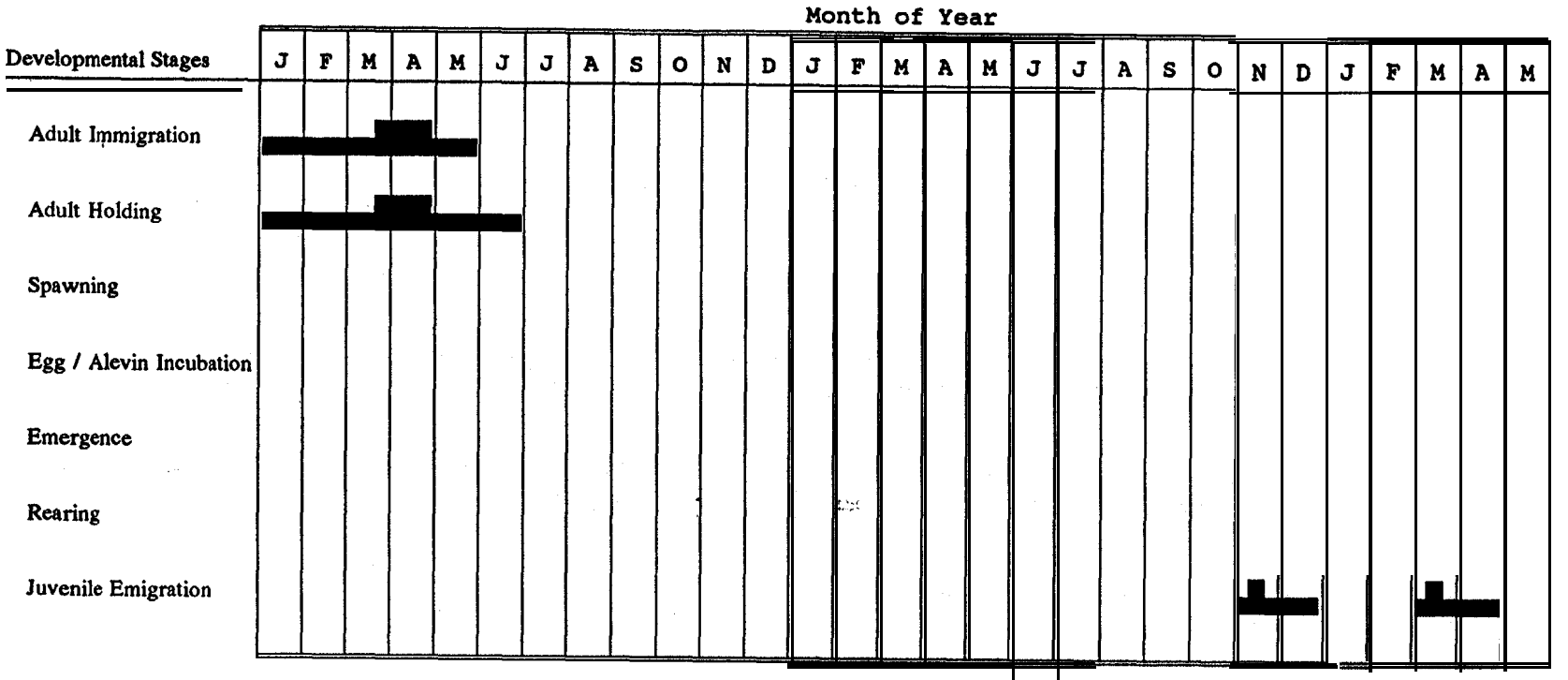
JUVENILE LIFE HISTORY

Survival Rate

Results from 1975-78 experimental releases indicate that the survival rate of Willamette hatchery spring chinook released as smolts into the lower mainstem was 0.71% and 1.19% for fall and spring releases, respectively (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see SANTIAM RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES; see MIDDLE FORK RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES; see MCKENZIE RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES; and see CLACKAMAS RIVER'SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.
3. Lack of bars for a developmental stage indicates that the stage does not typically occur in the mainstem Willamette River.

Figure 1 (TT). Freshwater life history of hatchery Willamette spring chinook in the mainstem Willamette River (Howell et al. 1985 cited by Oregon Department of Fish and Wildlife 1990).

fable 1 (TR). Hatchery spring chinook releases into the Uillamette River subbasin by broodyear and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1975	Uillamette	McKenzie	smolt	03/15/77[d]	--	..	411,953	Below Uillamette Falls	..
1975	Uillamatte	Sandy	smolt	03/15/77[d]	--	..	15,740	Above Willamette Falls	..
1975	Uillamette	South Santiam	smolt	03/15/77[d]	--	..	95,255	Below Uillamette Falls	..
1976	Willamette	South Santiam	smolt	03/15/77[d]	--	..	92,255	Below Willamette Falls	..
1976	Willamette	South Santiam	smolt	11/15/77[d]	--	--	93,867	Below Uillamette Falls	..
1978	N. Santiam R.	Marion Forks	fing.	03/11/80	--	18.2	24,843	Uillamette River	..
1978	N. Santiam R.	Marion Forks	fing.	03/12/80	--	18.4	22,077	Uillamette River	..
1978	N. Santiam R.	Marion Forks	fing.	03/12/80	--	18.5	23,680	Uillamette River	..
1978	N. Santiam R.	Marion Forks	fing.	03/12/80	--	18.8	24,816	Willamette River	..
1978	N. Santiam R.	Marion Forks	fins.	03/11/80	--	18.9	24,381	Willamette River	..
1978	N. Santiam R.	Marion Forks	fing.	03/11/80	--	19.1	24,639	Uillamette River	..
1978	N. Santiam R.	Marion Forks	fing.	03/11/80	--	19.2	23,424	Willamette River	..
1978	N. Santiam R.	Marion Forks	fing.	03/10/80	03/12/80	19.3	67,368	Uillamette River	..
1978	N. Santiam R.	Marion Forks	fing.	03/12/80	--	19.4	75,073	Willamette River	..
1978	N. Santiam R.	Marion Forks	fing.	03/10/80	--	19.8	72,958	Willamette River	..
1978	N. Santiam R.	Marion Forks	fing.	03/11/80	--	20.5	25,513	Uillamette River	..
1978	N. Santiam R.	Marion Forks	fing.	03/12/80	--	21.5	26,122	Willamette River	..
1978	S. Santiam R.	South Santiam	smolt	03/14/80	--	5.6	31,920	Willamette River	AD-CUT
1978	S. Santiam R.	South Santiam	smolt	03/14/80	--	5.6	7,275	Willamette River	CUT
1978	S. Santiam R.	South Santiam	smolt	03/14/80	--	6.0	15,180	Uillamette River	AD-CUT
1978	S. Santiam R.	South Santiam	smolt	03/14/80	--	6.0	8,337	Uillamette River	CUT
1978	Willamette	Oakridge	smolt	11/15/79[c]	--	..	34,560	Below Willamette Falls	..
1978	Willamette	South Santiam	smolt	11/15/79[c]	--	--	87,915	Below Uillamatte Falls	..
1978	Willamette[e]	McKenzie	smolt	03/11/80	--	11.0	26,613	Uillamette River	..
1978	Willamette[e]	McKenzie	smolt	03/10/80	--	11.2	26,867	Uillamette River	..
1978	Willamette[e]	McKenzie	smolt	03/12/80	03/13/80	11.4	52,183	Uillamette River	..
1978	Hfk Will [f]	Oakridge	smolt	03/10/80	--	7.6	590,232	Uillamette River	..
1978	Mfk Will:'	Oakridge	snlolt	03/10/80	--	7.6	65,581	Uillamette River	AD-CUT
1979	Willamette[e]	McKenzie	smolt	11/17/80	11/18/80	5.0	82,669	Uillamette River	..
1979	Willamette[e]	McKenzie	smolt	11/14/80	11/17/80	5.3	24.846	Uillamette River	..
1979	Willamette[e]	McKenzie	smolt	11/12/80	11/14/80	5.5	34,594	Uillamette River	..
1979	Willamette[e]	Clackamas	smolt	03/03/81	03/12/81	13.8	7,267	Willamette River	..
1979	Willamette[e]	McKenzie	smolt	02/25/81	--	5.9	16,782	Uillamette River	..
1979	Willamette[e]	McKenzie	smolt	02/25/81	--	6.6	7,653	Uillamette River	..
1979	Willamette[e]	McKenzie	smolt	02/25/81	--	7.0	17,848	Willamette River	..
1979	Willamette[e]	McKenzie	smolt	02/24/81	--	7.1	47,863	Uillamette River	--
1979	Willamette[e]	McKenzie	slnolt	02/25/81	--	7.3	32,685	Willamette River	--
1979	Willamette[e]	McKenzie	smolt	02/25/81	--	7.8	17,214	Uillamette River	..
1979	Willamette[e]	McKenzie	smolt	02/26/81	03/03/81	8.0	69,121	Uillamette River	..
1979	Willamette[e]	McKenzie	smolt	02/26/81	--	8.7	10,541	Uillamatte River	..
1979	Willamette[e]	McKenzie	smolt	02/26/81	--	9.2	24,486	Uillamette River	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Uillamatte River subbasin by broodyear and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1979	Willamette[e]	McKenzie	slnolt	02/26/81	..	9.7	12,268	Uillamette River	..
1979	Willamette[e]	McKenzie	smolt	02/27/81	--	9.8	29,887	Uillamette River	..
1979	Willamette[e]	McKenzie	smolt	02/26/81	..	10.3	27,674	Wi lamette River	..
1979	Clackamas R.	Oakridge	smolt	03/05/81	03/10/81	IQ.5	79,501	Ui lamette River	..
1979	Clackamas R.	Oakridge	smolt	03/05/81	..	10.9	27,686	Ui lamette River	
1979	Clackamas R.	Oakridge	smolt	03/04/81	03/09/81	11.0	207,235	Wi lamette River	..
1979	Willamette[e]	Oakridge	smolt	11/12/80	11/13/80	7.0	42,945	Wi lamatte River	
1979	Willamette[e]	Oakridge	smolt	03/12/81	..	12.2	65,269	Wi lamette River	
1979	Willamette[e]	Oakridge	smolt	03/10/81	03/11/81	12.5	66,186	Wi lamatte River	..
1979	Willamette[e]	Oakridge	smolt	03/10/81	03/11/81	12.6	73,083	Wi lamette River	
1979	Mfk Will.[f]	Oakridge	smolt	03/16/81	..	6.9	742,182	Wi lamatte River	..
1979	MFk Will.[f]	Oakridge	smolt	03/16/81	..	6.9	5,984	Wi lamette River	AD-CUT
1980	S. Santiam R.	McKenzie	smolt	11/02/81	11/03/81	5.6	48,630	Wi lamette River	..
1980	S. Santiam R.	McKenzie	smolt	11/03/81	11/04/81	5.9	28,486	Wi lamette River	
1980	S. Santiam R.	McKenzie	snlolt	02/24/82	02/25/82	9.5	31,583	Wi lamette River	
1980	S. Santiam R.	McKenzie	smolt	02/24/82	..	10.0	4,300	Uillamette River	--
1980	S. Santiam R.	McKenzie	smolt	02/23/82	..	10.1	3,131	Uillamette River	
1980	S. Santiam R.	McKenzie	smolt	02/24/82	..	10.2	14,278	Uillamette River	
1980	S. Santiam R.	McKenzie	smolt	02/23/82	..	11.6	16,351	Uillamette River	--
1980	S. Santiam R.	McKenzie	smolt	02/24/82	..	11.7	11,349	Uillamette River.	..
1980	S. Santiam R.	McKenzie	smolt	02/23/82	..	12.3	13,407	Uillamette River	..
1980	Willamette[e]	McKenzie	smolt	11/04/81	11/06/81	4.7	29,215	Uillamette River	..
1980	Willamette[e]	McKenzie	smolt	02/22/82		12.3	14,760	Uillamette River	..
1980	Willamette[e]	McKenzie	smolt	02/21/82	02/22/82	12.7	30,462	Uillamette River	
198Q	MFk Will.[f]	Oakridge	smolt	11/05/81	..	4.2	312,444	Uillamatte River	..
1980	MFk Will.[f]	Oakridge	smolt	11/05/81		4.2	3,155	Uillamette River	AD-CUT
1980	MFk Will.[f]	Oakridge	smolt	11/02/81	..	5.4	485,163	Uillamatte River	..
1980	MFk Will.[f]	Oakridne	smolt	11/16/81	11/17/81	5.6	23,376	Willamette River	
1980	MFk Will.[f]	Oakridge	smolt	11/03/81	..	5.8	29,926	Uillamatte River	..
1980	MFk Will.[f]	Oakridge	smolt	11/13/81	11/17/81	5.9	66,520	Uillamette River	..
1980	MFk Uill.[f]	Oakridge	smolt	11/17/81		6.0	8,400	Uillamette River	
1980	MFk Will.[f]	Oakridge	smolt	11/12/81	..		17,955	Willamette River	
1980	MFk Will.[f]	Oakridge	smolt	11/16/81	..	[illegible]	27,000	Uillamatte River	..
1980	MFk Will.[f]	Oakridge	smolt	11/06/81	11/13/81	6.6	73,788	Uillamatte River	..
1980	MFk Will.[f]	Oakridge	smolt	11/06/81	11/09/81	6.7	26,329	Uillamette River	..
1980	MFk Will.[f]	Oakridge	smolt	11/06/81	11/17/81	6.8	64,852	Uillamatte River	..
1980	MFk Will.[f]	Oakridge	snlolt	11/04/81	11/05/81	6.9	36,222	Uillamette River	
1980	MFk Will.[f]	Oakridge	snlolt	11/13/81	--	7.0	29,321	Uillamette River	..
1980	S Santiam R.	Willsmatte	smolt	03/03/82		14.0	35,350	Uillamette River	..
1980	S Santiam R.	Willamette	smolt	03/03/82		14.3	36,823	Uillamette River	..

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Uillamette River subbasin by broodyear and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1980	S Santiam R.	Uillamette	smolt	03/04/82	··	14.5	27,913	Wil lamette River	--
1981	MFk Will.?	McKenzie	smolt	11/12/82	··	5.7	6,840	Willamette River	--
1981	MFk Will.;	McKenzie	smolt	11/12/82	11/16/82	5.8	85,551	Willamette River	--
1981	MFk Will.;	McKenzie	smolt	11/17/82	11/18/82	5.9	33,786	Willamette River	--
1981	MFk Will.f	McKenzie	smolt	11/12/82	11/15/82	6.0	43,243	Willamette River	--
1981	MFk Will.f	McKenzie	smolt	11/16/82	··	6.1	29,707	Wil lamette River	--
1981	MFk Will.f	McKenzie	smolt	11/15/82	11/16/82	6.2	31,422	Wil lamette River	--
1981	MFk Will.f	McKenzie	smolt	11/12/82	··	6.4	7,933	Willamette River	--
1981	MFk Will.f	McKenzie	smolt	11/16/82	11/17/82	6.5	32,238	Wil lamette River	--
1981	MFk Will.f	McKenzie	smolt	11/12/82	--	7.0	8,394	Willamette River	--
1982	MFk Will.f	Willamette	fry	03/23/83	··	596.0	140,060	Willamette River R-2	--
1982	MFk	Willamette	fry	03/23/83	··	656:Q	110,864	Willamette River R-2	
1982	MFk [illegible]	Willamette	fry	03/23/83	··	711.0	250,222	Willamette River R-2	
1982	MFk Will.f	McKenzie	smolt	03/23/84	··	6.1	9,394	Willamette River	--
1982	MFk Will.f	McKenzie	smolt	03/23/84	··	6.2	8,556	Willamette River	
1982	MFk Will.f	McKenzie	smolt	03/22/84	03/23/84	6.5	18,459	Uillamette River	
1982	MFk Will.f	McKenzie	smolt	03/23/84	--	6.8	8,770	Uillamette River	
1982	MFk Will.f	McKenzie	smolt	03/23/84	03/26/84		32,305	Willamette River	··
1982	MFk Will.f	McKenzie	smolt	03/23/84	··	5::	10,220	Willamette River	··
1982	MFk Will.f	McKenzie	smolt	03/23/84	··	7.4	9,250	Willamette River	
1982	MFk Will.f	McKenzie	smolt	03/22/84	03/26/84	7.6	64,587	Uillamette River	··
1982	MFk Will.f	McKenzie	smolt	03/23/84	··	7.7	9,812	Uillamette River	··
1982	MFk Will.f	McKenzie	smolt	03/26/84	··	8.3	30,929	Willamette River	··
1982	MFk Will.f	McKenzie	snwlt	03/23/84	03/26/84	8.4	16,034	Willamette River	··
1982	MFk Will.f	McKenzie	smolt	03/26/84	··	8.6	42,812	Willamette River	··
1982	MFk Will.f	McKenzie	smolt	03/23/84	··	8.8	11,259	Willamtte River	··
1982	MFk Uill.f	McKenzie	smolt	03/27/84	03/29/84	9.0	41,037	Willamette River	··
1982	MFk Will.f	McKenzie	smolt	03/23/84	··	9.4	11,843	Willamette River	··
1983	MFk Will.f	McKenzie	smolt	11/09/84	··	6.6	37,087	Willamette River	··
1983	MFk Will.f	McKenzie	smolt	11/08/84	··	7.0	26,599	Uillamette River	··
1983	MFk Will.f	McKenzie	smolt	11/08/84	11/09/84	7.2	67,066	Uillamette River	··
1983	MFk Will.f	McKenzie	smolt	11/08/84	11/14/84	7.4	86,223	Uillamette River	··
1983	MFk Will.f	McKenzie	smolt	11/07/84	11/14/84	7.5	99,623	Willamette River	··
1983	MFk Will.f	McKenzie	smolt	11/07/84	··	7.6	31,462	Uillamette River	··
1983	MFk Will.f	McKenzie	smolt	11/06/84	11/08/84	7.8	83,754	Willamette River	··
1983	MFk Will.f	McKenzie	smolt	11/09/84	11/13/84	7.9	75,992	Uillamette River	··
1983	MFk Will.f	McKenzie	smolt	11/05/84	11/06/84	8.1	22,194	Willamette River	··

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Willamette River subbasin by broodyear and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1983	MFk Will.[f]	McKenzie	smolt	11/13/84	..	8.5	25,160	Uillamette River	..
1984	MFk Will.[f]	Uillamette	fing.	07/03/85	..	51.0	91,700	Uillamette River R-2	..
1984	MFk Will.[f]	Willamette	fing.	07/09/85		71.4	81,039	Uillamette River R-2	..
1984	MFk Wftt.[f]	Stayton Pond	smolt	11/19/85	..	6.4	5,996	Uillamette River	..
1984	MFk Will.[f]	Stayton Pond	smolt	11/20/85	..	6.5	8,115	Uillamette River	
1984	MFk Will.[f]	Stayton Pond	smolt	11/20/85		8.8	8,971	Willamette River	..
1984	MFk Will.[f]	Stayton Pond	smolt	11/19/85	..	9.2	10,481	Uillamette River	..
1984	MFk Will.[f]	Stayton Pond	smolt	11/21/85		10.0	8,890	Uillamette River	
1984	MFk Will.[f]	Stayton Pond	smolt	11/19/85	..	IQ.5	3,870	Uillamette River	..
1984	MFk Will.[f]	Stayton Pond	smolt	11/19/85	..	11.3	9,482	Uillamette River	
1984	MFk Will.[f]	Stayton Pond	smolt	11/21/85		14.0	5,596	Willamette River	..
1985	MFk Will.[f]	Willamette	fing.	06/17/86		114.3	426,893	Willamette River R-2	..
1985	MFk Will.[f]	Uillamette	smolt	04/06/87		8.6	9,780	Willamette River R-2	07-34-30
1985	MFk Will.[f]	Willamette	smolt	04/06/87		8.6	9,789	Willamette River R-2	07-34-31
1985	MFk Wftt.[f]	Uillamette	smolt	10/10/86		11.9	15,173	Willamatte River R-2	07-39-04
1985	MFk Will.[f]	Willamette	smolt	10/10/86	..	11.9	15,172	Willamette River R-2	07-39-05
1985	MFk Will.[f]	Willamette	smolt	09/11/86	..	14.1	15,157	Willamette River R-2	07-38-63
1985	MFk Will.[f]	Willamette	smolt	09/11/86	..	14.1	15,156	Willamette River R-2	07-39-01
1986	S Santiam R.	Willamette	fry	06/04/87	..	201.0	89,650	Uillamette River R-2	..
1986	S Santiam R.	Uillamette	fry	06/04/87	..	210.0	280,250	Willamette River R-2	..
1986	S. Santiam R.	South Santiam	smolt	11/17/87		8.0	28,297	Willamette River	--
1986	S. Santiam R.	South Santiam	smolt	11/17/87		8.0	11,392	Willamette River	07-37-07
1986	S. Santiam R.	South Santiam	smolt	11/17/87		8.0	12,336	Willamette River	07-37-08
1986	S. Santiam R.	South Santiam	smolt	11/16/87	..	8.3	18,343	Willamette River	..
1986	S. Santiam R.	South Santiam	smolt	11/16/87	11/17/87	8.4	22,760	Willamette River	..
1986	S. Santiam R.	South Santiam	smolt	11/16/87	..	8.5	26,350	Willamette River	..
1986	S. Santiam R.	South Santiam	smolt	11/16/87	..	8.6	10,362	Willamette River	..
1987	MFk Will.[f]	Dexter Pond	smolt	03/03/89	..	8.5	90,872	Willamette River	..
1987	S. Santiam R.	South Santiam	smolt	11/14/88	..	7.7	27,004	Willamette River	..
1987	S. Santiam R.	South Santiam	smolt	11/17/88	..	7.9	3,315	Willamette River	..
1987	S. Santiam R.	South Santiam	smolt	11/17/88		7.9	24,294	Uillamette River	07-50-42
1987	S. Santiam R.	South Santiam	smolt	11/14/88	..	8.0	30,160	Willamette River	..
1987	S. Santiam R.	South Santiam	smolt	11/14/88	..	8.8	29,148	Willamette River	..
1987	S. Santiam R.	South Santiam	smolt	10/17/88	..	7.9	19	Willamette River R-2	..
1987	S. Santiam R.	South Santiam	smolt	10/27/88	..	8.0	10	Uillamette River R-2	..

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Willamette River subbasin by broodyear and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1988	MFk Will[f]	Willamette	smolt	02/26/90	--	11.9	35,400	Willamette River	--
1988	MFk Will.[f]	Willamette	smolt	02/26/90	--	13.5	43,873	Uillamette River	--
1988	MFk Will.[f]	Willamette	smolt	02/26/90	--	13.6	16,706	Uillamette River	--

a Modified from Oregon Department of Fish and Wildlife (1990); and Oregon Department of Fish and Wildlife's hatchery production database.
b North Santiam, South Santiam, Clackamas, and Middle Fork Uillamette rivers stocks are all considered part of Willamette River stock.
c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded uire tag (tag code unknoun); AD-CUT = adipose fin clip plus coded wire tag (tag code unknoun); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if knoun, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand uas applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.
d Day(s) of release unknoun. Standardized to the 15th of the month.
e Fall Creek Reservoir stock.
f Willamette Fish Hatchery stock.

Table 2 (AE). Emigration of coded wire tagged hatchery spring chinook salmon released as juveniles in the mainstem Willamette River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(S)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Willamette River	McKenzie River	Hatchery Returns		
	1982	--	24	24
	1983	--	2	2
Willamette River	Middle Fork River	Hatchery Returns		
	1982	--	3	3
Willamette River	Santiam,Calapooia	Hatchery Returns		
	1982	--	12	12
	1983	--	1	1
Willamette River	Elk River, OR	Hatchery Returns		
	1988	--	1	1

a Based on the following tag codes: 07-19-22, 07-19-23, 07-19-24, 07-19-29, 07-19-30, 07-19-44, 07-19-47, 07-19-48, 07-20-18, 07-20-19, 07-37-07, 09-05-10.

b Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

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MAINSTEM WILLAMETTE RIVER SUBBASIN

Naturally Produced Fall Chinook Salmon

GEOGRAPHIC LOCATION

The mainstem Willamette River forms at the junction of the Coast Fork and Middle Fork rivers, and flows 187 miles to enter the Columbia River at River Mile (RM) 101.5 (Oregon Department of Fish and Wildlife 1990a; see Naturally Produced Spring Chinook Salmon, Figure 1). The mainstem Willamette River subbasin, for purposes of subbasin planning, includes the mainstem Willamette River and its tributaries, excluding the Clackamas River, the Tualatin River, the Coast Range rivers, the Molalla and Pudding rivers, the Santiam and Calapooia rivers, the McKenzie River, the Coast Fork and Long Tom rivers, and the Middle Fork River subbasins.

ORIGIN

Fall chinook are not native to the Willamette River Basin above Willamette Falls or the mainstem Willamette River subbasin; although they are native to the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990a). Natural production of fall chinook in the mainstem Willamette River occurs primarily as the result of hatchery fish spawning in the wild (Oregon Department of Fish and Wildlife 1990a; see MAINSTEM WILLAME'ITE RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon).

DISTRIBUTION

Subbasin

Hatchery fall chinook were released into the mainstem beginning in 1979 and the distribution of natural production is controlled primarily by the location of release (Oregon Department of Fish and Wildlife 1990a). Fall chinook spawn between RM 50 and RM 187, although the majority of adults occur above RM 132 (Oregon Department of Fish and Wildlife 1990a). Fall chinook that originate in tributaries to the Willamette River subbasin use the mainstem as a migration corridor. Habitat in the mainstem Willamette River subbasin considered suitable for spawning and rearing is rated as primarily of "good" and "fair" quality (Tables 1 and 2).

PRODUCTION

Harvest

Sport

Subbasin: No brood year specific estimates of sport harvest are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: No brood year specific estimates of escapement are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Run year specific estimates of escapement for the combined run of naturally and hatchery produced fish passing Willamette Falls are available in Foster (1991) and in Oregon Department of Fish and Wildlife (1990b).

Spawning Area

Timing: Tule fall chinook primarily spawn from mid-September through early October (Foster 1991).

Numbers: No brood year specific estimates of spawner escapement are available for either naturally or hatchery produced fish that originated in the mainstem Willamette River subbasin. Redds have been observed in the mainstem Willamette River (Oregon Department of Fish and Wildlife 1990a). Additional information (i.e. spawning ground counts in selected areas of the Willamette drainage) is available in Hansen (1977, cited by Oregon Department of Fish and Wildlife 1990a), Hansen (1978, cited by Oregon Department of Fish and Wildlife 1990a), Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990a), Smith et al. (1982, cited by Oregon Department of Fish and Wildlife 1990a), Smith et al. (1983, cited by Oregon Department of Fish and Wildlife 1990a), Smith et al. (1985, cited by Oregon Department of Fish and Wildlife 1990a), and Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990a).

Strays

Coded wire tags were recovered from hatchery fall chinook released as juveniles in the Klamath and Trinity rivers, which are coastal tributaries located on the northern California coast; the Klaskanine, Grays, and Washougal rivers and Big Creek, which are mainstem Columbia River tributaries located below Bonneville Dam; and in Puget Sound in Washington (Table 3). Coded wire tags were also recovered from hatchery fall chinook that were released as juveniles into the Molalla and Pudding rivers subbasin and the Coast Fork and Long Tom rivers subbasin (Table 3). The mainstem Willamette River is a necessary migration corridor to both the Molalla and Pudding rivers subbasin and the Coast Fork and Long Tom rivers subbasin.

Fork Length

No brood year specific estimates of mean fork length are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Brood year specific estimates of mean fork length for the combined run of naturally and hatchery produced fish at Willamette Falls are available in Oregon Department of Fish and Wildlife (1990b).

Age Structure

No brood year specific estimates of age structure are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Brood year specific estimates of age structure for the combined run of naturally and hatchery produced fish at Willamette

Falls are available in Oregon Department of Fish and Wildlife (1990b).

Sex Ratio

Although brood year specific information on the sex ratio of naturally produced fall chinook is not available, run year specific data for combined samples of naturally and hatchery produced fish is available in Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990a).

JUVENILE LIFE HISTORY

Age Structure

Juvenile fall chinook generally emigrate from the Willamette at 5 months of age (i.e. sub-yearlings; Hansen 1978, cited by Oregon Department of Fish and Wildlife 1990a).

Migration Timing

The majority of juvenile fall chinook outmigrate in late April and early May (Hansen 1978, cited by Oregon Department of Fish and Wildlife 1990a).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Willamette River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.6	50.1	37.2	12.1	--	126.2	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Willamette River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (AI). Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the mainstem Willamette River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Willamette River	Willamette River	Trap Returns		
	1984	--	7	7
	1985	--	113	128
	1986	--	67	67
	1987	--	133	206
	1988	--	98	163
Kalamath River	Willamette River	Trap Returns		
	1983	--	1	1
Trinity River	Willamette River	Trap Returns		
	1982	--	1	1
southern OR coast	Willamette River	Trap Returns		
	1985		1	1
Molalla, Pudding	Willamette River	Trap Returns		
	1982	--	4	4
Klaskanine River	Willamette River	Trap Returns		
	1985	--	2	2
	1986	--	--	--
	1987		--	--
	1988	--	2	4
Coast Fork[c]	Willamette River	Trap Returns		
	1982		297	308
	1983		92	93
	1984	--	201	201
	1985	--	142	159
	1986	--	78	78
	1987	--	9	15

Table 3 (AI). (cont.) Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the mainstem Willamette River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Puget Sound	Willamette River	Trap Returns		
	1988	--	1	2
Grays River	Willamette River	Trap Returns		
	1988	--	1	2
Big Creek	Willamette River	Trap Returns		
	1982	--	1	1
	1983	--	2	2
	1984	--	--	--
	1985	--	2	2
	1986	--	1	1
	1987	--	3	6
	1988	--	2	4
Washougal River	Willamette River	Trap Returns		
	1984	--	1	1
	1985	--	--	--
	1986	--	--	--
	1987	--	3	6
	1988	--	1	2

a Based on the following tag codes: 06-59-06, 06-61-09, 07-16-26, 07-18-41, 07-19-18, 07-20-55, 07-21-60, 07-23-28, 07-23-35, 07-24-10, 07-24-13, 07-26-62, 07-28-30, 07-28-31, 07-28-32, 07-28-33, 07-28-34, 07-28-57, 07-31-40, 07-31-44, 07-31-45, 07-31-46, 07-31-47, 07-31-48, 07-32-30, 07-32-31, 07-32-32, 07-32-35, 07-33-45, 07-33-48, 07-33-52, 07-33-53, 07-33-54, 07-33-55, 07-33-56, 07-38-18, 07-38-19, 07-38-20, 07-38-21, 07-38-22, 60-36-56, 63-22-51, 63-31-16, 63-33-26, 63-34-16, 63-34-33, 63-41-14.
b Modified from Pacific States Marine Fisheries Commission's coded wire tag database.
c Coast Fork and Long Tom rivers subbasin.

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MAINSTEM WILLAMETTE RIVER SUBBASIN

Hatchery Produced Fall Chinook Salmon

ORIGIN

Hatchery fall chinook were released into the upper Willamette River subbasin beginning in 1964 (Hansen 1978, cited by Oregon Department of Fish and Wildlife 1990a) and into the mainstem Willamette River beginning in 1979 (Table 1). Originally, hatchery fall chinook were released into the subbasin to establish a naturally producing population above Willamette Falls. Currently, fall chinook are released to increase harvest opportunities in ocean and Columbia River fisheries (Oregon Department of Fish and Wildlife 1990a).

Hatchery fall chinook released in the mainstem Willamette River subbasin are progeny of hatchery broodstock collected from the Lower Columbia River Hatchery (LRH) stock of fall chinook (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, ORIGIN; Table 1). The LRH stock is one of four major fall chinook stocks found in the Columbia River Basin. LRH stock fall chinook, along with the Bonneville Pool Hatchery stock, are informally called "tules" (Howell et al. 1985).

DISTRIBUTION

Subbasin

Smolts are released from late April through early May (Oregon Department of Fish and Wildlife 1990a).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

The only hatchery facility in which fry were reared or acclimated prior to release in the subbasin was Stayton Pond (Table 1). In 1989, 4,002 fry were released at a size of 276.0 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Stayton and Aumsville ponds, and Clackamas Hatchery (Table 1). Annual numbers released ranged from 827,923 to 1,811,183 fish (Table 1). Size at release ranged from 106.8 to 45.0 fish per pound (Table 1).

Smolt

The only hatchery facility in which smolts were reared or acclimated prior to release in the subbasin was Stayton Pond (Table 1). In 1979, 1,017,558 smolts were released.

Jack and Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: No brood year specific estimates of sport harvest are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasin. Run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: "Tule fall chinook pass Willamette Falls from mid-August through late September with peak passage from early to mid-September" (Foster 1991).

Numbers: No brood year specific estimates of escapement are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasin. Run year specific estimates of escapement for the combined run of naturally and hatchery produced fish passing Willamette Falls are available in Foster (1991) and in Oregon Department of Fish and Wildlife (1990b).

Fork Length

No brood year specific estimates of mean fork length are available for hatchery produced fish released as juveniles in the mainstem Willamette River subbasin. Brood year specific estimates of mean fork length for the combined run of naturally and hatchery produced fish at Willamette Falls are available in Oregon Department of Fish and Wildlife (1990b).

Age Structure

Age structure was estimated at Willamette Falls for LRH stock fall chinook (Tables 2 and 3). Age was determined based on a combination of coded wire tag data and an analysis of scales. To distinguish between spring and fall races of chinook salmon, all returning fish that migrated as sub-yearling smolts were classified as fall chinook and those that had migrated as age 1+ smolts were classified as spring chinook (personal communication on 9/3/92 with Bill Day, Oregon Department of Fish and Wildlife, Clackamas, Oregon). Freshwater age was designated as 1 year for juveniles migrating as sub-yearling smolts.

Stock of origin was determined based on coded wire tag return data. Estimates of age structure for the LRH stock at Willamette Falls were derived from samples which include both naturally and hatchery produced fish. Age structure was assumed to be representative of LRH stock fish passing Willamette Falls based on the assumptions that 1) most fish passing Willamette Falls (i.e. approximately 72%; Foster 1991) are hatchery fish, 2) naturally produced fish passing Willamette Falls are primarily derived from LRH stock hatchery fish that spawned above the falls (see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Fall Chinook, ORIGIN), and 3) natural production above

Willamette Falls is, to a great extent, the result of LRH stock hatchery fish that spawn above the falls.

Annual estimates of age structure, by brood year, for LRH stock fall chinook ranged from 3% to 17% age 2 fish, 43% to 71% age 3 fish, 11% to 53% age 4 fish, and < 1% to 2% age 5 fish (Table 2).

Annual estimates of age structure, by run year, for LRH stock fall chinook ranged from 2% to 53% age 2 fish, 36% to 75% age 3 fish, 10% to 56% age 4 fish, and < 1% to 4% age 5 fish (Table 3).

Sex Ratio

Although brood year specific information on sex ratio (percent females) of hatchery fall chinook is not available, run year specific data for hatchery and naturally produced fish combined are available in Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990a).

Mark Recoveries

Coded wire tagged hatchery fall chinook, released as juveniles in the mainstem Willamette River, were recovered in the Elokomin, Kalama, Washougal, and Sandy rivers and in the mainstem Columbia River from the mouth to McNary Dam (Table 4).

DISEASES

In general, Aumsville and Stayton Ponds have not had major disease problems (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990b), although various parasites and infectious disease agents have been identified (Table 5).

Table 1 (TR). Hatchery fall chinook releases into the Willamette River subbasin by brood/ear and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1978	LRH	Stayton Pond	smolt	01/01/79	12/31/79[d]	--	190,665	River Mile 161	--
1978	LRH	Stayton Pond	smolt	01/01/79	12/31/79[d]		826,893	River Mile 168	
1979	Tanner Creek	Stayton Pond	fing.	04/30/80	--	79.5	78,610	Uillamette River R-2	
1979	Tanner Creek	Stayton Pond	fing.	04/30/80	--	79.5	3,275	Willamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	79.9	94,554	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	79.9	2,924	Uillamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	04/29/80	--	82.5	94,819	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	04/29/80	--	82.5	4,990	Uillamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	04/26/80	--	84.3	86,745	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	02/29/80	--	85.6	92,658	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	02/29/80	--	85.6	4,876	Uillamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	04/29/80	--	85.7	79,787	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	04/29/80	--	85.7	4,199	Uillamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	05/02/80	--	85.9	99,772	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	05/02/80	--	85.9	4,157	Uillamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	04/28/80	--	86.2	99,897	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	04/28/80	--	86.2	5,257	Uillamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	86.6	101,944	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	86.6	5,365	Uillamette River R-2	CUT
1979	Tanner Creek	Stayton Pond	fing.	05/02/80	--	86.9	171,000	Willamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	05/02/80	--	86.9	7,125	Uillamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	87.8	85,069	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	87.8	4,477	Uillamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	05/02/80	--	88.2	90,586	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	05/02/80	--	88.2	3,774	Uillamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	04/28/80	--	89.2	105,069	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	04/28/80	--	89.2	5,529	Uillamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	05/02/80	--	89.5	114,451	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	05/02/80	--	89.5	3,539	Uillamette River R-2	CUT
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	96.3	194,084	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	96.3	8,086	Uillamette River R-2	CUT
1979	Tanner Creek	Steyton Pond	fing.	05/05/80	--	96.9	73,025	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	05/05/80	--	96.9	3,042	Willamette River R-2	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	05/06/80	--	106.8	77,714	Uillamette River R-2	--
1979	Tanner Creek	Stayton Pond	fing.	05/06/80	--	106.8	784	Uillamette River R-2	AD-CUT
1980	Tanner Creek	Aunsville Ponds	fing.	04/29/81	--	73.2	75,201	Uillamette River R-2	--
1980	Tanner Creek	Aumsville Ponds	fing.	04/29/81	--	73.2	226	Willamette River R-2	AD-CUT
1980	Tanner Creek	Clackamas	fing.	05/26/81	--	81 .0	1,296	Uillamette River R-2	--
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	69.7	66,645	Uillamette River R-2	--

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Uillamette River subbssin by broodyear and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	69.7	267	Willamette River R-2	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	73.3	187,995	Uillamette River R-2	--
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	73.3	754	UilLamette River R-2	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/30/81	--	75.2	188,616	Willamette River R-2	--
1980	Tanner Creek	Stayton Pond	fing.	04/30/81	--	75.2	1,138	Willamette River R-2	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/29/81		75.9	177.500	Uillamette River R-2	--
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	75.9	'712	UilLamette River R-2	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/30/81	--	77.1	107.592	UiLlamette River R-2	
1980	Tanner Creek	Stayton Pond	fing.	04/30/81	--	77.1	'432	UilLamette River R-2	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	78.4	60,443	Willamette River R-2	--
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	78.4	364	Uillamette River R-2	AD-CUT
1980	Tamer Creek	Stayton Pond	fing.	04/30/81	--	79.9	114,395	Uillamette River R-2	--
1980	Tanner Creek	Stayton Pond	fing.	04/30/81	--	79.9	690	Willamette River R-2	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/30/81	—	82.0	84,854	Uillamette River R-2	--
1980	Tanner Creek	Stayton Pond	fing.	04/30/81	--	82.0	426	Willamette River R-2	CUT
1981	Tanner Creek	Stayton Pond	fing.	05/04/82	05/11/82	88.6	956,681	Uillamette River R-2	
1981	Tanner Creek	Stayton Pond	fing.	05/04/82	05/11/82	88.6	38.824	Willamette River R-2	07-26-62[e]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	79.8	1,406,817	Willamette River R-2	--
1982	Tanner Creek	Stayton Pond	f ing.	04/26/83	04/28/83	79.8	3,088	Uillamette River R-2	07-23-28[f]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	79.8			
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	79.8	3,088	Uillamette Willamette River River R-2 R-2	07-28-30[g] 07-28-31[g]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	79.8	3,088	Uillamette River R-2	07-28-32[g]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	79.8	3,088	Willamette River R-2	07-28-33[g]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	79.8	3.088	Willamette River R-2	07-28-34[g]
1983	Tamer Creek	Stayton Pond	fing.	05/08/84	05/14/84	57.2	1,226,456	Willamette River R-2	--
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/14/84	57.2	7,847	Willamette River R-2	07-31-44[g]
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/14/84	57.2	7,847	Willamette River R-2	07-31-45[g]
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/14/84				07-31-46[g]
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/14/84	57.2	7,847	Willamette River R-2	07-31-47[g]
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/14/84	57.2	7,847	Willamette River R-2	07-31-48[g]
1984	Tanner Creek	Stayton Pond	fing.	05/16/85	05/31/85	57.3	788,183	Willamette River R-2	--
1984	Tanner Creek	Stayton Pond	fing.	05/16/85	05/31/85	57.3	7,948	Willamette River R-2	07-33-52[h]
1984	Tanner Creek	Stayton Pond	fing.	05/16/85	05/31/85	57.3	7,948	Uillamette River R-2	07-33-53[h]
1984	Tanner Creek	Stayton Pond	fing.	05/16/85	05/31/85	57.3	7,948	Willamette River R-2	07-33-54[h]
1984	Tanner Creek	Stayton Pond	fing.	05/16/85	05/31/85	57.3	7,948	Willamette River R-2	07-33-55[h]
1984	Tanner Creek	Stayton Pond	fing.	05/16/85	05/31/85	57.3	7,948	Willamette River R-2	07-33-56[h]

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Willamette River subbssin by broodyear and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/09/86	68.4	959,670	Ui lemette River R-2	--
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/09/86	68.4	8,623	Wi lamette River R-2	07-38-18[g]
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/09/86	68.4	8,623	Wi lamette River R-2	07-38-19[g]
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/09/86	68.4	8,623	Wi lamette River R-2	07-38-20[g]
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/09/86	68.4	8,623	Ui lamette River R-2	07-38-21[g]
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/09/86	68.4	8,623	Wi lamette River R-2	07-38-22[g]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.3	1,298,169	Wi lamette River R-2	--
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.3	9,695	Wi lamette River R-2	07-40-50[g]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.3	9,695	Wi lemette River R-2	07-40-519
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.3	9,695	Wi lamette River R-2	07-40-52[g]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.3	9,695	Ui lamette River R-2	07-40-539
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.3	9,695	Wi lamette River R-2	07-40-54[g]
1987	Tanner Creek	Stayton Pond	fing.	04/28/88	--	54.0	67,550	Wi lamette River R-2	--
1987	Tanner Creek	Stayton Pond	fins.	04/28/88	--	54.0	2,450	Wi lamette River R-2	07-45-26[g]
1987	Tanner Creek	Stayton Pond	fing.	04/29/88	--	55.6	58,067	Wi lamette River R-2	--
1987	Tanner Creek	Stayton Pond	fing.	04/29/88	--	55.6	1,981	Wi lamette River R-2	07-45-26[g]
1987	Tanner Creek	Stayton Pond	fins.	04/27/88	05/07/88	56.0	1,142,962	Willemette River R-2	--
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	56.0	9,029	Willamette River R-2	07-45-26[g]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	56.0	9,029	Uillamette River R-2	07-45-27[g]
1987	Tanner Creek	Stayton Pond	fins.	04/27/88	05/07/88	56.0	9,029	Willamette River R-2	07-45-28[g]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	56.0	9,029	Willamette River R-2	07-45-29[g]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	56.0	9,029	Willamette River R-2	07-45-30[g]
1988	Tanner Creek	Stayton Pond	fing.	04/25/89	04/28/89	62.3	732,260	Uillamette River R-2	--
1988	Tanner Creek	Stayton Pond	fing.	04/25/89	04/28/89	62.3	28,925	Uillamette River R-2	07-50-12[g]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89	67.1	531,575	Willamette River R-2	--
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89	67.1	5,126	Uillamette River R-2	07-50-12[g]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89	67.1	5,126	Willamette River R-2	07-50-15[i]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89	67.1	5,126	Uillamette River R-2	07-50-17[i]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89	67.1	5,126	Uillamette River R-2	07-50-18[i]
1988	Tanner Creek	Stayton Pod	fing.	05/01/89	05/03/89	67.1	5,126	Uillamette River R-2	07-50-20'
1988	Tanner Creek	Stayton Pond	fry	03/04/89	--	276.0	4,002	Uillamette River R-2	--

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Willamette River subbasin by broodyear and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1989	Tanner Creek	Stayton Pond	fing.	05/01/90	05/09/90	45.0	1,627,541	Uillamette River R-2	--
1989	Tanner Creek	Stayton Pond	fing.	05/01/90	05/09/90	45.0	82,060	Willamette River R-2	07-52-18[f]

a Modified from Oregon Department of Fish and Uildlife (1990).
b LRH refers to Louer Columbia River Hatchery Stock, which are informally called tules (along uith Bonneville Pool Hatchery Stock). Tanner Creek stock is part of the LRH stock group.
c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded Wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknom); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.
d Month(s) and day(s) of release unknom. Standardized to the first and last day of the year.
e Juveniles With this tag group Were elso released into the Molalla and Pudding rivers, Santiam and Calapooia rivers, and Middle Fork Uillamette River subbasins.
f Juveniles with this tag group were also released into the Santiam and Calapooia rivers, Holalla and Pudding rivers, and lower Columbia River s&basins.
g Juveniles With this tag group Were also released into the Molalla and Pudding rivers and Santiam and Calapooia rivers subbasins.
h Juveniles with this tag group were also released into the Santiam and Calapooia rivers and louer Columbia River subbasins.
i Juveniles with this tag group uere also released into the Santiam and Calapooia rivers subbasin.

Table 2 (AC). Age composition (freshwater.ocean) by brood year for LRH stock fall chinook at Willamette Falls".

Brood Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1983	--	17	71	11	<1	--	--	--	--	--
1984	--	13	57	28	2	--	--	--	--	--
1985	--	3	43	53	<1	--	--	--	--	--
1986	--	6	55	37	2	--	--	--	--	--

[a] Modified from Washington Department of Fisheries (unpublished data).

Table 3 (AC-a). Age composition (freshwater.ocean) by run year for LRH stock fall chinook at Willamette Falls[a].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1985	--	5	75	19	<1	--	--	--	--	--
1986	--	12	41	46	1	--	--	--	--	--
1987	--	2	86	11	1	--	--	--	--	--
1988	--	4	39	56	<1	--	--	--	--	--
1989	--	11	38	47	4	--	--	--	--	--
1990	--	7	57	35	<1	--	--	--	--	--
1991	--	53	36	10	1	--	--	--	--	--

[a] Modified from Washington Department of Fisheries (unpublished data).

Table 4 (AE). Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the mainstem Willamette River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Willamette River	mid-Col. R.[c]	Hatchery Returns		
	1987	--	1	1
	1988	--	2	2
Willamette River	mid-Col. R.[c]	Trap Returns		
	1987	--	2	2
Willamette River	mid-Col. R. Trib.[d]	Hatchery Returns		
	1988	--	3	3
Willamette River	lower Col. R.[e]	Hatchery Returns		
	1986	--	176	1
	1987	--	571	2
	1988	--	283	2
Willamette River	Elokomin River	Hatchery Returns		
	1987	--	1	1
Willamette River	Kalama River	Hatchery Returns		
	1986	--	1	1
Willamette River	Washougal River	Spawner Survey8		
	1988	--	1	7
Willamette River	Washougal River	Hatchery Returns		
	1987	--	1	1
Willamette River	Sandy River	Spawner Surveys		
	1987	--	3	3
	1988	--	1	1

[a] Based on the following tag codes: 07-18-38, 07-21-52, 07-33-52, 07-33-53, 07-33-54, 07-33-55, 07-33-56.

(cont.)

Table 4 (AE). (cont.) Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles in the mainstem Willamette River subbasin[a,b].

b Modified from Pacific States Marine Fisheries Commission's coded wire tag database.
c Mainstem between Bonneville Dam and McNary Dam.
d Tributaries of the Columbia between Bonneville Dam and McNary Dam, excluding Hood River, Fifteenmile Creek, Deschutes River, John Day River, and Umatilla River.
e Mainstem from the mouth to Bonneville Dam.

Table 5 (TD). Parasites and diseases of fall chinook at hatchery facilities located in the mainstem Willamette River subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Stayton Pond	*Epistylis sp.*
Bacteria	Aumsville Pond	Coldwater disease *(Cytophhaga psychrophila)*
Bacteria	Aumsville Pond	*Pseudomonas*
Bacteria	Aumsville Pond	*Aeromonas*
Bacteria	Aumsville Pond	Bacterial kidney diseaee *(Renibacterium salmoninarum)*

[a] Personal communication, 1991, A. Amandi, Oregon Department of Fish and Wildlife, Research and Development Section, Corvallis, Oregon.

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Foster, C.A. 1991. Fish Passage at Willamette Falls in 1990. *in* D.E. Bennett and C.A. Foster, editors. 1990 Willamette River spring chinook salmon run, fisheries, and passage at Willamette Falls. Annual Report of Oregon Department of Fish and Wildlife (Project Numbers F-l 19-R, F-l 19-R-6/7, F-119-R-6, and F-l 19-R-7), Fish Division, Portland, Oregon.

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MAINSTEM WILLAMETTE RIVER SUBBASIN

Naturally Produced Coho Salmon

GEOGRAPHIC LOCATION

The mainstem Willamette River forms at the junction of the Coast Fork and Middle Fork rivers, and flows 187 miles to enter the Columbia River at River Mile (RM) 101.5 (Oregon Department of Fish and Wildlife 1990a; see Naturally Produced Spring Chinook Salmon, GEOGRAPHIC LOCATION, Figure 1). The mainstem Willamette River subbasin, for purposes of subbasin planning, includes the mainstem Willamette River and its tributaries, excluding the Clackamas River, the Tualatin River, the Coast Range rivers, the Molalla and Pudding rivers, the Santiam and Calapooia rivers, the McKenzie River, the Coast Fork and Long Tom rivers, and the Middle Fork River subbasins.

ORIGIN

Coho are not native to the mainstem Willamette River subbasin or to the Willamette River Basin above Willamette Falls; although it is unknown but unlikely that they are native to the Tualatin River subbasin (see TUALATIN RIVER SUBBASIN, Naturally Produced Coho Salmon, ORIGIN). There are only approximately 45 miles of habitat considered suitable for spawning and rearing (Table 1).

DISTRIBUTION

Subbasin

Coho utilize the mainstem Willamette River primarily as a migration corridor (Oregon Department of Fish and Wildlife 1990b). Habitat in the mainstem Willamette River subbasin considered suitable for spawning and rearing is rated as "good", "fair", and "poor" quality (Tables 1 and 2).

PRODUCTION

Harvest

Sport

Subbasin: No brood year specific estimates of sport harvest are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: "Coho pass Willamette Falls from late August through early November with

peak numbers passing in middle to late September" (Foster 1991).

Numbers: No brood year specific estimates of escapement are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Run year specific estimates of escapement for the combined run of naturally and hatchery produced fish passing Willamette Falls are available in Foster (1991) and in Oregon Department of Fish and Wildlife (1990b).

Strays

Coded wire tagged hatchery coho, released as juveniles into the Clackamas River subbasin, were recovered in the mainstem Willamette River (Table 3). The mainstem Willamette River is a necessary migration corridor to the Clackamas River subbasin.

Age Structure

No brood year specific estimates of age structure are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Brood year specific estimates of age structure for the combined run of naturally and hatchery produced fish at Willamette Falls are available in Foster (1991) and in Oregon Department of Fish and Wildlife (1990b).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Willamette River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	31.4	39.7	28.9	--	45.1	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence databaee.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Willamette River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (AI). Non-harvest recoveries of coded wire tagged hatchery coho salmon in the mainstem Willamette River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Clackamas River	Willamette River	Trap Returns		
	1982	--	1	2
	1983	--	--	--
	1984	--	1	1

[a] Based on the following tag codes: 05-08-26, 05-11-37.
[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

REFERENCES

Foster, C.A. 1991. Fish Passage at Willamette Falls in 1990. *in* D.E. Bennett and C.A. Foster, editors. 1990 Willamette River spring chinook salmon run, fisheries, and passage at Willamette Falls. Annual Report of Oregon Department of Fish and Wildlife (Project Numbers F-l 19-R, F-l 19-R-6/7, F-119-R-6, and F-l 19-R-7), Fish Division, Portland, Oregon.

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MAINSTEM WILLAMETTE RIVER SUBBASIN

Hatchery Produced Coho Salmon

ORIGIN

Hatchery fish were released into the mainstem Willamette River subbasin beginning in the mid-1970's (Table 1). Coho were released in the 1970's to establish a self-sustaining run above Willamette Falls. In the 1980's, hatchery coho were released into the subbasin to contribute to ocean fisheries (Oregon Department of Fish and Wildlife 1990).

The majority of coho releases in the subbasin have been of Lower Columbia Early Run (LCER) stock; which was derived from the Toutle stock (Table 1; see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, ORIGIN). Some releases of late run Cowlitz stock hatchbox fry have also occurred (Oregon Department of Fish and Wildlife unpublished data).

DISTRIBUTION

Subbasin

The majority of hatchery coho releases have been into lower river tributaries (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Sandy, Cascade, and Oxbow hatcheries (Table 1). Annual numbers released ranged from 134,380 to 787,982 fish (Table 1). Size at release ranged from 1,200 to 350 fish per pound (Table 1).

Fingerling

Hatchery facilities in which LCER stock fingerlings were reared or acclimated prior to release in the subbasin include Sandy, Cascade, Bonneville, and Oxbow hatcheries (Table 1). Annual numbers released ranged from 95,000 to 393,436 fish (Table 1). Size at release ranged from 235.0 to 119.0 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Sandy and South Santiam hatcheries (Table 1). Annual numbers released ranged from 21,280 to 90,354 fish (Table 1). Size at release ranged from 14.7 to 14.2 fish per pound (Table 1).

Jack and Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: No brood year specific estimates of sport harvest are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasin. Run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: "Coho pass Willamette Falls from late August through early November with peak numbers passing in middle to late September" (Foster 1991).

Numbers: No brood year specific estimates of escapement are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasin. Run year specific estimates of escapement for the combined run of naturally and hatchery produced fish passing Willamette Falls are available in Foster (1991), in Oregon Department of Fish and Wildlife (1990), and in Hansen and Williams (1979).

Age Structure

Estimates of age structure are available at Willamette Falls (Tables 2 and 3). Age structure was determined in most years based on a visual classification of jack and adult fish. Jacks were distinguished from adults based on size. Prior to the 1990 return year, the general rule was to classify fish as jacks if they were less than 20 inches in fork length. Beginning in 1990, the cutoff was changed so that fish less than 18 inches in fork length were classified as jacks. All jacks were assumed to be males and were designated as two year old fish and all adults were designated as three year old fish. Scale analysis was used in selected years to adjust estimates in each age category to account for smaller than normal adult fish returning in selected run years.

All returning hatchery coho salmon were assigned to a given brood year based on the assumption that all hatchery fish migrate as age 1+ smolts whether they are released as sub-yearling or yearling smolts. This assumption is based on several factors: 1) that sub-yearlings not programmed to be raised to the size of yearling releases have a high mortality rate, 2) that although sub-yearlings programmed to be raised to the size of yearling releases are recovered in the Columbia River these release groups represent only a small percentage of total releases above Willamette Falls, and 3) that yearling juveniles migrate as age 1+ smolts. These assumptions are based on data that indicates most downstream migrant age 0+ smolts do not survive (Willis 1962) and data from an analysis of coho scales (Oregon Department of Fish and Wildlife unpublished data) that indicates virtually all returning hatchery coho migrated as age 1+ smolts (personal communication on 7/30/92 with Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon). Freshwater age was designated as 2 years for juveniles migrating as age 1+

smolts. Ocean age was designated as age 1 for jacks (total age 2) and age 2 for adults (total age 3) for purposes of presenting age in the standardized format of this report; even though jacks return in the same year in which they migrate as smolts and adults do not spend two complete years in the ocean (personal communication on 8/10/92 with Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon).

Estimates of age structure for the LCER stock of coho salmon were derived from returns of both naturally and hatchery produced fish. Age structure was assumed to be representative of LCER stock fish passing Willamette Falls based on the assumptions that 1) the run currently passing Willamette Falls is primarily comprised of LCER stock hatchery fish (i.e. late run Cowlitz stock hatchery fish released above Willamette Falls represent only a small percentage of total releases and are believed to have low survival rates based on the fact that they are primarily released as fry), 2) naturally produced fish passing Willamette Falls are primarily derived from LCER stock hatchery fish that spawned above the falls (see MAINSTEM WILLAME'ITE RIVER SUBBASIN, Naturally Produced Coho, ORIGIN), and 3) there is only limited natural production that occurs above the falls.

Annual estimates of age structure, by brood year, for LCER stock coho ranged from 27% to 79 % age 2 fish and 21% to 73 % age 3 fish (Table 2).

Annual estimates of age structure, by run year, for LCER stock coho ranged from 43% to 70% age 2 fish and 30% to 57% age 3 fish (Table 2).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES and see SANDY RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES.

Table 1 (TR). Hatchery coho releases into the Willamette River subbasin by broodyear and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1975	LCER	Sandy	fing.	01/01/76	12/31/76[d]	--	24,000	Tryon Cr	--
1975	LCER	Sandy	fing.	01/01/76	12/31/76[d]	--	100,064	Beaver Lake, Abernathy Cr	--
1975	LCER	Sandy	smolt	01/01/77	12/31/77[d]	--	21,280	Above Willamette Falls	--
1976	LCER	Sandy	fing.	01/01/77	12/31/77[d]	--	25,283	Tryon Cr	--
1976	LCER	Sandy	fins.	01/01/77	12/31/77[d]	--	100,419	Beaver Lake, Abernathy Cr	--
1977	LCER	Sandy	fing.	01/01/78	12/31/78[d]	--	25,000	Tryon Cr	--
1977	LCER	Sandy	fing.	01/01/78	12/31/78[d]	--	70,000	Beaver Lake, Abernathy Cr	--
1979	Sandy R.[e]	Bonneville	fing.	06/03/80	--	235.0	100,000	NFk Scappoose Creek	--
1979	Sandy R.[e]	Bonneville	fing.	06/03/80	--	235.0	40,000	Scappoose Creek	--
1979	Sandy R.[e]	Bonneville	fing.	06/05/80	--	235.0	37,635	Johnson Creek	--
1980	Sandy R.[e]	Sandy	fry	03/11/81	--	1,120	23,556	Kellogg Creek	--
1980	Sandy R.[e]	Sandy	fry	03/06/81	--	1,050	52,962	Ht Scott Creek	--
1980	Sandy R.[e]	Sandy	fry	03/11/81	--	1,120	70,668	Mt Scott Creek	--
1980	Sandy R.[e]	Sandy	fry	03/11/81	--	1,120	70,668	Tryon Creek	--
1980	Sandy R.[e]	Sandy	fry	03/11/81	--	1,120	97,037	NFk Scappoose Creek	--
1980	Sandy R.[e]	Sandy	fry	03/11/81	--	1,120	70,668	SFk Scappoose Creek	--
1980	Eagle Cr.[f]	Oxbow (Herman)	fry	03/12/81	--	1,200	157,625	Beaver Lakes	--
1980	Eagle Cr.[f]	Oxbow (Herman)	fry	03/12/81	--	1,200	72,750	Abernethy Creek	--
1980	Eagle Cr.[f]	Oxbow (Herman)	fry	03/12/81	--	1,200	36,375	Holcomb Creek	--
1980	Tanner Cr	Oxbow (Herman)	fry	02/27/81	--	1,200	135,673	Johnson Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/14/82	--	198.0	45,144	Beaver Lake	--
1981	Sandy R.[e]	Bonneville	fing.	06/08/82	--	189.0	20,601	Johnson Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/08/82	--	189.0	14,175	Kellogg Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/08/82	--	189.0	58,212	Mt Scott Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/08/82	--	189.0	36,099	Tryon Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/08/82	--	217.0	69,540	NFk Scappoose Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/08/82	--	217.0	6,944	Honeyman Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/08/82	--	217.0	39,928	Sfk Scappoose Creek	--
1982	Sandy R.[e]	Cascade	fing.	05/20/83	--	195.0	61,425	Beaver Lake	--
1982	Sandy R.[e]	STEP	fry	01/15/83	--	1,100	72,500	Abernethy Creek	--
1982	Sandy R.[e]	STEP	fry	01/29/83	--	1,100	24,184	Crystal Springs Creek	--
1982	Sandy R.[e]	STEP	fry	01/30/83	--	1,100	37,600	Johnson Creek	--
1982	Tanner Cr	Cascade	fry	02/25/83	--	1,150	25,300	Crystal Springs Creek	--
1982	Tanner Cr	Cascade	fry	02/25/83	--	1,150	49,450	Johnson Creek	--
1982	Tanner Cr	Cascade	fry	02/25/83	--	1,150	25,300	Kellogg Creek	--
1982	Tanner Cr	Cascade	fry	02/25/83	--	1,150	100,050	Mt Scott Creek	--
1982	Tanner Cr	Cascade	fry	02/25/83	--	1,150	49,450	Tryon Creek	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/28/84	--	362.5	11,963	Kellogg Creek	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/28/84	--	362.5	59,450	Mt Scott Creek	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/28/84	--	362.5	35,163	Tryon Creek	--
1982	Klaskanine R.	STEP	fry	03/15/83	--	1,100	24,000	NFk Scappoose Creek	--

Table 1 (TR). (cont.) Hatchery coho releases into the Willamette River subbasin by broodyear and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1982	Sandy R.[e]	STEP	fry	01/07/83	02/06/83	1,100	52,730	SFk Scappoose creek	--
1982	Tanner Cr	Cascade	fry	02/23/83	--	1,150	11,500	Beaver Creek	--
1982	Sandy R.[e]	Cascade	fing.	05/17/83	--	202.0	70,094	NFk Scappoose Creek	--
1982	Sandy R.[e]	Cascade	fing.	05/17/83	--	202.0	71,104	SFk Scappoose Creek	--
1982	Sandy R.[e]	Cascade	fing.	05/17/83	--	202.0	11,312	Honeyman Creek	--
1983	Cowlitz R.	Oxbou (Herman)	fry	06/28/84	--	362.5	55,100	SFk Scappoose Creek	--
1984	LCER	Oxbow	fry	01/01/85	12/31/85[d]	--	127,030	Beaver Lake, Abernathy Cr	--
1984	oxbow	STEP	fry	05/11/85	--	350.0	7,350	Newell Creek	--
1984	oxbou	STEP	fing.	07/15/85	--	119.0	750	Abernethy Creek	--
1984	Sandy R.[e]	Bonneville	fing.	05/03/85	--	167.0	38,076	Kellogg Creek	--
1984	Sandy R.[e]	Bonneville	fing.	05/03/85	--	167.0	47,094	Mt Scott Creek	--
1984	Sandy R.[e]	Bonneville	fing.	05/03/85	--	167.0	25,050	Tryon Creek	--
1984	Sandy R.[e]	Oxbow (Herman)	fing.	05/09/85	--	213.5	10,665	Beaver Creek	--
1985	Sandy R.[e]	South Santiam	smolt	05/18/87	--	14.2	29,535	Willamette River	CD
1985	Sandy R.[e]	South Santiem	smolt	05/19/87	--	14.3	13,856	Willamette River	CD
1985	Sandy R.[e]	South Santiam	smolt	05/18/87	--	14.6	31,097	Willamette River	CD
1985	Sandy R.[e]	South Santiam	smolt	05/19/87	--	14.7	15,866	Willamette River	CD
1986	Tanner Cr	Bonneville	fing.	05/27/87	--	227.0	57,885	Beaver Lake	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	221.0	16,575	McCarthy Creek	--
1986	Tanner Cr	Bonneville	fing.	05/27/87	--	227.0	44,265	Abernethy Creek	--
1986	Tanner Cr	Bonneville	fing.	06/02/87	--	188.0	25,004	Holcomb Creek	--
1986	Tanner Cr	Bonneville	fing.	05/26/87	--	201.0	50,652	Johnson Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	223.0	50,175	Kellogg Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	223.0	50,175	Mt Scott Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	223.0	40,140	Tryon Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	221.0	48,620	SFk Scappoose Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	221.0	9,945	Honeyman Creek	--

a Modified from Oregon Department of Fish and Wildlife (unpublished data); and Oregon Department of Fish and Wildlife's hatchery production database.

b LCER refers to Louer Columbia Early Run stock, a "catchall" name for early run hatchery stocks including Eagle Creek, Clackamas River, Sandy River, and Tanner Creek stocks. These stocks have been previously grouped as early run Toutle stock, or just early run coho. Cowlitz stock is part of a Late run stock group.

C D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = Left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brend; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if know, is listed after a colon. Cold brand locations are described as being on the right or Left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" and "CD" codes have not been identified.

(cont.)

Table 1 (TR). (cont.) Hetchery coho releases into the Willamette River subbasin by broodyear and, if marked, coded wire tag code[a].

d Month(s) end day(s) of release unknown. Standardized to the first end Last day of the year.
e Sandy fish Hetchery stock.
f Cascade Hetchery stock.

Table 2 (AC). Age composition (freshwater.ocean) by brood year for LCER stock coho salmon collected at Willamette Falls[a,b].

Brood Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1973	8,139	. .	--	--	. .	--	27	73	--	--
1974	4,453	. .	--	--	. .	--	48	52	--	--
1975	4,898	. .	--	--	. .	--	79	21	--	--
1976	3,402	--	--	--	--	--	50	50	--	--
1977	3,153	. .	--	--	--	--	43	57	--	. .
1978	3,693	--	--	--	--	--	65	35	--	. .
1979	4,549	--	--	--	--	--	77	23	--	. .
1980	3,805	--	--	--	--	--	55	45c	--	. .
1981	4,146	--	--	--	--	--	62'	38	--	. .
1982	5,013	--	--	--	--	--	45	55	--	. .
1983	5,028	--	--	--	--	--	45	55	--	. .
1984	6,154	--	--	--	--	--	52	48	--	--
1985	6,574	--	--	--	--	--	76	24	--	--
1986	5,448	--	--	--	--	--	32	68	--	--
1987	3,763	--	--	--	--	--	48	52	--	--

[a] Estimates are modified from Foster (1991).
[b] Unless otherwise footnoted, returning fish were visually classified as jack or adult fish (see ADULT LIFE HISTORY, Aae Structure).
[c] Scale analysis was used to adjust estimates to account for smaller than normal adult fish returning to Willamette Falls.

Table 3 (AC-a). Age composition (freshwater.ocean) by run year for LCER stock coho salmon collected at Willamette Falls[a,b].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1975	12,849	--	--	--	--	--	54	46	--	--
1976	4,550	--	--	--	--	--	49	51	--	--
1977	3,127	--	--	--	--	--	68	32	--	--
1978	5,602	--	--	--	--	--	69	31	--	--
1979	3,479	--	--	--	--	--	49	51	--	--
1980	2,641	--	--	--	--	--	52	48	--	--
1981	3,449	--	--	--	--	--	70	30	--	--
1982	5,219	--	--	--	--	--	67	33	--	--
1983[c]	3,689	--	--	--	--	--	57	43	--	--
1984	5,295	--	--	--	--	--	48	52	--	--
1985	5,066	--	--	--	--	--	45	55	--	--
1986	5,170	--	--	--	--	--	43	57	--	--
1987	4,813	--	--	--	--	--	67	33	--	--
1988	8,692	--	--	--	--	--	57	43	--	--
1989	3,687	--	--	--	--	--	47	53	--	--
1990	2,718	--	--	--	--	--	67	33	--	--

[a] Estimates are modified from Foster (1991).
[b] Unless otherwise footnoted, returning fish were visually classified as jack or adult fish (see ADULT LIFE HISTORY, Aae Structure).
[c] Scale analysis was used to adjust estimates to account for smaller than normal adult fish returning to Willamette Falls.

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MAINSTEM WILLAMETTE RIVER SUBBASIN

Naturally Produced Summer Steelhead

GEOGRAPHIC LOCATION

The mainstem Willamette River forms at the junction of the Coast Fork and Middle Fork rivers, and flows 187 miles to enter the Columbia River at River Mile (RM) 101.5 (Oregon Department of Fish and Wildlife 1990a; see Naturally Produced Spring Chinook Salmon, GEOGRAPHIC LOCATION, Figure 1). The mainstem Willamette River subbasin, for purposes of subbasin planning, includes the mainstem Willamette River and its tributaries, excluding the Clackamas River, the Tualatin River, the Coast Range rivers, the Molalla and Pudding rivers, the Santiam and Calapooia rivers, the McKenzie River, the Coast Fork and Long Tom rivers, and the Middle Fork River subbasins.

ORIGIN

Summer steelhead are not native to the mainstem Willamette River subbasin. There are only approximately 15 miles of habitat considered suitable for spawning and rearing (Table 1).

DISTRIBUTION

Subbasin

Summer steelhead utilize the mainstem Willamette River primarily as a migration corridor. Habitat in the mainstem Willamette River subbasin considered suitable for spawning and rearing is rated as "fair" quality (Tables 1 and 2).

PRODUCTION

Harvest

Sport

Subbasin: No brood year specific estimates of sport harvest are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Run year specific estimates for the combined sport harvest of natural and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Summer steelhead begin passing Willamette Falls in early March with peak migration occurring from mid-May through June (Foster 1991).

Numbers: No brood year specific estimates of escapement are available for naturally

produced fish that originated in the mainstem Willamette River subbasin. Run year specific estimates of escapement for the combined run of naturally and hatchery produced fish passing Willamette Falls are available in Foster (1991) and in Oregon Department of Fish and Wildlife (1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Willamette River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	100.0	0.0	--	15.2	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.
b Rating8 of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Willamette River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.
b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humane.

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Foster, C.A. 1991. Fish Passage at Willamette Falls in 1990. *in* D.E. Bennett and C.A. Foster, editors. 1990 Willamette River spring chinook salmon run, fisheries, and passage at Willamette Falls. Annual Report of Oregon Department of Fish and Wildlife (Project Numbers F-119-R, F-119-R-6/7, F-119-R-6, and F-119-R-7), Fish Division, Portland, Oregon.

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MAINSTEM WILLAMETTE RIVER SUBBASIN

Hatchery Produced Summer Steelhead Salmon

ORIGIN

Hatchery summer steelhead have been infrequently released into the mainstem Willamette River subbasin (Table 1). Hatchery summer steelhead released into the mainstem Willamette River subbasin are derived from Skamania stock (Howell et al. 1985) summer steelhead collected from the Skamania River located in Washington. The hatchery stock which was developed at Oregon hatchery facilities, and is currently used for the hatchery production program in the mainstem Willamette River subbasin, is still commonly referred to as the Skamania stock but is known more specifically as the Foster stock (Oregon Department of Fish and Wildlife 1990a).

DISTRIBUTION

Subbasin

Releases of hatchery summer steelhead in the subbasin have been few and of small numbers (Table 1). Releases of smolts and fingerlings have been made into the mainstem Willamette River (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

There are no records of releases in the subbasin.

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include McKenzie and Roanng River hatcheries (Table 1). Annual numbers released ranged from 16,000 to 80,460 fish (Table 1). Size at release ranged from 44.7 to 20.0 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Leaburg and McKenzie hatcheries (Table 1). Annual numbers released ranged from 11,718 to 33,791 fish (Table 1). Size at release ranged from 5.3 to 5.1 fish per pound (‘Table 1).

Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: No brood year specific estimates of sport harvest are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasin. Run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Summer steelhead begin passing Willamette Falls in early March with peak migration occurring from mid-May through June (Foster 1991).

Numbers: No brood year specific estimates of escapement are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasin. Run year specific estimates of escapement for the combined run of naturally and hatchery produced fish passing Willamette Falls are available in Foster (1991) and in Oregon Department of Fish and Wildlife (1990b).

The current summer steelhead run resulting from mainstem Willamette releases is believed to be zero (Oregon Department of Fish and Wildlife 1990a).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see MCKENZIE RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES and see SANTIAM RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES.

Table 1 (TR). Hatchery summer steelhead releases into the mainstem Willamette River subbasin by broodyear and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1973	Skamania	Leaburg	smolt	01/15/78[c]	--	--	11,718	mainstem Willamette	--
1977	Skamania	Roaring River	fing.	01/15/78[c]	--	--	24,668	Above Willamette Falls	--
1980	Skamania	Roaring River	fing.	12/15/80[c]	--	--	40,230	mainstem Willamette	--
1980	Skamania R.	Roaring River	fing.	12/30/80	--	44.7	40,230	Willamette River R-2	--
1981	Skamania R.	McKenzie	fing.	02/03/82	--	20.0	16,000	Dorena Reservoir	--
1984	Skamania	McKenzie	fing.	12/15/84[c]	--	--	11,172	mainstem Uillamette	--
1984	Skamania R.	McKenzie	fing.	12/12/84	--	22.8	11,172	Uillamette River R-2	--
1986	Skamania R.	McKenzie	smolt	04/14/87	--	5.1	6,727	Uillamette River R-2	AD
1986	Skamania R.	McKenzie	smolt	04/13/87	04/14/87	5.2	19,829	Uillamette River R-2	AD
1986	Skamania R.	McKenzie	smolt	04/13/87	--	5:3	7,235	Uillamette River R-2	AD

a Modified from Oregon Department of Fish and Wildlife (unpublished data).

b D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = Left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded uire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is Listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

c Day(s) of release unknown. Standardized to the 15th of the month.

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MAINSTEM WILLAMETTE RIVER SUBBASIN

Naturally Produced Winter Steelhead

GEOGRAPHIC LOCATION

The mainstem Willamette River forms at the junction of the Coast Fork and Middle Fork rivers, and flows 187 miles to enter the Columbia River at River Mile (RM) 101.5 (Oregon Department of Fish and Wildlife 1990a; see Naturally Produced Spring Chinook Salmon, GEOGRAPHIC LOCATION, Figure 1). The mainstem Willamette River subbasin, for purposes of subbasin planning, includes the mainstem Willamette River and its tributaries, excluding the Clackamas River, the Tualatin River, the Coast Range rivers, the Molalla and Pudding rivers, the Santiam and Calapooia rivers, the McKenzie River, the Coast Fork and Long Tom rivers, and the Middle Fork River subbasins.

ORIGIN

Late run winter steelhead are native to the Willamette River Basin, although natural production no longer occurs in the mainstem Willamette River subbasin (Oregon Department of Fish and Wildlife 1990a).

DISTRIBUTION

Subbasin

Historically, native winter steelhead spawned and reared in the upper mainstem Willamette River (Fulton 1970, cited by Oregon Department of Fish and Wildlife 1990a). Natural production in the mainstem is currently believed to be minimal or non-existent (Oregon Department of Fish and Wildlife 1990a). Habitat in the mainstem Willamette River subbasin considered suitable for spawning and rearing is rated as "fair", "poor", and "good" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990a) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: No brood year specific estimates of sport harvest are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data).

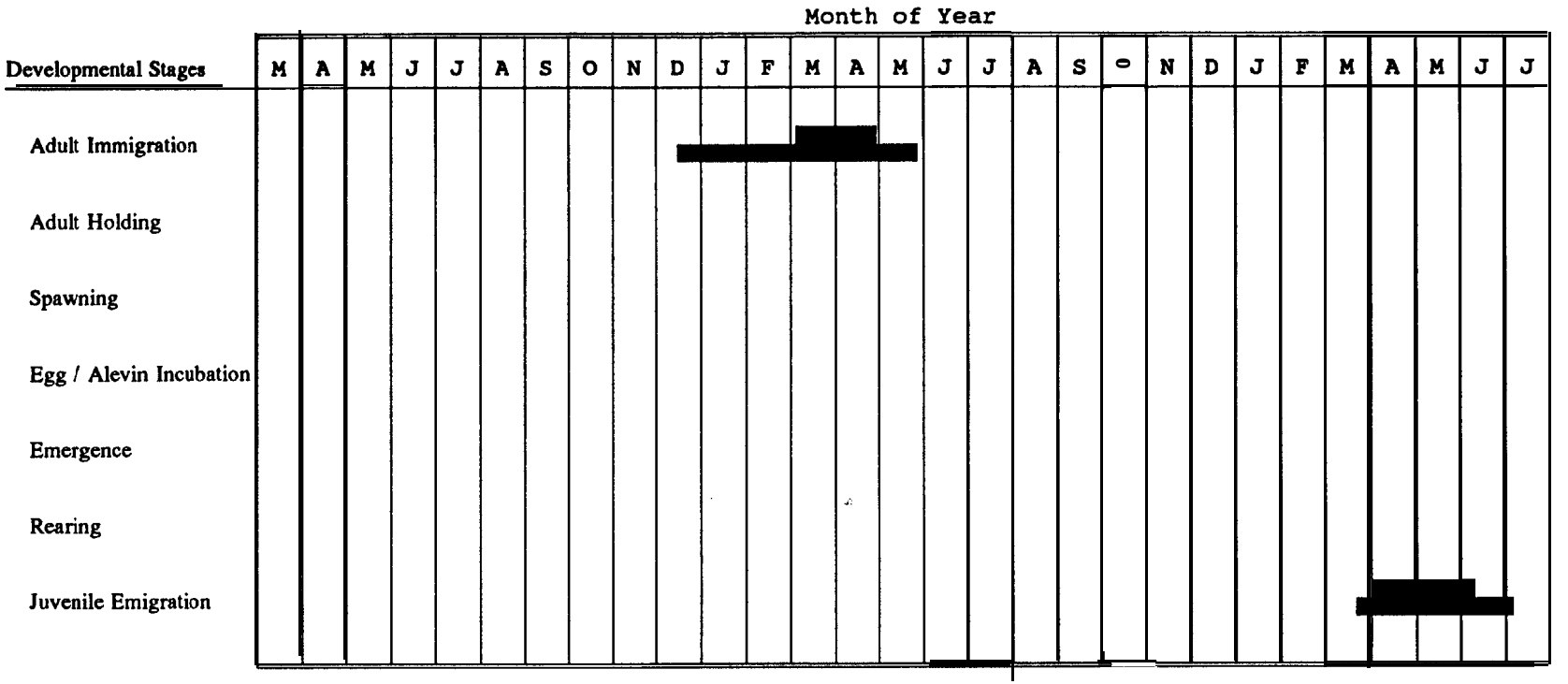
ADULT LIFE HISTORY

Escapement

Subbasin

Timing: The native Willamette stock is a late run stock that passes Willamette Falls from February through May (Foster 1991). "Big Creek winter steelhead have established naturally reproducing populations. Winter steelhead passing through February 15 are mainly introduced Big Creek stock and fish passing after February 15 are mainly indigenous Willamette stock" (Foster 1991).

Numbers: No brood year specific estimates of escapement are available for naturally produced fish that originated in the mainstem Willamette River subbasin. Run year specific estimates of escapement for the combined run of naturally and hatchery produced fish passing Willamette Falls are available in Foster (1991) and in Oregon Department of Fish and Wildlife (1990b).



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.
3. Lack of bars for a developmental stage indicates that the stage does not typically occur in the mainstem Willamette River.

Figure 1 (TT). Freshwater life history of Willamette winter steelhead in the mainstem Willamette River (Oregon Department of Fish and Wildlife 1990a).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Willamette River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	26.6	42.5	30.9	--	42.1	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Willamette River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	0.0	100.0	0.0	--	15.2	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

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Foster, C.A. 1991. Fish Passage at Willamette Falls in 1990. *in* D.E. Bennett and C.A. Foster, editors. 1990 Willamette River spring chinook salmon run, fisheries, and passage at Willamette Falls. Annual Report of Oregon Department of Fish and Wildlife (Project Numbers F-119-R, F-119-R-6/7, F-119-R-6, and F-119-R-7), Fish Division, Portland, Oregon.

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MAINSTEM WILLAMETTE RIVER SUBBASIN

Hatchery Produced Winter Steelhead

ORIGIN

The subbasin hatchery program was implemented in 1976 with the release of Big Creek stock winter steelhead (Table 1). Most of the releases to date have been of Big Creek stock winter steelhead (Table 1).

DISTRIBUTION

Subbasin

Hatchery winter steelhead are primarily released into lower river tributaries (Table 1). From 1982-87, Big Creek stock hatchbox fry were released in lower river tributaries (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990a).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Eagle Creek National Fish Hatchery (Table 1). Annual numbers released ranged from 28,308 to 98,900 fish (Table 1). Size at release ranged from 1,700 to 1,413 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Roaring River and Gnat Creek hatcheries (Table 1). Annual numbers released ranged from 328 to 52,455 fish (Table 1). Size at release ranged from 80.0 to 34.0 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Sandy, Gnat Creek, Clackamas and Roaring River hatcheries, and Trojan Pond (Table 1). Annual numbers released ranged from 5,012 to 22,735 fish (Table 1). Size at release ranged from 8.0 to 4.2 fish per pound (Table 1).

Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: No brood year specific estimates of sport harvest are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasin. Run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: The Big Creek stock of hatchery winter steelhead is an early run stock (Oregon Department of Fish and Wildlife 1990a). Winter steelhead passing Willamette Falls before 15 February are classified as Big Creek stock (Oregon Department of Fish and Wildlife 1990a). An approximation of the temporal distribution of the run was reported in Oregon Department of Fish and Wildlife (1990a) and is presented in Figure 1. The methodology used to generate this approximation is unknown.

Numbers: No brood year specific estimates of escapement are available for hatchery produced fish that were released as juveniles in the mainstem Willamette River subbasin. Run year specific estimates of escapement for the combined run of naturally and hatchery produced fish passing Willamette Falls are available in Foster (1991) and in Oregon Department of Fish and Wildlife (1990b).

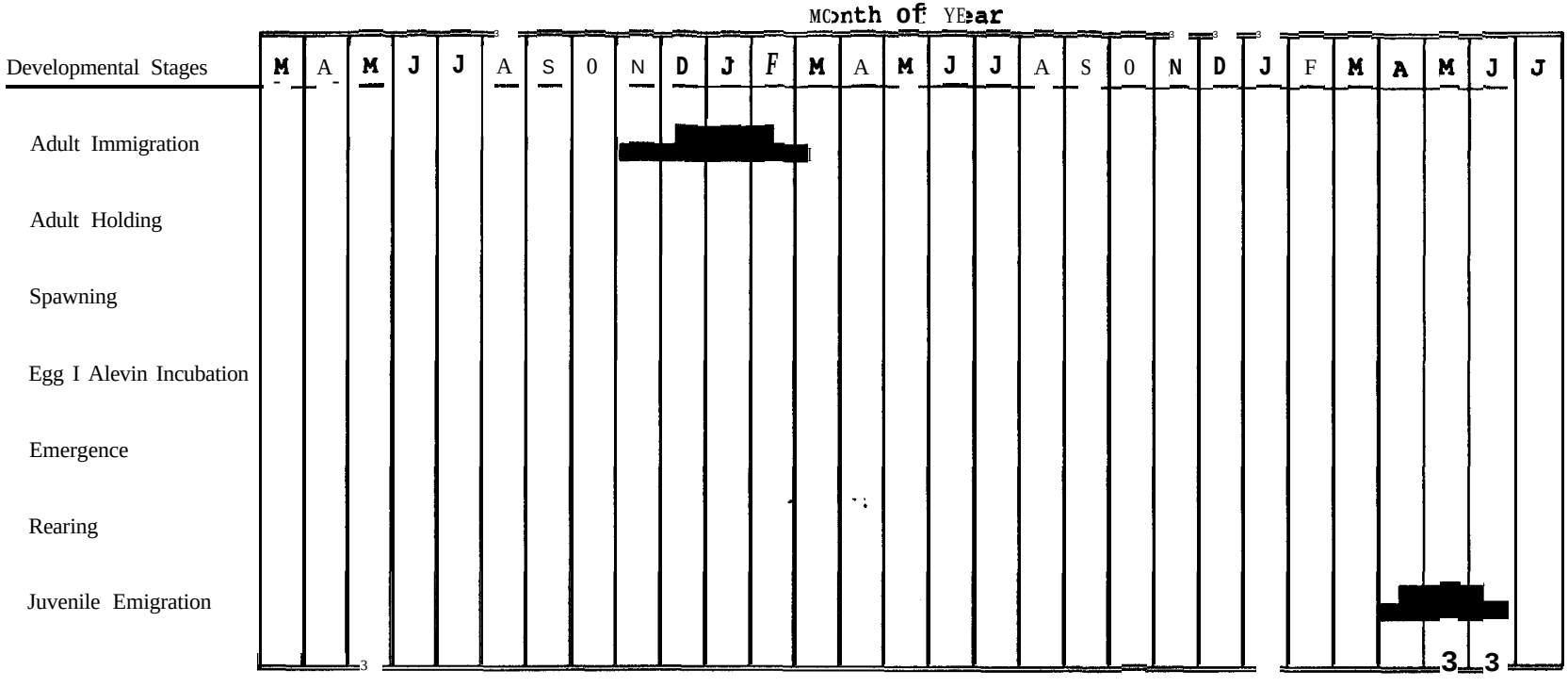
JUVENILE LIFE HISTORY

Migration Timing

An approximation of the temporal distribution of juvenile outmigration for naturally produced fish was reported in Oregon Department of Fish and Wildlife (1990a) and is presented in Figure 1. The methodology used to generate this approximation is unknown.

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see CLACKAMAS RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES and see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.
3. Lack of bars for a developmental stage indicates that the stage does not typically occur in the mainstem Willamette River.

Figure 1 (TT). Freshwater life history of Big Creek winter **steelhead in the mainstem Willamette River (Oregon Department of Fish and Wildlife 1990).**

Table 1 (TR). Hatchery winter steelhead releases into the Willamette River subbasin by broodyeer and, if marked, coded uire tag code".

Brood Year	stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1975	Big Creek	Gnat Creek	smolt	05/15/76[c]	--		10,002	Scappoose Cr.	--
1976	Big Creek	Roaring River	fing.	11/15/76[c]	--	347.x	20,520	Mt Scott Creek	--
1976	Big Creek	Roaring River	fing.	11/15/76[c]	--	34:o	6,000	Crystal Springs Creek	--
1976	Big Creek	Sandy	smolt	06/15/77[c]	--	7.9	3,660	Willamette River	--
1976	Big Creek	Sandy	smolt	06/15/77[c]	--	7.9	1,550	Uillamette River	--
1976	Big Creek	Sandy	smolt	06/15/77[c]	--	8.0	2,770	Willamette River	--
1976	Big Creek	Gnat Creek	smolt	04/15/77[c]	--	6.4	10,240	Scappoose Cr.	--
1977	Big Creek	Roaring River	smolt	05/15/78[c]	--	7.2	11,592	Mt Scott Creek	--
1977	Big Creek	Gnat Creek	smolt	04/15/78[c]	--	6.1	11,143	Scappoose Cr.	--
1978	Big Creek	Gnat Creek	fing.	09/15/78[c]	--	44:o	22,004	Mt Scott Creek	--
1978	Big Creek	Gnat Creek	fing.	09/15/78[c]	--	44.0	11,000	Johnson Creek	--
1978	Big Creek	Gnat Creek	smolt	04/15/79[c]	--	6.5	10,205	Scappoose Cr.	--
1979	Big Creek	Roaring River	fing.	10/15/79[c]	--	80.0	20,000	Mt Scott Creek	--
1979	Big Creek	Roaring River	fing.	10/15/79[c]	--	80:0	22,455	Johnson Creek	--
1979	Big Creek	Roaring River	fing.	10/15/79[c]	--	80.0	10,000	Crystal Springs Creek	--
1979	Big Cr[d]	Gnat Creek	smolt	04/08/80	--	6.0	5,100	Scappoose Creek	--
1979	Big Cr[d]	Gnat Creek	smolt	04/08/80	--	6.1	5,246	Scappoose Creek	--
1980	Big Cr[d]	Clackames	smolt	05/01/81	05/11/81	5.0	1,495	Uillamette River	--
1980	Big Cr[d]	Clackamas	smolt	04/09/81	04/22/81	5.6	3,580	Uillamette River R-2	--
1980	Big Cr[d]	Gnat Creek	smolt	04/13/81	--	5.4	5,184	SFk Scappoose Creek	--
1980	Big Cr[d]	Gnat Creek	smolt	04/13/81	--	5.5	4,840	SFk Scappoose Creek	--
1981	Big Cr[d]	Gnat Creek	smolt	04/30/82	--	6:0	5,096	SFk Scappoose Creek	--
1982	Eagle Creek	Eagle Creek	fry	05/27/82	--	1,413	28,308	Beaver Lake	--
1982	Big Cr[d]	Gnat Creek	smolt	05/10/83	--	5.7	5,699	NFk Scappoose Creek	--
1982	Big Cr[d]	Gnat Creek	smolt	05/09/83	--	6.2	4,277	NFk Scappoose Creek	--
1983	USFWS[e]	STEP	fry	04/11/83	--	1,700	49,700	Abernethy Creek	--
1983	USFWS[e]	STEP	fry	04/18/83	--	1,700	25,200	Crystal Springs Creek	--
1983	USFWS[e]	STEP	fry	04/20/83	--	1,700	24,000	SFk Scappoose Creek	--
1983	Big Cr[d]	Gnat Creek	smolt	05/04/84	--	6.4	4,863	Scappoose Creek	--
1983	Big Cr[d]	Gnat Creek	smolt	05/04/84	--	6.6	5,279	Scappoose Creek	--
1984	Big Cr[d]	Trojan Pond	smolt	05/01/85	--	4.8	9,994	Scappoose Creek	--
1985	Big Cr[d]	Gnat Creek	smolt	04/14/86	--	5.1	4,998	NFk Scappoose Creek	AD
1985	Big Cr[d]	Gnat Creek	smolt	04/14/86	--	5.2	5,000	NFk Scappoose Creek	AD
1986	Big Cr[d]	Trojan Pond	smolt	05/14/87	--	4.5	9,964	NFk Scappoose Creek	--
1987	Big Cr[d]	Gnat Creek	smolt	04/25/88	--	5.9	5,012	NFk Scappoose Creek	--
1988	Big Cr[d]	Trojan Pond	smolt	04/17/89	--	4.2	5,067	NFk Scappoose Creek	--

Table 1 (TR). (cont.) Hatchery winter steelhead releases into the Willamette River subbasin by broodyear and, if marked, coded wire tag code[a].

Brood Year	stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1989	Big Cr[d]	Gnat Creek	fing.	12/19/89	--	41.0	328	Salmonbarry Lake	--
1989	Big Cr[d]	Trojan Pond	smolt	04/12/90	--	4.7	10,006	NFk Sceppoose Creek	AD
1990	Big Cr[d]	Gnat Creek	smolt	04/15/91	--	6.0	10,018	NFk Scappoose Creek	AD

a Modified from Oregon Department of Fish and Uildlife (unpublished data); and Oregon Department of Fish and Wildlife's hatchery production database.

b D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknoun); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

c Dav(s) of release unknoun. Standardized to the 15th of the month.

d Big Creek Hatchery stock.

e U.S. Fish and Uildlife Service hatchery stock, not including fish from Hagerman Fish Hatchery.

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CLACKAMAS RIVER SUBBASIN

Naturally Produced Spring Chinook Salmon

GEOGRAPHIC LOCATION

The Clackamas River originates on the west slope of the Cascade Mountains, between Mount Hood and Mount Jefferson. The Clackamas River flows into the Willamette River at River Mile (RM) 24.8. Major tributaries of the Clackamas River include the Roaring and Collawash rivers, the North and Oak Grove forks, and Clear, Deep, Eagle, and Fish creeks (Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The Clackamas River subbasin drams an area of 934 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Spring chinook are native to the Clackamas River subbasin. Historically, spring chinook were abundant in the Clackamas River (Oregon Department of Fish and Wildlife 1990). The current size of the native run is considerably smaller than in the past (Oregon Department of Fish and Wildlife 1990). Some natural production also occurs as a result of hatchery fish spawning in the subbasin (see CLACKAMAS RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon). The proportions of hatchery and wild fish in the run are unknown (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Spring chinook use the mainstem and larger tributaries for spawning, and the mainstem for rearing (Oregon Department of Fish and Wildlife 1990). The upper mainstem, Eagle and Fish creeks, the Roaring and Collawash rivers, and the Hot Springs Fork of the Collawash River are the primary spawning areas (Oregon Department of Fish and Wildlife 1990). It is believed that most juvenile spring chinook migrate soon after emergence, and rear in the mainstem Clackamas River and the reservoirs of the North Fork Dam complex (Oregon Department of Fish and Wildlife 1990). Available spring chinook habitat in the Clackamas River subbasin is rated as primarily of "excellent" and "good" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 2. The methodology used to generate these approximations is unknown.

PRODUCTION

Juvenile

Smolt

The average count of downstream migrant smolts at North Fork Dam for 1978-86 was

21,745 smolts (Oregon Department of Fish and Wildlife 1990). This number may not reflect the true smolt production above North Fork Dam since many juvenile fish pass the dam in the spill (Fish Commission of Oregon unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced spring chinook are not available, estimates by run year for the combined harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Columbia River

Timing: Current information on run timing to the Columbia River is unavailable, however, Galbreath (1965, cited by Oregon Department of Fish and Wildlife 1990) reports recoveries of adult spring chinook in the Clackamas River that had been tagged in the lower Columbia River from mid-March through late April.

Subbasin

Timing: Although information on run timing for naturally produced spring chinook is not available, information on run timing for the combined run of naturally and hatchery produced fish is available in Oregon Department of Fish and Wildlife (1990).

Numbers: Although brood year specific estimates of run size for naturally produced spring chinook are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Timing: Historically spring chinook are reported to have spawned as early as mid-July (McGuire 1898, cited by Oregon Department of Fish and Wildlife 1990). An approximation of the temporal distribution of spawning was reported in Oregon Department of Fish and Wildlife (1990) and is presented in Figure 2. The methodology used to generate this approximation is unknown.

Strays

No stray coded wire tagged fish have been recovered on spawning ground surveys or at hatchery facilities located in the subbasin (Table 3). Coded wire tag recoveries are all from hatchery spring chinook released as juveniles in the Clackamas River subbasin (Table 3).

Weieht

Although brood year specific estimates of weight for naturally produced spring chinook returning to the Clackamas River subbasin are not available, information from returns of naturally and hatchery produced fish combined is available in Bennett (1990).

Age Structure

Although brood year specific estimates of age structure for naturally produced spring chinook returning to the Clackamas River subbasin are not available, information from returns of naturally and hatchery produced fish combined is available in Bennett (1990).

JUVENILE LIFE HISTORY

Migration Timing

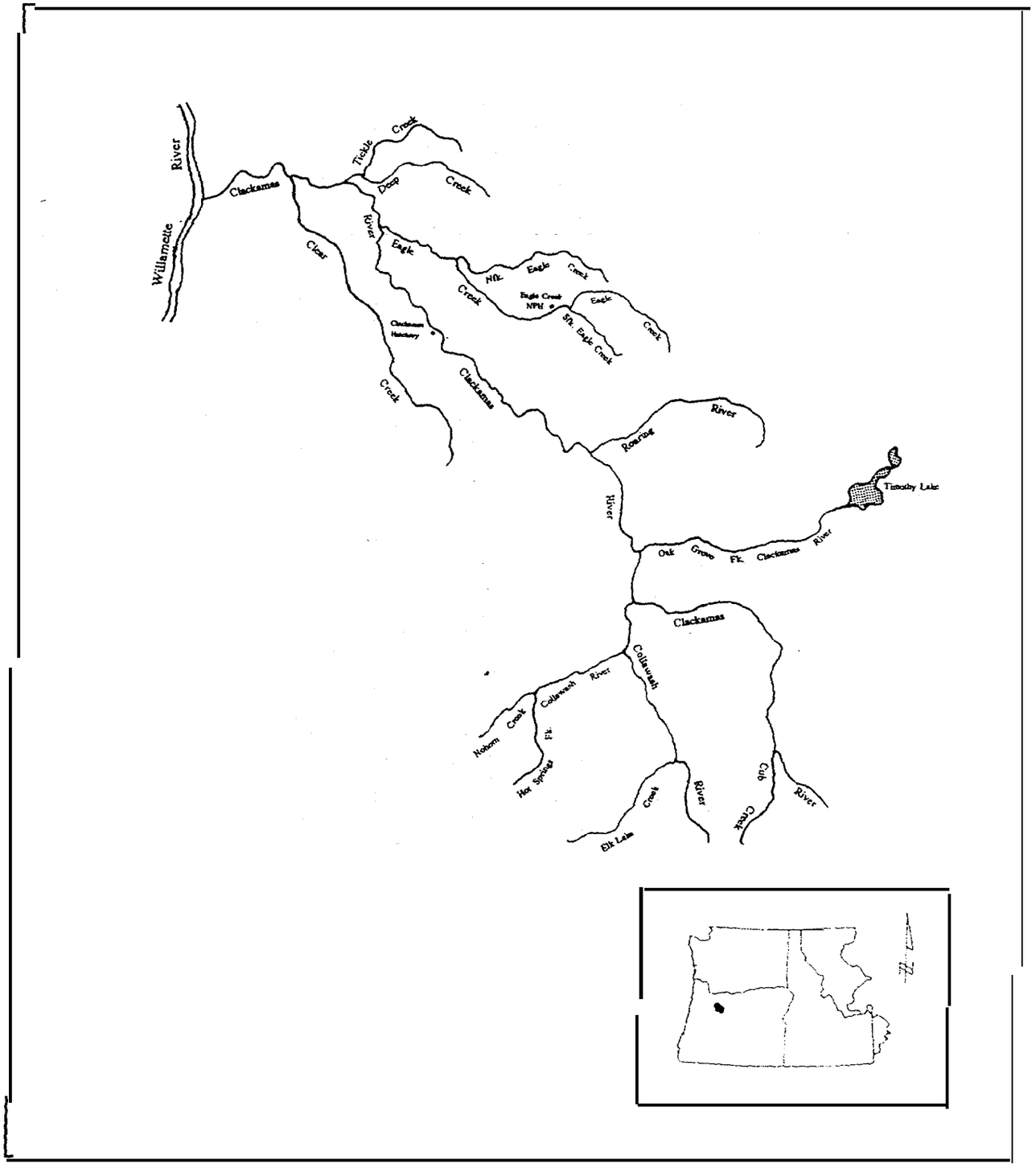
Peak migration of juvenile spring chinook past North Fork Dam occurs in May (Oregon Department of Fish and Wildlife 1990). During 1979-88, an average of 29% of the downstream migrant juveniles passed the dam in May (Oregon Department of Fish and Wildlife 1990). Smaller peaks in the number of downstream migrants past the North Fork Dam occur in October (an average of 10% of annual passage during 1979-88) and November (an average of 19% of annual passage during 1979-88; Oregon Department of Fish and Wildlife 1990).

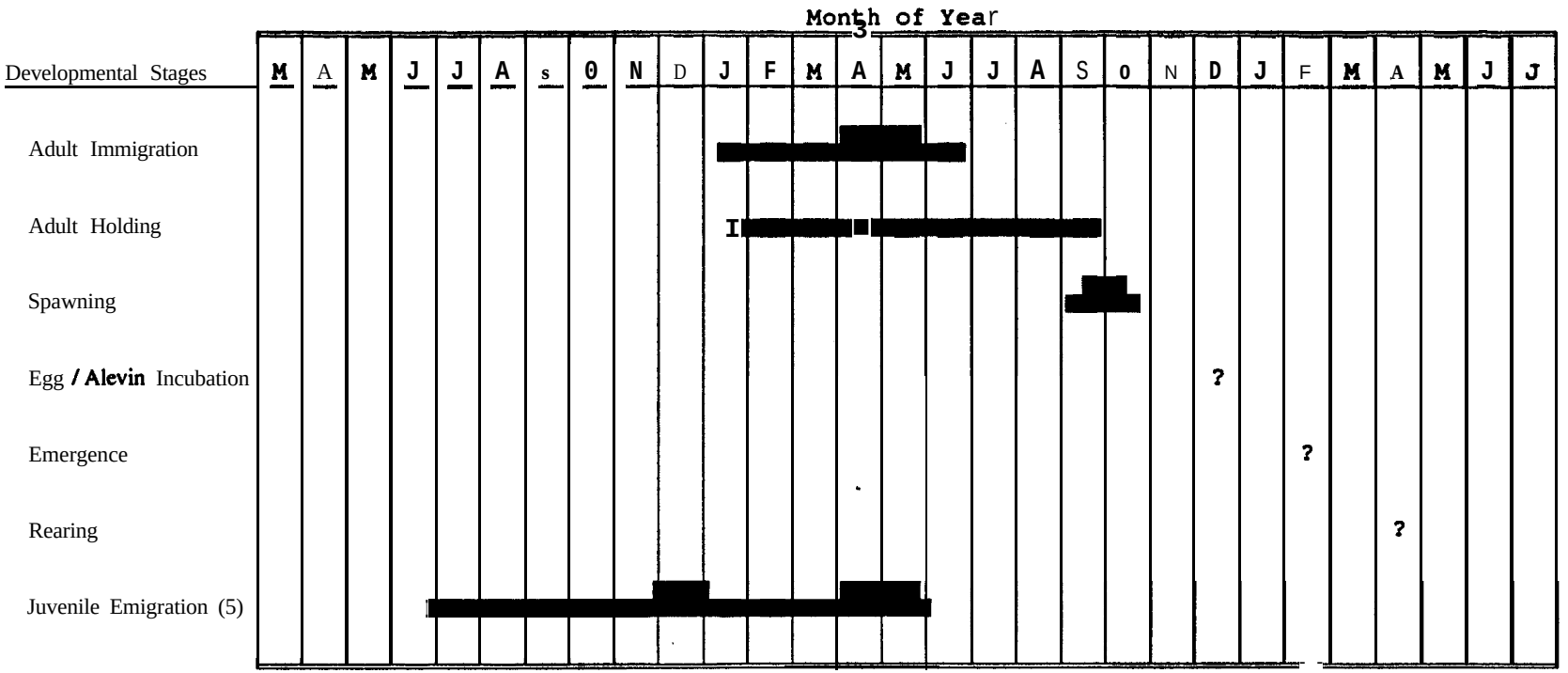
BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile spring chinook were collected from the Collawash River, in the Clackamas subbasin, and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele mobilities and allele frequencies were determined for 17 enzyme systems (Appendix Table 3). No rare alleles were detected.

Schreck et al. (1986) classified Columbia River Basin chinook into several clusters of similar stocks, based on biochemical, morphological, and life history characters. Columbia River Basin chinook stocks segregated into two primary groups. The first group consisted of spring chinook from east of the Cascade Mountains and summer chinook from Idaho. The second group consisted of spring chinook from west of the Cascades, summer chinook from the upper Columbia, and all fall chinook stocks. The second primary group was composed of 3 subgroups. At the subgroup level, wild spring chinook collected from the Collawash River were found to be most similar to other chinook stocks (wild and hatchery, fall and spring) found in the Willamette River subbasin. This subgroup was characterized by the highest average values for head length, gill rakers and pelvic fin rays, and the lowest average values for anal fin rays and pectoral fin rays. This group also had the lowest average frequencies of the common aconitate hydratase, malate dehydrogenase and mannose phosphate isomerase alleles. All stocks placed in this subgroup are native to the Willamette River subbasin, with the possible exception of Clackamas River fall chinook.

Figure 1. The **Clackamas** River subbasin.





Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate adult immigration, spawning, and juvenile emigration.
3. Wide bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.
4. ? -- specific information not available for the Clackamas.
5. Juvenile passage at North Fork Dam. Wide Bars indicate when > 10% of the brood year emigration occurs.

Figure 2 **(TT). Wild spring chinook freshwater life history in the Clackamas River eubbasin (Oregon Department of Fish and Wildlife 1990).**

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Clackamas River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	38.8	45.4	15.8	0.0	--	116.1	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Clackamas River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	100.0	0.0	0.0	--	16.7	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (AI). Immigration of coded wire tagged hatchery spring chinook salmon into the Clackamas River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Eagle Creek NFH	Clackamas River	Hatchery Returns		
	1986	--	36	36
	1987	--	424	472
	1988	--	697	722
	1989	--	329	329

[a] Based on the following tag codes from hatchery fish: 07-31-63, 07-32-01, 07-32-02, 07-32-03. Based on the following tag codes from fish of unknown rearing type (assumed to be hatchery): 10-13-20, 10-13-21, 10-13-22, 10-13-23, 10-25-23, 10-25-24, 10-25-25, 10-25-26, 10-25-27, 10-25-28, 10-25-29, 10-25-30, 10-25-31, 10-25-32, 10-25-33, 10-25-40, 10-26-01, 10-26-02, 10-26-40, 10-26-41, 10-26-44, 10-26-45, 10-26-46, 10-26-47.

[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

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CLACKAMAS RIVER SUBBASIN

Hatchery Produced Spring Chinook Salmon

ORIGIN

The hatchery Willamette stock of spring chinook is the only stock currently released into the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990). Supplementation records are available for the 1959-91 release years (Table 1). Sandy stock and a California stock were released in the 1890's (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990), but it is believed that survival rates were low for these releases (Oregon Department of Fish and Wildlife 1990).

The hatchery Willamette stock was derived primarily from the native Willamette stock (Howell et al, 1985). Historically, spring chinook were trapped and spawned from most of the major tributaries on the east side of the Willamette (Howell et al. 1985). Prior to the 1970's, Willamette River spring chinook eggs and fish were widely exchanged among rearing facilities within the Willamette River subbasin (Howell et al. 1985). Beginning in the mid-1970's and early 1980's the McKenzie, Clackamas and South Santiam hatcheries, and Dexter Pond have primarily collected broodstock from returning fish (personal communication, M. Smith, Oregon Department of Fish and Wildlife, cited by Howell et al. 1985). Recently, Clackamas Hatchery and Eagle Creek National Fish Hatchery (NFH) have utilized broodstock from Marion Forks, Oakridge/Dexter, and South Santiam hatcheries, as well as using returning adult fish for broodstock (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

In recent years, only the hatchery Willamette stock has been released into the Clackamas River subbasin; primarily from Clackamas Hatchery and Eagle Creek NFH. Currently, Clackamas Hatchery is the only facility that rears spring chinook for release into the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990). The current hatchery program releases smolts in the fall and spring (Oregon Department of Fish and Wildlife 1990). Smolts are generally released directly from the hatcheries and fry and fingerlings are released at various locations in the subbasin (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Clackamas, Marion Forks and Willamette hatcheries, and Eagle Creek NFH (Table 1). Annual numbers released ranged from 203,286 to 3,795,169 fish (Table 1). Size at

release ranged from 1,264 to 140.8 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Eagle Creek NFH and Clackamas and Metolius hatcheries (Table 1). Annual numbers released ranged from 13,316 to 3,910,998 fish (Table 1). Size at release ranged from 52 1 .O to 9.4 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Eagle Creek and Carson National Fish hatcheries and Clackamas, Marion Forks, Oak Springs, and Sandy hatcheries (Table 1). Annual numbers released ranged from 552,510 to 1,958,171 fish (Table 1). Size at release ranged from 22.9 to 5.1 fish per pound (Table 1).

Jack and Adult

Hatchery facilities in which adult fish were held prior to release in the subbasin include Willamette and Clackamas hatcheries (Table 1). Annual numbers released ranged from 39 to 1,613 fish (Table 1).

Harvest.

Sport

Ocean: Coded wire tag recoveries from the 1975-77 brood releases from Eagle Creek NFH indicate that less than 1% of these broods were caught in sport fisheries off of the Oregon coast (Oregon Department of Fish and Wildlife 1990). The proportion of these broods caught in other ocean sport fisheries is unknown.

Columbia River: Coded wire tag recoveries from the 1975-77 brood releases from Eagle Creek NFH indicate that 3% of the harvest of these broods was in the Columbia River sport fishery (Oregon Department of Fish and Wildlife 1990).

Subbasin: Although brood year specific estimates of sport harvest for hatchery spring chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Commercial

Ocean: Coded wire tag recoveries from the 1975-77 brood releases from Eagle Creek NFH indicate that less than 1% of these broods were caught in commercial fisheries off of the Oregon coast, and 3% were caught in commercial fisheries located in Washington waters (Oregon Department of Fish and Wildlife 1990). The proportion of these fish caught in other ocean commercial fisheries is unknown.

Columbia River: Coded wire tag recoveries from the 1975-77 brood releases from Eagle Creek NFH indicate that 3% of the harvest of these broods was in the Columbia River gill net fishery (Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timin : Although information on run timing for hatchery produced spring chinook is not available, run timing information for the combined run of naturally and hatchery produced fish is available in Oregon Department of Fish and Wildlife (1990).

Numbers: Although brood year specific estimates of run size for hatchery spring chinook are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Hatchery Facilities

Timing: Adult spring chinook return to hatcheries in the Clackamas River subbasin from May through early November (Oregon Department of Fish and Wildlife 1990). Spawning at Clackamas Hatchery occurs between mid-September and mid-October (Oregon Department of Fish and Wildlife 1990).

Numbers: Although brood year specific estimates of escapement for hatchery spring chinook are not available, estimates by run year for total escapement to Clackamas Hatchery and Eagle Creek NFH are available in Oregon Department of Fish and Wildlife (1990).

Weight

Although brood year specific estimates of weight for hatchery produced spring chinook returning to the Clackamas River subbasin are not available, information from returns of naturally and hatchery produced fish combined is available in Bennett (1990).

Age Structure

Although brood year specific estimates of age structure for hatchery produced spring chinook returning to the Clackamas River subbasin are not available, information from returns of naturally and hatchery produced fish combined is available in Bennett (1990).

Ratio

No information is available on sex ratios for hatchery spring chinook returning to the subbasin. However, hatchery spring chinook are spawned at a ratio of one male to three females (Oregon Department of Fish and Wildlife 1990).

Fecundity

Average mean fecundity for spring chinook spawned at Clackamas Hatchery was estimated at 4,700 eggs per female for the 1983-86 run years (Oregon Department of Fish and Wildlife 1990). Average mean fecundity of spring chinook spawned at Eagle Creek NFH was estimated at 4,500 eggs per female for the 1977-85 run years (Oregon Department of Fish and Wildlife 1990). Fecundities were based on volumetric measurements at Clackamas Hatchery and estimated with an electronic counter at Eagle Creek NFH (Oregon Department of Fish and Wildlife 1990).

Mark Recoveries

Coded wire tagged spring chinook, released as juveniles in the Clackamas River subbasin, were recovered in the Alsea, Elk, and Little White Salmon rivers (Table 2) and in the mainstem Willamette River (Table 2), which is a necessary migration corridor to the Clackamas River.

JUVENILE LIFE HISTORY

Age Structure

Hatchery spring chinook are released as yearling smolts (Oregon Department of Fish and Wildlife 1990).

BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile spring chinook were collected from Eagle Creek NFH, in the Clackamas subbasin, and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele mobilities and allele frequencies were determined for 18 enzyme systems (Appendix Table 3). No rare alleles were detected.

Schreck et al. (1986) classified Columbia River Basin chinook into several clusters of similar stocks, based on biochemical, morphological, and life history characters. Columbia River Basin chinook stocks segregated into two primary groups. The first group consisted of spring chinook from east of the Cascade Mountains and summer chinook from Idaho. The second group consisted of spring chinook from west of the Cascades, summer chinook from the upper Columbia, and all fall chinook stocks. The second primary group was composed of 3 subgroups. At the subgroup level, hatchery spring chinook from Eagle Creek NFH were found to be most similar to other chinook stocks (wild and hatchery, fall and spring) found in the Willamette River subbasin. This subgroup was characterized by the highest average values for head length, gill rakers and pelvic fin rays, and the lowest average values for anal fin rays and pectoral fin rays. This group also had the lowest average frequencies of the common aconitate hydratase, malate dehydrogenase and mannose phosphate isomerase alleles. All stocks placed in this subgroup are native to the Willamette River subbasin, with the possible exception of Clackamas River fall chinook.

DISEASES

Various parasites and infectious disease agents have been identified at Clackamas Hatchery (Table 3). Those of greatest concern are MN, VEN, furunculosis, and ***Zchthyoptherius sp*** (Oregon Department of Fish and Wildlife 1990). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see MIDDLE FORK RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES; see SANTIAM RIVER SUBBASIN, Hatchery Produced Spring Chinook, DISEASES; and see SANDY RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery spring chinook releases into the Clackamas River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1957	Uillamette	Eagle Creek NFH	fing.	02/15/59[d]	--	38.0	604,910	Eagle Creek	--
1958	Willamette	Eagle Creek NFH	fing.	07/15/60[d]	--	33.0	749,100	Eagle Creek	--
1959	Willamette	Eagle Creek NFH	fing.	02/15/61[d]	--	29.0	533,372	Eagle Creek	--
1960	Uillamette	Eagle Creek NFH	fing.	02/15/62[d]	--	28.0	108,945	Eagle Creek	--
1961	Willamette	Eagle Creek NFH	fing.	02/15/63[d]	--	26.0	882,963	Eagle Creek	--
1961	Uillamette	Eagle Creek NFH	fing.	02/15/63[d]	--	30.0	28,931	N Fk Clackamas River	--
1961	Uillamette	Eagle Creek NFH	fing.	05/15/63[d]	--	21.0	28,685	N Fk Clackamas River	--
1962	Uillamette	Eagle Creek NFH	fing.	01/15/64[d]	--	27.0	35,450	N Fk Clackamas River	--
1962	Willamette	Eagle Creek NFH	fing.	01/15/64[d]	--	28.0	1,108,825	Eagle Creek	--
1962	Willamette	Eagle Creek NFH	fing.	02/15/64[d]	--	30.0	182,744	Clackamas River	--
1962	Uillamette	Eagle Creek NFH	fing.	03/15/64[d]	--	32.0	99,300	Eagle Creek	--
1962	Willamette	Eagle Creek NFH	fing.	03/15/64[d]	--	23.0	3,013	Eagle Creek	--
1963	Uillamette	Uillamette	fry	01/01/64	12/31/64[e]	998.0	3,795,169	Clackamas River	--
1963	Uillamette	Eagle Creek NFH	fing.	12/15/64[d]	--	41.1	22,883	N Fk Clackamas River	--
1963	Uillamette	Eagle Creek NFH	fing.	12/15/64[d]	--	48.2	2,458,783	Eagle Creek	--
1964	Willamette	Marion Forks	fry	05/13/65	05/14/65	1,264-0	674,353	Clackamas River	--
1964	Willamette	Marion Forks	fry	05/19/65	--	1,264.0	326,911	Collauash River	--
1964	Uillamette	Eagle Creek NFH	fing.	09/15/65[d]	--	118.0	880,747	Clackamas River	--
1964	Uillamette	Eagle Creek NFH	fing.	11/15/65[d]	--	46.0	360,435	Clackamas River	--
1964	Uillamette	Eagle Creek NFH	fing.	12/15/65[d]	--	45.0	359,565	Ctackamas River	--
1964	Uillamette	Eagle Creek NFH	fing.	02/15/66[d]	--	31.0	1,386,951	Eagle Creek	--
1965	Uillamette	Eagle Creek NFH	fing.	02/15/67[d]	--	36.0	1,813,431	Eagle Creek	--
1965	Uillamette	Eagle Creek NFH	fing.	02/15/67[d]	--	33.0	407,296	Clackamas River	--
1966	Uillamette	Eagle Creek NFH	fing.	04/15/68[d]	--	31.0	1,404,000	Eagle Creek	--
1966	Uillamette	Eagle Creek NFH	fing.	10/15/67[d]	--	65.0	23,000	Clackamas River	--
1966	Uillamette	Eagle Creek NFH	fing.	11/15/67[d]	--	45.0	10,900	Clackamas River	--
1967	Uillamette	Eagle Creek NFH	fing.	11/15/68[d]	--	38.0	15,000	Clackamas River	--
1967	Uillamette	Eagle Creek NFH	fing.	01/15/69[d]	--	39.0	15,630	Clackamas River	--
1967	Uillamette	Eagle Creek NFH	fing.	05/15/69[d]	--	26.0	1,157,613	Eagle Creek	--
1967	Willamette	Uillamette	adult	09/15/67[d]	--	--	1,613	N Fk Reservoir	--
1968	Uillemette	Eagle Creek NFH	fing.	12/15/69[d]	--	29.0	13,322	Clackamas River	--
1968	Uillemette	Eagle Creek NFH	fing.	01/15/70[d]	--	25.0	13,316	Clackamas River	--
1968	Uillamette	Eagle Creek NFH	smolt	05/15/70[d]	--	18.0	620,853	Eagle Creek	--
1968	Uillamette	Eagle Creek NFH	smolt	05/15/70[d]	--	18.0	14,122	Eagle Creek	--
1968	Uillamette	Eagle Creek NFH	smolt	05/15/70[d]	--	17.0	15,400	Eagle Creek	--
1969	Uillamette	Eagle Creek NFH	fing.	04/15/71[d]	--	17.0	460,150	Eagle Creek	--
1970	Uillamette	Eagle Creek NFH	fing.	05/15/72[d]	--	9.4	75 388	Eagle Creek	--
1971	Uillamette	Eagle Creek NFH	smolt	05/15/73[d]	--	17.2	953'232	Eagle Creek	--
1971	Uillamette	Eagle Creek NFH	smolt	06/15/73[d]	--	14.8	'857	Eagle Creek	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Clackamss River subbesin by brood year and, if merked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1971	Wi llamette	Eagle Creek NFH	smolt	06/15/73[d]	--	17.2	2,000	Clackamas River	--
1972	Uillamette	Metol ius	fing.	05/03/73[d]	--	521.0	325,104	Clackamas River	--
1972	Uiflamette	Eagle Creek NFH	smolt	04/15/74[d]	--	18.4	552,510	Eagle Creek	--
1973	Willamette	Eagle Creek NFH	smolt	05/15/75[d]	--	14.1	289,710	Eagle Creek	--
1973	Uillamette	Carson	smolt	05/15/75[d]	--	15.2	316,860	Eagle Creek	--
1974	Uillamette	Eagle Creek NFH	smolt	05/15/76[d]	--	17.3	848,650	Eagle Creek	--
1975	Willamette	Eagle Creek NFH	smolt	05/15/77[d]	--	13.7	251,943	Eagle Creek	--
1975	Willamette	Marion Forks	smolt	03/11/77	03/18/77	14.7	377,392	Eagle Creek	--
1975	Willamette	Oak Springs	smolt	03/09/77	03/10/77	22.9	465,247	Eagle Creek	--
1975	Willamette	Sandy	smolt	03/24/77	--	13.5	9,652	Eagle Creek	--
1976	Uillamette	Eagle Creek NFH	smolt	04/15/78[d]	--	14.9	782,473	Eagle Creek	--
1976	Willamette	Clackames	smolt	03/15/78	03/25/78	10.1	478,048	Clackamss River	--
1977	Ui llamette	Eagle Creek NFH	smolt	04/15/79[d]	--	14.9	421,327	Eagle Creek	
1977	Wil lamette	Clackamas	smolt	03/15/79	03/29/79	7.7	500,090	Clackamas River	--
1978	Willamette	Eagle Creek NFH	smolt		--	7.1	640,053	Clackamas River	--
1978	Willamette	Eagle Creek NFH	smolt	04/15/80, 11/16/79	--	14.4	402,144	Eagle Creek	
1979	Willamette	Eagle Creek NFH	smolt	04/15/81[d]	--	15.2	940,647	Eagle Creek	--
1979	Eagle Cr.	Clackamss	smolt	11/05/80	--	8.4	359,476	Clackames River	
1979	Willamette[f]	Clackamas	smolt	03/31/81	--	13.8	2,912	Clackamas River	--
1979	S. Santiam R.	Clackamas	smolt	11/06/80	--	7.8	494,990	Clackamss River	--
1980	Willamette	Eagle Creek NFH	fing.	10/23/81	--	64.6	61,830	Eagle Creek	
1980	Uillamette	Eagle Creek NFH	fing.	11/02/81	--	34.8	158,960	Eagle Creek	--
1980	Ui llamette	Eagle Creek NFH	fing.	11/20/81	--	33:o	31,461	Eagle Creek	
1980	Ui llamette	Clackamas	fing.	03/12/81	--	400.0	4,000	North Fk Reservoir	--
1980	Uillamette	Eagle Creek NFH	smolt	05/03/82	--	12.0	518,204	Eagle Creek	--
1980	Willamette	Eagle Creek NFH	smolt	05/05/82	--	15.5	71,420	Eagle Creek	--
1980	Eagle Cr.	Clackames	smolt	10/16/81	--	9.5	384,760	Clackamas River	--
1980	Eagle Cr.	Clackames	smolt	10/17/81	--	9.7	398,456	Clackames River	--
1981	Clackames R.	Eagle Creek	smolt	04/25/83	--	10.7	540,307	Eagle Creek	--
1981	MFk Will.[g]	Clackamss	smolt	11/03/82	11/05/82	6.5	616,083	Clackamas River	--
1981	MFk Will.[g]	Clackames	smolt	11/03/82	--	6.6	6,996	Clackamss River	--
1981	MFk Will.[g]	Clackamas	smolt	11/03/82	--	6.9	6,245	Clackames River	--
1981	MFk Will.[g]	Clackamas	smolt	11/03/82	11/05/82	7:o	218,756	Clackames River	--
1981	MFk Will.[g]	Clackames	smolt	11/03/82	--		6,862	Clackames River	--
1981	MFk Will.[g]	Clackames	smolt	11/03/82	--	5::	25,852	Clackamas River	--
1981	MFk Will.[g]	Clackamas	smolt	11/03/82	--	7.6	14,846	Clackames River	--
1981	MFk Will.[g]	Clackamss	smolt	11/03/82	--	7.9	27,650	Clackames River	--
1982	MFk Will.[g]	Marion Forks	fry	06/07/83	--	415:o	246,625	Clackamss River	--
1982	MFk Will.[g]	Marion Forks	fry	06/07/83	--	395.0	154,840	Collawash River	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Clackamas River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1982	MFk Will.[g]	Narion Forks	fry	06/07/83		410.0	177,290	Hot Springs Fork	--
1982	MFk Will.[g]	Narion Forks	fry	05/26/83	--	492.0	175,130	North Fork Reservoir	--
1982	Clackames R.	Eagle Creek	fry	06/07/83	--	164.7	66,370	Eagle Creek	--
1982	Clackamas R.	Eagle Creek	smolt	10/17/83	10/17/83	8.2	634,885	Eagle Creek	--
1982	MFk Will.[g]	Clackamas	smolt	11/07/83	--	5.1	5,952	Clackamas River	--
1982	MFk Will.[g]	Clackamss	smolt	11/04/83	11/09/83	5.2	744,574	Clackamas River	--
1982	MFk Will.[g]	Clackamas	smolt	11/07/83	--	5.3	4,873	Clackames River	--
1982	MFk Will.[g]	Clackamas	smolt	11/07/83	11/08/83	5.5	14,830	Clackamas River	--
1982	MFk Will.[g]	Clackamas	smolt	11/07/83	--	5.7	5.415	Clackamas River	--
1982	MFk Will.[g]	Clackamas	smolt	11/07/83		6.5	7,335	Clackamas River	--
1983	MFk Will.[g]	Narion Forks	fry	06/01/84	--	287:0	18,655	Clackamas River	--
1983	MFk Will.[g]	Marion Forks	fry	06/01/84	--	369.0	206,640	Clackamas River	--
1983	MFk Will.[g]	Narion Forks	fry	05/31/84	--	365.0	129,940	Collawash River	--
1983	MFk Will.[g]	Narion Forks	fry	05/31/84	--	365.0	120,085	Hot Springs Fork	--
1983	MFk Will.[g]	Narion Forks	fry	05/30/84		392.0	75,264	Hot Springs Fork	--
1983	MFk Will.[g]	Marion Forks	fry	05/30/84	--	392.0	175,596	North Fork Reservoir	--
1983	Clackamas R.	Eagle Creek	smolt	06/18/85		8.0	1,276	Eagle Creek	--
1983	Clackamas R.	Eagle Creek	smolt	04/29/85	--	9.5	98,141	Eagle Creek	--
1983	Clackamas R.	Eagle Creek	smolt	04/29/85	--	9.7	85,484	Eagle Creek	--
1983	Clackamas R.	Eagle Creek	smolt	04/29/85		10.8	227,567	Eagle Creek	--
1983	Clackamas R.	Eagle Creek	smolt	10/23/84		12.2	207,858	Eagle Creek	--
1983	Uillamette	Eagle Creek	smolt	10/15/85	--	10.6	221,047	Eagle Creek	--
1983	Eagle Cr.	Clackamas	smolt	10/16/84	--	6.4	358,259	Clackamss River	--
1983	MFk Will.[g]	Clackamas	smolt	11/06/84		8.1	363,342	Clackamas River	--
1983	Uillamette	Clackamas	adult	06/15/83	--	--	93	Clackamas River	--
1983	Willamette	CLackamas	adult	08/31/83		--	114	Clackamss River	--
1984	Uillamette	CLackamas	fry	12/28/84	--	--	89,619	Clear Creek	--
1984	Clackamas R.	Eagle Creek	fry	07/17/85	--	140.8	32,384	Collawash River	--
1984	Clackamas R.	Eagle Creek	smolt	10/31/86	--	6.9	221,628	Eagle Creek	--
1984	Clackamas R.	Eagle Creek	smolt	05/01/86		7.6	255,052	Eagle Creek	--
1984	Eagle Cr.	Clackamas	smolt	10/17/85		8.3	661,346	Clackamas River	--
1984	Eagle Cr.	Clackamas	smolt	10/17/85		8.3	61,082	Clackamas River	AD
1984	Willamette	Clackamss	adult	09/21/84	--	--	109	Clackamas R, above N Fk Dam	--
1985	Willamette	Clackamas	fry	12/30/85		--	170,902	Clackamas R, above N Fk Dam	--
1985	Clackamas R.	Eagle Creek	fry	02/20/86	--	1,045	118,817	Clackamas River	--
1985	CLackamas R.	Eagle Creek	fry	02/20/86	--	1,045	52,773	Eagle Creek	--
1985	Clackamas R.	Eagle Creek	fry	02/20/86		1,045	79,211	North Fork Reservoir	--
1985	Clackamas R.	Eagle Creek	smolt	04/28/87	--	8.5	309,102	Eagle Creek	--
1985	Clackamas R.	Eagle Creek	smolt	04/20/87	--	8.9	207,845	Eagle Creek	--
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	6.6	10,460	Clackamas River	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Clackamas River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	6.6	1,064	Clackamas River	07-39-10
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	6.6	1,001	Clackamas River	07-39-11
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	8.0	14,213	Clackamas River	--
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	8.0	1,446	Clackamas River	07-39-10
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	8.0	1,361	Clackamas River	07-39-11
1985	Eagle Cr.	Clackamas	smolt	10/27/86	--	8.1	378,914	Clackamas River	--
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	8.4	13,495	Clackamas River	--
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	8.4	1,373	Clackamas River	07-39-10
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	8.4	1,292	Clackamas River	07-39-11
1985	Eagle Cr.	Clackemas	smolt	03/16/87	--	8.9	16,561	Clackamas River	--
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	8.9	1,685	Clackamas River	07-39-10
1985	Eagle Cr.	Clackamas	smolt	03/16/87	--	8.9	1,586	Clackamas River	07-39- 11
1985	Eagle Cr.	Clackamas	smolt	10/13/86	--	9.6	276,021	Clackamas River	--
1985	Eagle Cr.	Clackamas	smolt	10/13/86	--	9.6	14,652	Clackamas River	07-39-06
1985	Eagle Cr.	Clackamas	smolt	10/13/86	--	9.6	13,849	Clackamas River	07-39-07
1985	Eagle Cr.	Clackamas	smolt	10/13/86	--	9.6	14,678	Clackamas River	07-39-08
1985	Eagle Cr.	Clackamas	smolt	10/13/86	--	9.6	14,434	Clackamas River	07-39-09
1985	Uillamette	Clackamas	adult	06/05/85	--	--	39	Clackamas R, above N Fk Dam	
1986	Eagle Cr.	Clackamas	smolt	04/13/88	--	7.4	332,710	Clackamas River	--
1986	Eagle Cr.	Clackamas	smolt	04/13/88	--	7.4	14,224	Clackamas River	07-37-19
1986	Eagle Cr.	Clackamas	smolt	10/13/87	--	9.4	379,190	Clackamas River	
1986	Eagle Cr.	Clackamas	smolt	10/13/87	--	9.4	56,660	Clackamas River	07-47-13
1986	Eagle Cr.	Clackamas	smolt	10/15/87	--	9.7	144,918	Clackamas River	--
1986	Eagle Cr.	Clackamas	smolt	10/16/87	--	10.1	91,557	Clackamas River	--
1986	MFk Will.[g]	Clackamas	smolt	04/13/88	--	7.4	104,806	Clackamas River	--
1986	MFk Will.[g]	Clackamas	smolt	03/03/88	--	9.1	275,595	Clackamas River	--
1986	MFk Will.[g]	Clackamas	smolt	03/03/88	--	9.1	15,423	Clackamas River	07-37-20
1987	Eagle Cr.	Clackamas	smolt	03/10/89	--	9.3	305,058	Clackamas River	--
1987	Eagle Cr.	Clackamas	smolt	03/10/89	--	9.3	7,822	Clackamas River	07-46-53[h]
1987	Eagle Cr.	Clackamas	smolt	03/14/89	--	10.0	50,376	Clackamas River	--
1987	Eagle Cr.	Clackamas	smolt	03/14/89	--	10.0	1,291	Clackamas River	07-46-53[h]
1987	Eagle Cr.	Clackamas	smolt	09/30/88	--	10.8	136,836	Clackamas River	--
1987	Eagle Cr.	Clackamas	smolt	09/27/88	--	10.9	309,576	Clackamas River	--
1987	Eagle Cr.	Clackamas	smolt	09/27/88	--	10.9	57,220	Clackamas River	07-50-52
1987	MFk Will.[g]	Clackamas	smolt	03/09/89	--	9.5	287,844	Clackamas River	
1987	MFk Will.[g]	Clackamas	smolt	03/09/89	--	9.5	16,109	Clackamas River	07-46-54
1988	Eagle Cr.	Clackamas	smolt	09/12/89	--	9.5	32,433	Clackamas River	07-52-02
1988	Eagle Cr.	Clackamas	smolt	03/12/90	--	10.4	256,735	Clackamas River	--
1988	Eagle Cr.	Clackamas	smolt	03/12/90	--	10.4	15,807	Clackamas River	07-52-05

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Clackamas River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nunber Released	Release Location	CWT Code/ Fin Clip[c]
1988	Eagle Cr.	Clackamas	smolt	09/12/89	--	10.5	290,850	Clackamss River	--
1988	Eagle Cr.	Clackamss	smolt	08/14/89	--	11.1	364,907	Clackams River	--
1988	Eagle Cr.	Clackamss	smolt	08/14/89	--	11.1	32,595	Clackamas River	07-52-01
1988	Eagle Cr.	Clackamas	smolt	03/12/90	--	11.2	274,344	Clackamss River	--
1988	Eagle Cr.	Clackamas	smolt	03/12/90	--	11.2	16,582	Clackamas River	07-52-03
1989	Eagle Cr.	Clackamas	smolt	09/14/90	--	8.0	26,192	Clackamas River	07-54-38
1989	Eagle Cr.	Clackamas	smolt	09/14/90	--	8.4	265,776	Clackams River	--
1989	Eagle Cr.	Clackamas	smolt	09/14/90	--	8.5	26,206	Clackamas River	07-54-38
1989	Eagle Cr.	Clackamas	smolt	03/28/91	--	9.8	180,830	Clackamas River	--
1989	Eagle Cr.	Clackamas	smolt	08/14/90	--	10.9	176,340	Clackamas River	--
1989	Eagle Cr.	Clackamss	smolt	08/14/90	--	10.9	53,868	Clackamss River	07-54-36
1989	Eagle Cr.	Clackamas	smolt	08/13/90	--	11.3	28,815	Clackamas River	--
1989	Eagle Cr.	Clackamss	smolt	03/18/91	--	11.5	283,813	Clackamss River	--
1989	Eagle Cr.	Clackamas	smolt	03/18/91	--	11.5	31,885	Clackamas River	07-53-49
1989	Eagle Cr.	Clackamas	smolt	08/13/90	--	12.0	27,276	Clackamas River	--
1989	Eagle Cr.	Clackamas	smolt	08/13/90	--	12.8	28,685	Clackamas River	--
1990	Eagle Cr.	Clackamss	smolt	09/03/91	--	9.0	263,655	Clackamas River	--
1990	Eagle Cr.	Clackamas	smolt	09/03/91	--	9.0	51,345	Clackamas River	07-53-46
1990	Eagle Cr.	Clackamas	smolt	08/05/91	--	13.5	257,773	Clackamas River	--
1990	Eagle Cr.	Clackamas	smolt	08/05/91	--	13.5	50,567	Clackamas River	07-54-52

a Modified from Oregon Department of Fish and Uildlife (1990); and Oregon Department of Fish and Wildlife's hatchery production database.
b North Santiam, South Santiam, Clackamss, and Riddle Fork Willamette rivers stocks, and Eagle Creek stock are all considered part of Willamette River stock.
c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LN = left maxillary fin clip; RN = right maxillary fin clip; AD+ = adipose fin clip plus coded uire tag (tag code unknown); AD-CUT = adipose fin clip plus coded uire tag (tag code unknoun); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if knoun, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.
d Day(s) of release unknown. Standardized to the 15th of the month.
e Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.
f Fall Creek Reservoir stock.
g Willamette Fish Hatchery stock.
h Juveniles with this tag group uere also released into the Sandy River subbasin.

Table 2 (AR). Emigration of coded wire tagged hatchery spring chinook salmon released as juveniles into the Clackamas River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Clackamas River	Alsea River	Hatchery Returns		
	1978	--	1	1
Clackamas River	Elk River	Hatchery Returns		
	1987	--	1	1
Clackamas River	Little White Salmon	Hatchery Returns		
	1989	--	1	1
Clackamas River	Willamette River	Trap Returns		
	1985	--	1	1
	1986	--	--	--
	1987	--	6	9
	1988	--	1	2

[a] Based on the following tag codes from hatchery reared fish: 07-39-07, 09-16-58. Based on the following tag codes from fish of unknown rearing type (assumed to be hatchery): 10-25-25, 10-25-26, 10-26-41.

[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

Table 3 (TD). Parasites and diseases of spring chinook at hatcheries located in the Clackamaa River[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Clackamas	Ich *(Ichthyophthirius multifilis)*
Parasite	Clackamas	Gill amoeba
Parasite	Clackamas	Fluke miricidium
Parasite	Clackamas	*Trichodina spp.*
Parasite	Clackamas	Costia *(Ichthyobodo sp.)*
Parasite	Clackamas	*Hexamita spp.*
Parasite	Clackamas	*Dermocystidium*
Bacteria	Clackamas	Furunculosis *(Aeromonas salmonicida)*
Bacteria	Clackamas	Columnaris *(Flexibacter columnaris)*
Bacteria	Clackamas	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Clackamas	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	Clackamas	Proliferated Kidney Disease (PKD)
Bacteria	Clackamas	*Aeromonas spp.*
Bacteria	Clackamas	*Pseudomonas spp.*
Virus	Clackamas[b]	Infectious Hematopoietic Necrosis (IHN)
Virus	Clackamas	Viral Erythropoietic Necrosis (VEN)
Virus	Clackamas	Erythrocytic Inclusion Body Syndrome (EIBS)
Fungi	Clackamas	Internal
Fungi	Clackamas	External

[a] Except where footnoted, data are from *Oregon* Department of Fish and Wildlife (unpublished data).
[b] Personal communication, 1991, Terry Kreps, Oregon Department of Fish and Wildlife, Clackamas, Oregon.

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Howell, P.J., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Clackamas River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

Schreck, C.B., H.W. Li, R.C. Hjort, and C.S. Sharpe. 1986. Stock identification of Columbia River chinook salmon and steelhead trout. Final Report of Oregon Cooperative Fisheries Unit, Oregon State University (Project 83-451, Agreement DE-A179-83 BP 13499) to Bonneville Power Administration, Portland, Oregon.

CLACKAMAS RIVER SUBBASIN

Naturally Produced Fall Chinook Salmon

GEOGRAPHIC LOCATION

The Clackamas River originates on the west slope of the Cascade Mountains, between Mount Hood and Mount Jefferson. The Clackamas River flows into the Willamette River at River Mile (RM) 24.8. Major tributaries of the Clackamas River include the Roaring and Collawash rivers, the North and Oak Grove forks, and Clear, Deep, Eagle, and Fish creeks (see CLACKAMAS RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The Clackamas River subbasin drams an area of 934 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

It is believed that fall chinook were native to the Clackamas River but there is no historic information available on the native stock (Oregon Department of Fish and Wildlife 1990). Currently, all natural fall chinook production in the Clackamas River subbasm is thought to be derived from Lower Columbia River Hatchery (LRH) stock fall chinook that spawn in the subbasin (see CLACKAMAS RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon).

DISTRIBUTION

Subbasin

Fall chinook spawn and rear in the mainstem Clackamas River (Oregon Department of Fish and Wildlife 1990). Prior to completion of the North Fork Dam complex, fall chinook spawned above the site (Oregon Department of Fish and Wildlife 1990). Currently, fall chinook spawning and rearing habitat is limited to the mainstem Clackamas River below River Mill Dam and in the lower reaches of Clear Creek (Oregon Department of Fish and Wildlife 1990). Available fall chinook habitat in the Clackamas River subbasin is rated as primarily of "fair" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, and spawning were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced fall chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for naturally produced fall chinook are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Numbers: No brood year specific estimates of spawner escapement to the Clackamas River subbasin are available. Spawning ground counts are available in Oregon Department of Fish and Wildlife (1990).

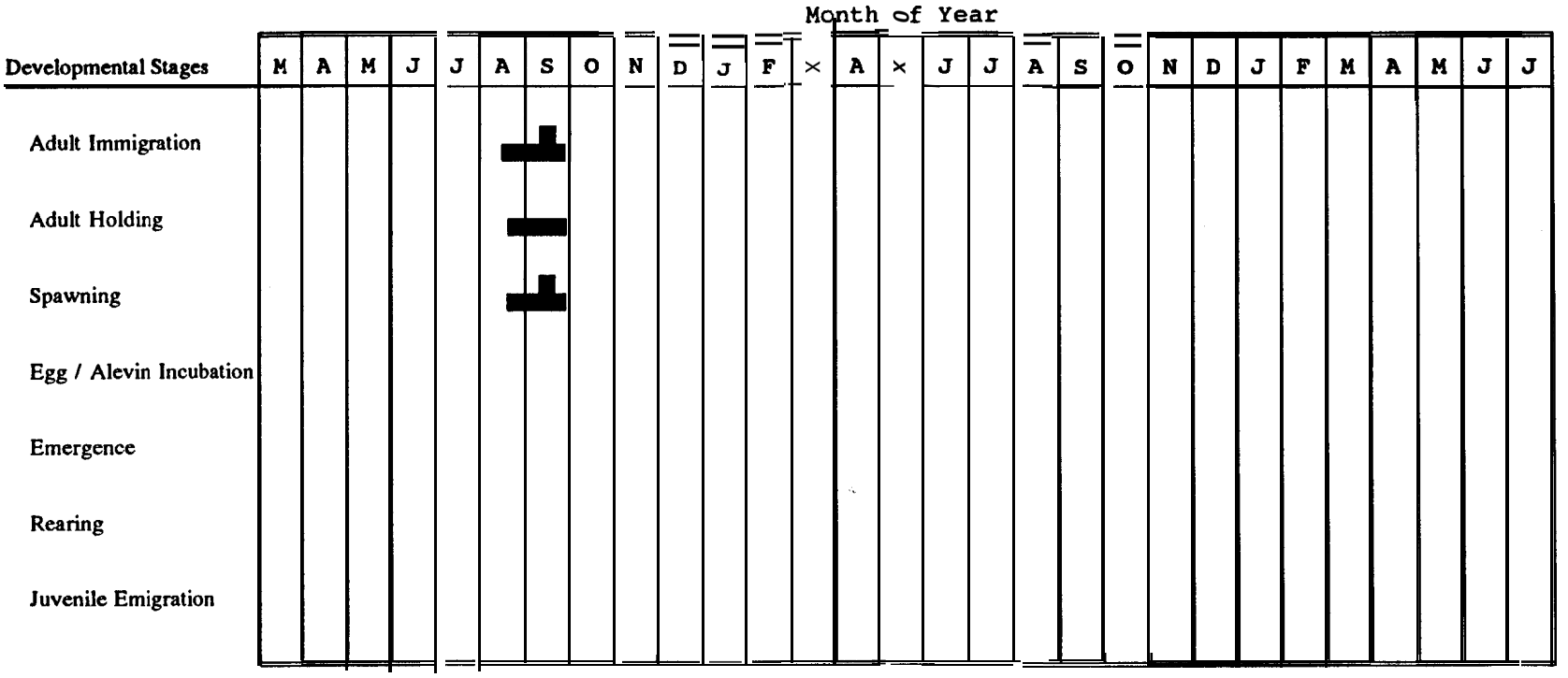
Strays

Coded wire tagged stray fall chinook, released as juveniles into Big Creek and the Willamette River, were recovered in the Clackamas River subbasin (Table 3).

BIOCHEMICAL-GENETIC INFORMATION

Juvenile fall chinook were collected from the Clackamas River and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele mobilities and allele frequencies were determined for 18 enzyme systems (Appendix Table 3). No rare alleles were detected. There is a possibility that the sample was actually comprised of spring chinook (Oregon Department of Fish and Wildlife 1990).

Schreck et al. (1986) classified Columbia River Basin chinook into several clusters of similar stocks, based on biochemical, morphological, and life history characters. Columbia River Basin chinook stocks segregated into two primary groups. The first group consisted of spring chinook from east of the Cascade Mountains and summer chinook from Idaho. The second group consisted of spring chinook from west of the Cascades, summer chinook from the upper Columbia, and all fall chinook stocks. The second primary group was composed of 3 subgroups. At the subgroup level, wild fall chinook collected from the Clackamas River were found to be most similar to other chinook stocks (wild-and hatchery, fall and spring) found in the Willamette River subbasin. This subgroup was characterized by the highest average values for head length, gill rakers and pelvic fin rays, and the lowest average values for anal fin rays and pectoral fin rays. This group also had the lowest average frequencies of the common aconitate hydratase, malate dehydrogenase and mannose phosphate isomerase alleles. All stocks placed in this group are native to the Willamette River subbasin, with the possible exception of Clackamas River fall chinook.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate adult immigration and spawning.
3. Wide bars indicate periods of heavies adult immigration, spawning, and juvenile emigration.

Figure 1 (TT). Native fall chinook freshwater life history in the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HE-l). Estimated amount of spawning and rearing habitat by quality of Clackamas River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	3.8	8.0	16.2	0.0	--	26.5	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Clackamas River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (AI). Immigration of coded wire tagged hatchery fall chinook salmon into the Clackamas River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Big Creek, OR	Clackamas River 1990	Hatchery Returns --	1	1
Willamette River	Clackamas River 1990	Hatchery Returns --	1	1

[a] Based on the following tag codes: 07-38-21, 07-41-44.
[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Clackamas River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

Schreck, C.B., H.W. Li, R.C. Hjort, and C.S. Sharpe. 1986. Stock identification of Columbia River chinook salmon and steelhead trout. Final Report of Oregon Cooperative Fisheries Unit, Oregon State University (Project 83-451, Agreement DE-A179-83 BP 13499) to Bonneville Power Administration, Portland, Oregon.

CLACKAMAS RIVER SUBBASIN

Hatchery Produced Fall Chinook Salmon

ORIGIN

Currently, there is no hatchery fall chinook program in the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990). Historic releases were primarily of Lower Columbia River Hatchery (LRH; see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, ORIGIN) stock.

DISTRIBUTION

Subbasin

The first recorded release of hatchery fish into the subbasin was in 1952. Releases were made into the mainstem and various tributaries (Oregon Department of Fish and Wildlife 1990). No hatchery fall chinook have been released into the Clackamas River subbasin since 1981 (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Big Creek, Oxbow and Cascade hatcheries (Table 1). Annual numbers released ranged from 9,560 to 1,743,000 fish (Table 1). Size at release ranged from 1,214 to 150 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Bonneville, Delph Creek, Oxbow, Eagle Creek National, Klaskanine, Nehalem, Cascade, Spring Creek, White Salmon, and Sandy hatcheries and Sta ton Pond (Table 1). Annual numbers released ranged from 4,080 to 5,685,211 fish (Tab e 1). Size at release ranged from 1,020 to 80 fish per pound (Table 1).

Smolt

The only hatchery in which smolts were reared or acclimated prior to release in the subbasin was Oxbow Hatchery (Table 1). In 1955, 40,010 smolts were released at a size of 41 .O fish per pound (Table 1).

Jack and Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery fall chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for hatchery fall chinook are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Hatchery Facilities

There are no hatchery facilties located in the subbasin that collect or spawn returning fish for subbasin hatchery production.

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery fall chinook releases into the Clackamas River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CUT Fin Clip	Code/
1951	LRH	Bonneville	fing.	06/15/52[c]	--	357	300,000	Clackamas River	..	
1951	LRH	Bonneville	f ing.	06/15/52[c]	--	320	200,000	Clear Creek	..	
1951	LRH	Bonneville	fing.	06/15/52[c]	--	380	75,000	Deep Creek	..	
1951	LRH	Bonneville	fing.	06/15/52[c]	--	320-380	250,000	Eagle Creek	..	
1951	LRH	Bonneville	fing.	06/15/52[c]	--	380	100,000	Roaring River	..	
1951	LRH	Delph Creek	fing.	01/01/52	12/31/52[d]	..	406,610	Delph Cr	..	
1952	LRH	Bonneville	fing.	03/15/53[c]	--	352	1 ,ooo,ooo	Clackamas River	..	
1952	LRH	Bonneville	fing.	03/15/53[c]	--	552	500,000	Clear Creek	..	
1952	LRH	Bonneville	fing.	03/15/53[c]	--	675	500,000	Eagle Creek	..	
1952	LRH	Delph Creek	fing.	01/01/53	12/31/53[d]	..	416,000	Delph Cr	..	
1953	LRH	Delph Creek	fing.	05/15/54[c]	--	..	95,000	Delph Cr	..	
1953	LRH	Delph Creek	fing.	01/01/54	12/31/54[d]	..	100,000	Delph Cr	..	
1953	LRH	Oxbow	fing.	04/15/54[c]	--	350	660,000	Clackamas River	..	
1953	LRH	oxbow	fing.	04/15/54[c]	--	350	195,700	Clear Creek	..	
1954	LRH	oxbow	smolt	10/15/55[c]	--	41	40,010	Clackamas River	..	
1956	LRH	Eagle Creek NFH	fing.	05/15/57[c]	--	293	1,769,138	Eagle Creek	..	
1957	LRH	Eagle Creek NFH	fing.	05/15/58[c]	--	244	1,750,008	Eagle Creek	..	
1958	LRH	Eagle Creek NFH	fing.	02/15/59[c]	--	1,020	3,084,145	Eagle Creek	..	
1958	LRH	Eagle Creek NFH	fing.	05/15/59[c]	--	324	2,601,066	Eagle Creek		
1959	LRH	Eagle Creek NFH	fing.	04/15/60[c]	--	986	1,012,607	Eagle Creek	..	
1959	LRH	Eagle Creek NFH	fing.	06/15/60[c]	--	230	2,890,274	Eagle Creek		
1960	LRH	Eagle Creek NFH	fing.	06/15/61[c]	--	2 0 9	2,193,611	Eagle Creek	..	
1962	LRH	Eagle Creek NFH	fing.	[illegible][c]		'323	2,435,531	Eagle Creek	..	
1963	LRH	Eagle Creek NFH	fing.	05/15/63[c]		435	1,427,326	Clackamas River		
1964	LRH	Eagle Creek NFH	fing.	05/15/65[c]	--	479	554,290	Clackamss River	..	
1964	LRH	Big Creek	fry	03/18/65	--	1,188	118,576	Clackamas River	..	
1964	LRH	Klaskanine	fing.	03/30/65	--	474	302,412	Clackamas River		
1964	LRH	Klaskanine	fing.	03/31/65	--	412	315,592	Clackamas River	..	
1964	LRH	Klaskanine	fing.	04/01/65	--	421	303,541	Clackamas River	..	
1964	LRH	Nehalem	fing.	05/12/65	--	843	541,206	Clackamas River	..	
1964	LRH	Nehalem	fing.	05/13/65	--	800	260,800	Clackamas River	..	
1964	LRH	Nehalem	fing.	06/07/65	--	444	372,835	Clackamas River	..	
1966	LRH	Oxbow	fry	02/09/67	--	1,214	700,000	Collawash & Hot Spr. Frk.	..	
1966	LRH	oxbow	fry	02/09/67	02/10/67	1,214	1,043,000	Roaring R. & Austin Hot Spr.	..	
1966	LRH	Cascade	fing.	05/05/67	--	452	501,720	Collawash R & Hot Spr. Fk.	..	
1967	BPH	Spring Creek	fing.	02/02/68	02/05/68	660	1,050,000	Paradise & Barton	..	
1967	BPH	White Salmon	fing.	06/10/68	06/14/68	182	1,027,000	Paradise	..	
1967	LRH	Eagle Creek NFH	fing.	05/06/68	06/08/68	487	1,813,800	Barton	..	
1970	LRH	Steyton Pond	fing.	06/01/71	06/18/71	a2	313.373	Paradise	..	

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Clackamas River subbasin by brood year and, if marked, coded uire tag code'.

Brood Year	Stock[b]	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release location	CWT Code/ Fin Clip
1971	LRH	Cascade	fry	03/07/72	--	1,045	806,055	Paradise & Barton	--
1971	LRH	Sandy	fing.	04/14/72	--	334	424,000	Paradise & Barton	--
1979	Tanner Cr	Cascade	fry	06/20/80	--	150	9,560	Eagle Creek	--
1980	Tanner Cr	Stayton Pond	fing.	06/10/81	--	80	4,080	Clackamas River	--

a Modified from Oregon Department of Fish and Wildlife (1990); and Oregon Department of Fish and Wildlife's hatchery production database.
b For the 1951-71 brood years, the stock is unknown, but assuned to be LRH stock (lower Columbia River Hatchery stock) or BPH stock (Bonneville Pool Hatchery stock), based on the associated hatchery. Both LRH and BPH stocks are informally called tules. Tanner Creek stock is part of the LRH stock group.
c Day(s) of release unknown. Standardized to the 15th of the month.
d Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.

REFERENCES

Howell, P.J., K. Jones, D. Scamecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Clackamas River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

CLACKAMAS RIVER SUBBASIN

Naturally Produced Early Run Coho Salmon

GEOGRAPHIC LOCATION

The Clackamas River originates on the west slope of the Cascade Mountains, between Mount Hood and Mount Jefferson. The Clackamas River flows into the Willamette River at River Mile (RM) 24.8. Major tributaries of the Clackamas River include the Roaring and Collawash rivers, the North and Oak Grove forks, and Clear, Deep, Eagle, and Fish creeks (see CLACKAMAS RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The Clackamas River subbasin drains an area of 934 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Early run coho are not native to the Clackamas River subbasin. A naturally producing run has been established from releases of hatchery fish (see CLACKAMAS RIVER SUBBASIN, Hatchery Produced Coho Salmon; Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Naturally produced early run coho primarily spawn above the North Fork Dam (Oregon Department of Fish and Wildlife 1990). For a description of the quality of coho spawning and rearing habitat, (see CLACKAMAS RIVER SUBBASIN, Naturally Produced Late Run Coho Salmon, DISTRIBUTION, Subbasin).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of harvest for naturally produced early run coho are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for naturally produced early run coho are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

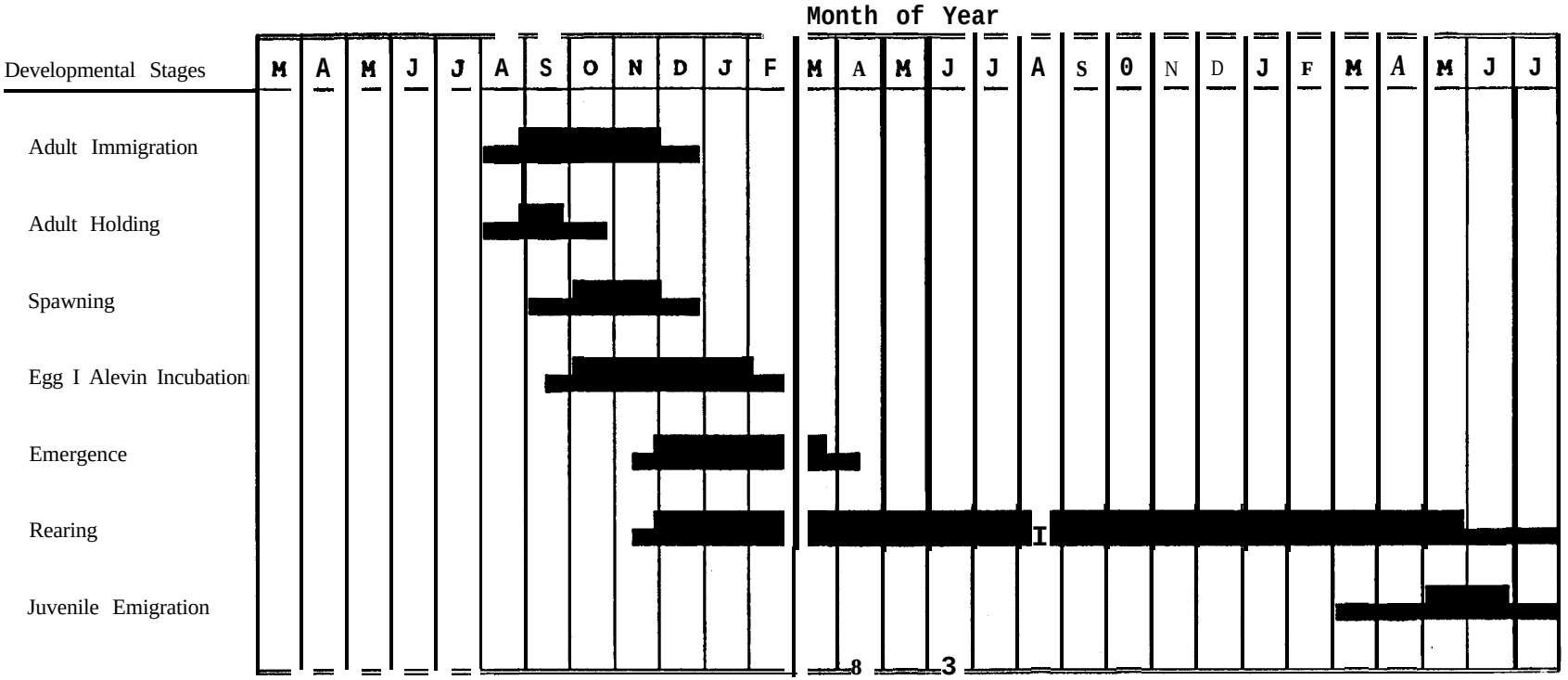
Numbers: Although brood year specific estimates of spawner escapement for naturally produced early run coho are not available, estimates by run year for the combined spawner escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Strays

For information on immigration into the subbasin, (see CLACKAMAS RIVER SUBBASIN, Naturally Produced Late Run Coho Salmon, ADULT LIFE HISTORY, Strays.

DISEASES

Bacterial kidney disease (*Renibacterium salmoninarum*) and Erythrocytic Inclusion Body Syndrome (EIBS) are the only infectious disease agents of wild juvenile coho salmon that have been detected in the Clackamas River subbasm (see CLACKAMAS RIVER SUBBASIN, Naturally Produced Late Run Coho Salmon, DISEASES).



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narruw bars indicate periods of light to moderate activity for a given life history stage. **Wide** bars indicate heavier activity.

Figure 1 (TT). Coho (early run) freshwater life history in the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990).

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Clackamas River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

CLACKAMAS RIVER SUBBASIN

Naturally Produced Late Run Coho Salmon

GEOGRAPHIC LOCATION

The Clackamas River originates on the west slope of the Cascade Mountains, between Mount Hood and Mount Jefferson. The Clackamas River flows into the Willamette River at River Mile (RM) 24.8. Major tributaries of the Clackamas River include the Roaring and Collawash rivers, the North and Oak Grove forks, and Clear, Deep, Eagle, and Fish creeks (see CLACKAMAS RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1; see MAINSTEM WILLAME'ITE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The Clackamas river subbasin drains an area of 934 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Late run coho are native to the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Native late run coho salmon primarily spawn above the North Fork Dam (Oregon Department of Fish and Wildlife 1990). Quality ratings of available coho spawning and rearing habitat are split between "good", "excellent", and "fair" (Tables 1 and 2).

Approximations of the temporal distribution of adult holding, incubation, emergence, and rearing were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Juvenile

Smolt

The only available estimates of juvenile subbasin production are counts of downstream migrants at the North Fork Dam. Counts are made from October of the brood year through September of the next year.

Annual estimates of the number of juvenile downstream migrants passing North Fork Dam ranged from 18,079 to 185,294 (Table 3).

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for native late run coho are not available, estimates by run year for total sport harvest are available in Oregon

Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Prior to the introduction of early run coho into the subbasin, native late run coho passed North Fork Dam from late October through March, with peak passage occurring in November (Oregon Department of Fish and Wildlife 1990). Currently, peak passage occurs in January (Oregon Department of Fish and Wildlife 1990). This shift may be a result of the fall Columbia River gill net fishery (Oregon Department of Fish and Wildlife 1990). An approximation of the temporal distribution of the run was reported in Oregon Department of Fish and Wildlife (1990) and is presented in Figure 1. The methodology used to generate this approximation is unknown.

Numbers: Although brood year specific estimates of run size for native late run coho are not available, estimates by run year for total escapement are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Timing: Native late run coho that were collected at North Fork Dam during the 1985-86 to 1987-88 run years were spawned at Clackamas Hatchery from mid-January through March (Oregon Department of Fish. and Wildlife 1990). An approximation of the temporal distribution of spawning was reported in Oregon Department of Fish and Wildlife (1990) and is presented in Figure 1. The methodology used to generate this approximation is unknown.

Numbers: Although brood year specific'estimates of spawner escapement for native late run coho are not available, estimates by run year for total spawner escapement are available in Oregon Department of Fish and Wildlife (1990).

Strays

No coded wire tagged strays were recovered in the subbasin (Table 4). Coded wire tag recoveries were all from hatchery coho salmon released as juveniles in the Clackamas River subbasin (Table 4).

Fork Length

The average length of native late run coho collected at North Fork Dam from 1986-88 was 28 inches (Oregon Department of Fish and Wildlife 1990).

Weight

The average weight of native late run coho collected at North Fork Dam from 1986-88 was 9.8 pounds (Oregon Department of Fish and Wildlife 1990).

Fecundity

Average fecundity of native late run coho salmon spawned at Clackamas Hatchery from

1986-88 was 2,799 eggs per female (Oregon Department of Fish and Wildlife 1990).

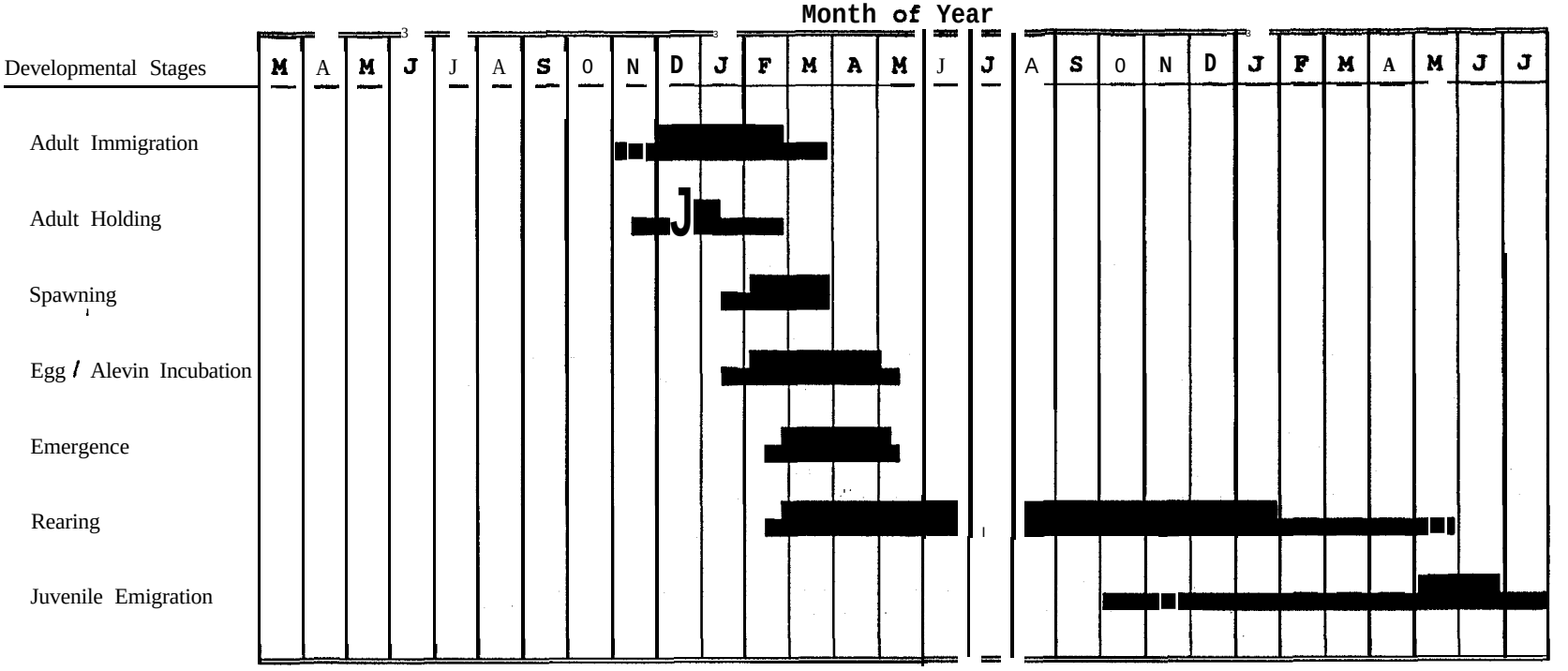
JUVENILE LIFE HISTORY

Migration Timing

During 1971-86, native late run coho migrated past North Fork Dam from October through July, and passage peaked in May and June (Cramer 1988, cited by Oregon Department of Fish and Wildlife 1990). In general, pre-smolt migration is completed during April and smolts begin passing the dam in May (Oregon Department of Fish and Wildlife. 1990). An approximation of the temporal distribution of juvenile outmigration is reported in Oregon Department of Fish and Wildlife (1990) and is presented in Figure 1. The methodology used to generate this approximation is unknown.

DISEASES

Bacterial kidney disease (*Renibacterium salmoninarum*) and Erythrocytic Inclusion Body Syndrome (EIBS) are the only infectious disease agents of wild juvenile coho salmon that have been detected in the Clackamas River subbasin (Table 5).



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate adult immigration, spawning, and juvenile emigration.
3. Wide bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

Figure 1 (TT). Native coho (late run) freshwater life history in the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Clackamas River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	30.8	42.6	26.4	0.2	--	204.1	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Clackamas River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	1.3	98.7	0.0	0.0	--	32.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (JM). Number of naturally produced juvenile late-run coho that migrated past the North Fork Dam[a].

Brood Year	Time of Miuration		Total[b]
	Fall (subyearling)	Spring	
1959	--	--	22,369
1960	--	--	44,195
1961	--	--	18,079
1962	--	--	100,092
1963	--	--	136,874
1964	--	--	46,695
1965	--	--	79,539
1966	--	--	185,294
1967	--	--	105,704
1968	--	--	100,165
1969	--	--	153,288
1970	--	--	86,490
1971	--	--	47,241
1972	--	--	91,299
1973	--	--	100,256
1974	--	--	66,197
1975	--	--	52,644
1976	--	--	101,673
1977	--	--	135,060
1978	--	--	52,423
1979	--	--	54,085
1980	--	--	89,839
1981	--	--	114,454
1982	--	--	41,361
1983	--	--	105,471
1984	--	--	69,545
1985	--	--	50,373

[a] Modified from Oregon Department of Fish and Wildlife (1990).
[b] Totals are counts at North Fork Dam from October of the brood year through September of the next year.

Table 4 (AI). Immigration of coded wire tagged hatchery coho salmon into the Clackamas River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Clackamas River	Clackamas River	Hatchery Returns		
	1982	--	633	633
	1983	--	478	478
	1984	--	622	622

[a] Based on the following tag codes: 05-08-26, 05-08-27, 05-08-28, 05-10-35, 05-10-36, 05-10-37, 05-10-38, 05-10-39, 05-10-40, 05-11-33, 05-11-34, 05-11-35, 05-11-36, 05-11-37, 05-11-38.

[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

Table 5 (TD). Parasites and diseases of naturally produced winter steelhead in the Clackamas River subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Bacteria	--	Bacterial kidney disease (*Renibacterium salmoninarum*)
Virus	--	Erythrocytic Inclusion Body Syndrome (EIBS)

[a] Data are from Oregon Department of Fish and Wildlife (unpublished data).

REFERENCES

Cramer, D. 1988. Unpublished tables of anadromous fish passage data over Portland General Electric Dams on Clackamas and Sandy rivers. Portland General Electric, Portland, Oregon. (As reported by Oregon Department of Fish and Wildlife 1990.)

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Clackamas River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

CLACKAMAS RIVER SUBBASIN

Hatchery Produced Coho Salmon

ORIGIN

The majority of coho releases in the subbasin have been of Lower Columbia Early Run (LCER) stock coho salmon (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, ORIGIN). The LCER stock is also known as the Toutle stock and the late run stock as the Cowlitz stock. Native and hatchery late run stocks have also been released into the subbasin (Oregon Department of Fish and Wildlife 1990).

The native late run coho stock released into the Clackamas River subbasin was obtained from broodstock collected each year from wild fish passing the North Fork Dam. Broodstock was spawned at Clackamas Hatchery and reared at South Santiam and Marion Forks hatcheries (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

LCER stock coho have been released into the Clackamas subbasin since 1958; generally downstream of North Fork Dam (Oregon Department of Fish and Wildlife 1990). LCER stock coho were released above the North Fork Dam from 1963-69 and from the 1971 and 1972 broods (Oregon Department of Fish and Wildlife 1990). Currently, Eagle Creek National Fish Hatchery (NFH) releases smolts from late April to early June, into Eagle Creek (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

Eggs from the 1966 brood were supplied by Trask and Sandy hatcheries for release into the Clackamas River subbasin (Table 1). Annual numbers released ranged from 101,700 to 165,000 eggs (Table 1).

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Sandy, Bonneville, Cascade, Clackamas, Oxbow, and Gnat Creek hatcheries, and Eagle Creek NFH (Table 1). Annual numbers released ranged from 5,035 to 2,269,972 fish (Table 1). Size at release ranged from 1,274.4 to 265.0 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Bonneville, Cascade, Oxbow, South Santiam, and Sandy hatcheries, and Eagle Creek NFH (Table 1). Annual numbers released ranged from 12,837 to 1,734,381 fish (Table 1). Size at release ranged from 475.0 to 24.0 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Eagle Creek NFH and Sandy and South Santiam hatcheries (Table 1). Annual numbers released ranged from 16,800 to 2,656,185 fish (Table 1). Size at release ranged from 23.0 to 10.9 fish per pound (Table 1).

Jack and Adult

Hatchery facilities in which adult coho were held prior to release in the subbasin include Big Creek, Bonneville, Cascade, and Sandy hatcheries, and Eagle Creek NFH (Table 1). Annual numbers released ranged from 100 to 2,773 fish (Table 1).

Harvest

Sport

Subbasin: Although brood year specific estimates of harvest for LCER stock coho are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for LCER stock are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Hatchery Facilities

Timing: LCER stock coho usually return to Eagle Creek NFH from October through November (Oregon Department of Fish and Wildlife 1990).

Numbers: Estimates of spawner escapement are available at Eagle Creek NFH (Table 2). Escapement, by age category, was determined each year based on a combination of methods which included either a visual classification of jack and adult fish, coded wire tag returns., or scale analysis (personal communication on 8/12/92 with Steve Pastor, U.S. Fish and Wildlife Service, Vancouver, Washington). All females were assumed to be adults. Jacks were designated as two year old fish and all adults were designated as three year old fish. Scale analysis was specifically used in selected years to adjust estimates in each age category to account for smaller than normal adult fish returning in selected run years.

All returning hatchery coho salmon were assigned to a given brood year based on the assumption that all hatchery fish migrate as age 1+ smolts whether they are released as sub-yearling or yearling smolts. This assumption is based on several factors: 1) that sub-yearling releases (i.e. fry and fingerlings) have a high juvenile to adult mortality rate and 2) that hatchery yearling releases migrate as age 1+ smolts. These assumptions are based on data that Indicates most downstream migrant age 0+ smolts do not survive (Willis 1962) and data from an analysis of coho scales (Oregon Department of Fish and Wildlife unpublished data) that indicates virtually all returning hatchery coho migrated as age 1+

smolts (personal communication on 7/30/92 with Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon). Freshwater age was designated as 2 years for juveniles migrating as age 1+ smolts. Ocean age was designated as age 1 for jacks and age 2 for adults for purposes of presenting age in the standardized format of this report; even though jacks return in the same year in which they migrate as smolts and adults do not spend two complete years in the ocean (personal communication on 8/10/92 with Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon).

Estimated returns to Eagle Creek NFH include both marked and unmarked fish. Unmarked fish returning to Eagle Creek NFH may include both unmarked hatchery fish and an unknown number of naturally produced fish. Naturally produced fish are primarily assumed to be returns of LCER stock coho based on the fact that 1) few late run coho are recovered at Eagle Creek NFH (personal communication on 8/12/92 with Pat Keeley, Oregon Department of Fish and Wildlife, Clackamas, Oregon), 2) few stray coho are recovered at Eagle Creek NFH (personal communication, Steve Pastor, U.S. Fish and Wildlife Service, Vancouver, Washington), and 3) most natural production in Eagle Creek is the result of hatchery fish spawning in the wild (personal communication, Steve Pastor, U.S. Fish and Wildlife Service, Vancouver, Washington).

Annual estimates of spawner escapement ranged from 105-2,655 jacks and 790-14,467 adults (Table 2).

Aee Structure

Age structure was estimated for coho salmon returning to Eagle Creek NFH (Table 3). Age structure was determined based on estimates of brood returns by age category (see ADULT LIFE HISTORY, Escanement, Hatchery Facilities). Stock of origin is unknown but virtually all returning fish are believed to be either marked or unmarked progeny of LCER stock hatchery fish (see ADULT LIFE HISTORY, Escanement, Hatchery Facilities).

Annual estimates of age structure, by brood year, ranged from 4-45% jacks and 55-96% adults at Eagle Creek NFH (Table 3).

Annual estimates of age structure, by run year, ranged from 1-77% jacks and 23-99 % adults at Eagle Creek NFH (Table 4).

Sex Ratio

Sex ratio (Percent females) was estimated for coho salmon returning to Eagle Creek NFH (Table 5). All females were classified as adults (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities). Stock of origin is unknown but virtually all returning fish are believed to be either marked or unmarked progeny of LCER stock hatchery fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Annual estimates of sex ratio ranged from 32-53% for adult fish at Eagle Creek NFH (Table 5).

Fecundity

Mean fecundity was estimated for coho salmon returning to Eagle Creek NFH (Table 6). All females were classified as adults (see ADULT LIFE HISTORY, Escanement, Hatchery Facilities). Stock of origin is unknown but virtually all returning fish are believed to be either marked or unmarked progeny of LCER stock hatchery fish (see ADULT LIFE HISTORY, Escanement, Hatchery Facilities).

Annual estimates of mean fecundity ranged from 1,229-3,420 eggs per female at Eagle Creek NFH (Table 6).

Mark Recoveries

Stray coded wire tagged hatchery fish, released as juveniles in the Clackamas River subbasin, were recovered at the Little White Salmon NFH in Washington and the mainstem Willamette River (Table 7), which is a necessary migration corridor to the Clackamas River.

JUVENILE LIFE HISTORY

Age Structure

Fingerlings are generally released 3 to 4 months after hatching and smolts from 14 to 17 months after hatching (Oregon Department of Fish and Wildlife 1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES and see SANDY RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES.

Table 1 (TR). Hatchery releases of coho into the Clackamas River subbasin by brood year and if marked, by coded wire tag code*.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1957	LCER	Eagle Cr NFH	fing.	11/15/58[c]	--	25.0	410,000	Eagle Cr	--
1957	LCER	Eagle Cr NFH	smolt	02/15/59[c]	--	21.0	00,717	Eagle Cr	--
1958	LCER	Eagle Cr NFH	smolt	03/15/60[c]	--	20.0	75.874	N Fk Eagle Cr	--
1958	LCER	Eagle Cr NFH	smolt	03/15/60[c]	--	20.0	282,604	Eagle Cr	--
1959	LCER	Eagle Cr NFH	fing.	03/15/61[c]	--	36.0	100,875	N Fk Eagle Cr	--
1959	LCER	Eagle Cr NFH	smolt	03/15/61[c]	--	23.0	1,169,804	Eagle Cr	--
1960	LCER	Eagle Cr NFH	fing.	03/15/62=	--	28.0	100,036	N Fk Eagle Cr	--
1960	LCER	Eagle Cr NFH	fing.	03/15/62[c]	--	25.0	87,000	Delph Cr	--
1960	LCER	Eagle Cr NFH	fing.	03/15/62[c]	--	24.0	80,767	Deep Cr	--
1960	LCER	Eagle Cr NFH	fing.	03/15/62[c]	--	24.0	87,000	Clear Cr	--
1960	LCER	Eagle Cr NFH	smolt	04/15/62[c]	--	19.0	49,574	N Fk Clackamas R	--
1960	LCER	Eagle Cr NFH	smolt	03/15/62=	--	19.0	600.000	Eagle Cr	--
1961	LCER	Eagle Cr NFH	fing.	03/15/63[c]	--	28.0	96,450	N Fk Eagle Cr	--
1961	LCER	Eagle Cr NFH	smolt	02/15/63[c]	--	21.0	26,022	N Fk Clackamas R	--
1961	LCER	Eagle Cr NFH	smolt	04/15/63[c]	--	16.0	28,200	N Fk Cleckamas R	--
1961	LCER	Eagle Cr NFH	smolt	03/15/63[c]	--	18.0	599,479	Eagle Cr	--
1962	LCER	Eagle Cr NFH	fing.	01/15/64[c]	--	26.0	35,450	N Fk Clackamas R	--
1962	LCER	Eagle Cr NFH	smolt	03/15/64[c]	--	21.0	99,587	N Fk Eagle Cr	--
1962	LCER	Eagle Cr NFH	smolt	04/15/64[c]	--	19.0	15,993	N Fk Clackamas R	--
1962	LCER	Eagle Cr NFH	smolt	03/15/64[c]	--	22.0	455,660	Eagle Cr	--
1963	LCER	Eagle Cr NFH	fing.	11/15/64[c]	--	36.0	10,472	N Fk Clackamas R	--
1963	LCER	Eagle Cr NFH	fing.	12/15/64[c]	--	42.0	22,802	N Fk Clackamas R	--
1963	LCER	Eagle Cr NFH	fing.	12/15/64[c]	--	35.5	653,867	Eagle Cr	--
1963	LCER	Sandy	smolt	03/02/65	--	21.0	15,435	Roaring River	--
1963	LCER	Sandy	smolt	03/02/65	03/03/65	21.0	52,749	Pinhead Creek	--
1963	LCER	Sandy	smolt	03/03/65	03/05/65	20-21	31,795	Hot Springs Fork	--
1964	LCER	Sandy	fry	02/16/65	02/18/65	1,168.0	999,051	Pinhead Cr	--
1964	LCER	Sandy	fry	03/05/65	--	1,168.0	307,445	Rot Springs Fk, Coll. R	--
1964	LCER	Sandy	fry	03/23/65	--	1,208.0	364,041	Hot Springs Fk, Coll. R	--
1964	LCER	Sandy	fry	02/15/65	02/18/65	1,168.0	310,130	Fish Cc	--
1964	LCER	Sandy	fry	02/25/65	--	1,168.0	289,305	Boyer Cr	--
1964	LCER	Eagle Cr NFH	smolt	03/15/66=	--	14.4	695,377	Eagle Cr	--
1965	LCER	Sandy	fry	04/07/66	--	1,208.0	52,699	N Fk Clackamas R	--
1965	LCER	Sandy	fry	04/08/66	--	1,208.0	132,467	Hot Springs Fk, Coil. R	--
1965	LCER	Sandy	fry	04/07/66	04/08/66	1,208.0	240,653	Fish Cr	--
1965	LCER	Sandy	fry	04/07/66	--	1,208.0	35,133	Boyer Cr	--
1965	LCER	Eagle Cr NFH	fing.	02/15/67[c]	--	30.0	183,753	Eagle Cr	--
1965	LCER	Eagle Cr NFH	fing.	03/15/67[c]	--	27.0	854,762	Eagle Cr	--
1965	LCER	Eagle Cr NFH	fing.	02/15/67[c]	--	25.0	8,500	Deep Cr	--

Table 1 (TR). (cont.) Hatchery releases of coho into the Clackamas River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip
1966	LCER	Sandy	egg	01/01/66	12/31/66[d]	--	101,700	Fish Cr	--
1966	LCER	Trask	egg	01/01/67	12/31/67[d]	--	55,000	Richardson Cr	--
1966	LCER	Trask	egg	01/01/67	12/31/67[d]	--	55,000	DuBoise Cr	--
1966	LCER	Trask	egg	01/01/67	12/31/67[d]	--	55,000	Wade Cr	--
1966	LCER	Bonneville	fry	07/15/67[c]	--	1,095.0 118.0	560,500 339,190	Nohorn Cr	--
1966	LCER	Eagle Cr NFH	fing.					Clackamas R	--
1966	LCER	Sandy	fins.	06/05/67	--	179.0	126,866	Collawash R	--
1966	LCER	Eagle Cr NFH	smolt	03/15/68[c]	--	23.0	1,095,500	Eagle Cr	--
1966	LCER	Eagle Cr NFH	smolt	04/15/68[c]	--	22.0	347,700	Eagle Cr	--
1966	LCER	Eagle Cr NFH	smolt	04/15/68[c]	--	22.0	404.000	Clackamas R	--
1966	LCER	Sandy	adult	10/26/66	--		-150	N Fk Clackamas R	--
1966	LCER	Sandy	adult	10/25/66	--		150	Fish Cr	--
1966	LCER	Sandy	adult	11/16/66	11/17/66	--	630	Clackamas R	--
1967	LCER	Sandy	fry	03/11/68	--	1,160.0	55,850	Nohorn Cr	--
1967	LCER	sandy	fry	02/23/68	--	1,071.0	202,041	N Fk Clackamas R	--
1967	LCER	Sandy	fry	03/11/68	--	1,160.0	55,850	Hugh Cr	--
1967	LCER	Sandy	fry	02/26/68	--	1,180.0	203,089	Fish Cr	--
1967	LCER	Sandy	fry	03/10/68	--	1,160.0	52,224	Deep Cr	--
1967	LCER	Sandy	fry			1,160.0	407,488	Collawash R	--
1967	LCER	Sandy	fry	03/11/68 03/10/68	03/12/68 --	1,160.0	121,856	Clear Cr	--
1967	LCER	Sandy	fry	03/11/68	--	1,160.0	74,420	Blister Cr	--
1967	LCER	Bonneville	fry	03/29/68	--	1,105.0	368,104	Memaloose Cr	--
1967	LCER	Eagle Cr NFH	smolt	05/15/69[c]	--	16.0	736,000	Eagle Cr	--
1967	LCER	Eagle Cr NFH	molt	02/15/69[c]	--	22.0	14,180	Deep Cr	--
1967	LCER	Eagle Cr NFH	smolt	11/15/68[c]	--	23.0	15,000	Clackamas R	--
1967	LCER	Eagle Cr NFH	smolt	01/15/69[c]	--	21.0	15,710	Clackamas R	--
1967	LCER	Eagle Cr NFH	smolt	03/15/69[c]	--	20.0	2,000	Clackamas R	--
1967	LCER	Sandy	adult	10/24/67	--	--	180	Clackamas R	--
1967	LCER	Bonneville	adult	09/21/67	--	--	419	Nohorn Cr	--
1967	LCER	Bonneville	adult	09/20/67	--	--	400	Hot Springs Fk, Coll. R	--
1967	LCER	Cascade	adult	10/19/67	--	--	350	Clackamas R	--
1968	LCER	Eagle Cr NFH	fing.	01/15/70[c]	--	33.0	13,311	Cleckamas R	--
1968	LCER	Eagle Cr NFH	fing.	12/15/69[c]	--	37.0	12,837	Clackamas R	--
1968	LCER	Eagle Cr NFH	smolt	03/15/70[c]	06/15/70[c]	18.4	1,148,852	Eagle Cr	--
1968	LCER	Sandy	adult	10/22/68	--	--	200	Collawash R, E Fk	--
1968	LCER	Bonneville	adult	09/16/68	--	--	120	Nohorn Cr	--
1968	LCER	Bonneville	adult	09/16/68	--	**	200	Hugh Cr	--
1968	LCER	Bonneville	adult	09/11/68	--	--	580	Cleckamas R	--
1969	LCER	Sandy	fry	03/10/70	03/11/70	1,269.0	235,800	Fish Cr	--
1969	LCER	Eagle Cr NFH	fry	05/15/70[c]	--	739.0	184,092	Eagle Cr	--

Table 1 (TR). (cont.) Hatchery releases of coho into the Clackamas River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip
1969	LCER	Eagle Cr NFH	smolt	04/15/71[c]	--	15.0	1'452,366	Eagle Cr	--
1969	LCER	Sandy	adult	11/28/69	--	--	222	Collawash R, E Fk	--
1969	LCER	Bonneville	adult	09/24/69	--	--	200	Clackamas R	--
1969	LCER	Eagle Cr NFH	adult	12/15/69[c]	--	--	100	N Fk Clackamas R	--
1969	LCER	Eagle Cr NFH	adult	12/01/69	--	**	180	Hugh Cr	--
1970	LCER	Eagle Cr NFH	fry	03/15/71[c]	--	900.0	549,000	Eagle Cr	--
1970	LCER	Eagle Cr NFH	fing.	06/15/71[c]	--	227.0	207,500	Eagle Cr	--
1970	LCER	Eagle Cr NFH	smolt	05/15/72[c]	--	13.4	1,750,271	Eagle Cr	--
1971	LCER	Eagle Cr NFH	fry	04/15/72[c]	05/15/72[c]	1,073.4	798,606	Eagle Cr	--
1971	LCER	Eagle Cr NFH	smolt	04/15/73[c]	06/15/73[c]	17.8	1,119,296	Eagle Cr	--
1971	LCER	Eagle Cr NFH	smolt	06/15/73[c]	--	18.6	2,000	Clackamas R	--
1971	LCER	Sandy	adult	12/02/71	--	**	200	Nohorn Cr	--
1971	LCER	Sandy	adult	12/03/71	--	--	210	Hot Springs Fk, Colt. R	--
1971	LCER	Bonneville	adult	11/19/71	11/22/71	--	400	Pinhead Cr	--
1971	LCER	Bonneville	adult	11/23/71	--	--	200	Hugh Cr	--
1971	LCER	Bonneville	adult	11/18/71	11/24/71	--	224	Clackamas R	--
1971	LCER	Cascade	adult	11/18/71	--	--	186	Clackamas R	--
1971	LCER	Big Creek	adult	11/17/71	--	--	350	Collawash R	--
1971	LCER	Big Creek	adult	11/12/71	11/17/71	--	615	Clackamas R	--
1972	LCER	Eagle Cr NFH	fry	04/15/73[c]	--	1,274.4	1,126,587	Eagle Cr	--
1972	LCER	Sandy	fing.	06/12/73	--	--	61,438	N Fk Clackamas R	--
1972	LCER	Eagle Cr NFH	smolt	04/15/74[c]	--	15.1	2,000	Eagle Cr	--
1972	LCER	Eagle Cr NFH	smolt	04/15/74[c]	--	15.1	1,093,070	Eagle Cr	--
1972	LCER	Bonneville	adult	11/15/72	11/22/72	--	512	Pinhead Cr	--
1972	LCER	Bonneville	adult	11/21/72	--	--	300	Nohorn Cr	--
1972	LCER	Bonneville	adult	11/21/72	--	--	165	Hugh Cr	--
1972	LCER	Bonneville	adult	11/22/72	--	--	310	Hot Springs Fk, Colt. R	--
1972	LCER	Bonneville	adult	11/20/72	--	--	300	Fish Cr	--
1972	LCER	Bonneville	adult	11/14/72	11/22/72	--	1,186	Clackamas R	--
1973	LCER	Eagle Cr NFH	smolt	03/15/75[c]	04/15/75[c]	12.5	1,320,155	Eagle Cr	--
1973	LCER	Sandy	smolt	12/19/74	--	20.0	200	Clackamas R	--
1974	LCER	Eagle Cr NFH	fing.	05/15/75[c]	--	475.0	250.000	Eagle Cr	--
1974	LCER	Eagle Cr NFH	smolt	04/15/76=	--	16.0	953,604	Eagle Cr	--
1974	LCER	Eagle Cr NFH	smolt	05/15/76=	--	13.0	100,009	Eagle Cr	--
1975	LCER	Eagle Cr NFH	smolt	04/15/77[c]	--	14.2	1,505,959	Eagle Cr	--
1976	LCER	Eagle Cr NFH	smolt	04/15/78[c]	--	15.3	946,500	Eagle Cr	--
1976	LCER	Eagle Cr NFH	smolt	05/15/78[c]	--	13.6	320,544	Eagle Cr	--
1977	LCER	Eagle Cr NFH	smolt	04/15/79[c]	--	17.4	801,970	Eagle Cr	--
1977	LCER	Eagle Cr NFH	smolt	05/15/79[c]	--	17.9	399,870	Eagle Cr	--
1978	LCER	Eagle Cr NFH	smolt	04/15/80[c]	--	14.4	1,082,014	Eagle Cr	--

Table 1 (TR). (cont.) Hatchery releases of coho into the Clackamas River subbasin by brood year and if marked, by coded wire teg code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip
1978	LCER	Eagle Cr NFH	smolt	04/15/80[c]	--	14.6	1,574,171	Eagle Cr	--
1979	Sandy R.[d]	Bonneville	fins.	06/02/80	--	235.0	20,000	Clear Creek	--
1979	LCER	Eagle Cr NFH	fing.	06/30/80	--	127.4	20,384	Tickle Cr	--
1979	LCER	Eagle Cr NFH	fing.	06/30/80	--	127.4	24,206	N Fk Clackamss R	--
1979	LCER	Eagle Cr NFH	fing.	06/30/80	--	127.4	30,576	Deep Cr	--
1979	LCER	Eagle Cr NFH	fing.	06/30/80	--	127.4	49,829	Clear Cr	--
1979	LCER	Eagle Cr NFH	smolt	04/15/81[c]	--	14.1	699,485	Eagle Cr	--
1979	LCER	Eagle Cr NFH	smolt	05/26/81[c]	--	12.7	240,326	Eagle Cr	--
1979	LCER	Eagle Cr NFH	adult	10/29/79	--	--	100	Tickle Cr	--
1979	LCER	Eagle Cr NFH	adult	10/29/79	--	--	212	Clear Cr	--
1980	Sandy R.[d]	Sandy	fry	03/10/81	--	1,111	23,436	Cedar Creek (Lower)	--
1980	Sandy R.[d]	Sandy	fry	03/10/81	--	1,111	257,783	Clear Creek	--
1980	Sandy R.[d]	Sandy	fry	03/10/81	--	1,111	82,026	Clear Creek (Lower)	--
1980	Sandy R.[d]	Sandy	fry	03/10/81	--	1,111	46,872	Mosier Creek	--
1980	Eagle Cr.[e]	Oxbow (Herman)	fry	03/12/81	--	1,200	48,500	Wade Creek	--
1980	Tanner Cr	Oxbow (Herman)	fry	02/27/81	--	1,200	148,016	Deep Creek	--
1980	Tanner Cr	Oxbow (Herman)	fry	03/12/81	--	1,200	188,200	Oelph Creek	--
1980	Tanner Cr	Oxbow (Herman)	fry	02/27/81	--	1,200	37,004	Goose Creek	--
1980	Tanner Cr	Oxbow (Herman)	fry	02/27/81	--	1,200	49,322	NFk Deep Creek	--
1980	Tanner Cr	Oxbow (Herman)	fry	02/27/81	--	1,200	61,665	NFk Eagle Creek	--
1980	Tanner Cr	Oxbow (Herman)	fry	02/27/81	--	1,200	49,322	Tickle Creek	--
1980	Clackamas R.	Eagle Creek	smolt	05/06/82	--	16.6	684,584	Eagle Creek	--
1980	USFUS[f]	Eagle Creek	smolt	06/02/82	--	13.7	244,682	Eagle Creek	--
1980	LCER	Eagle Cr NFH	adult	11/18/80	--	--	100	Tickle Cr	--
1980	LCER	Eagle Cr NFH	adult	11/18/80	--	--	166	Deep Cr	--
1980	LCER	Eagle Cr NFH	adult	11/15/80[c]	--	--	300	Clear Cr	--
1981	LCER	Bonneviile	fing.	06/07/82	--	179.0	14,375	Little Clear Cr (Elwood)	--
1981	LCER	Bonneville	fing.	06/07/82	--	179.0	14,375	Clear Cr tributary	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	179.0	14,320	Cedar Creek (Lower)	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	179.0	14,499	Clear Creek (Lower)	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	179.0	26,242	Deep Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/09/82	--	197.0	41,173	Deep Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/09/82	--	197.0	20,488	Goose Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	179.0	28,640	Hosier Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	179.0	16,110	NFk Deep Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/09/82	--	197.0	20,685	NFk Deep Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	179.0	16,110	Tickle Creek	--
1981	Sandy R.	Bonneville	fing.	06/09/82	--	197.0	20,488	Tickle Creek	--
1981	Clackamss R.	Eagle Creek	smolt	06/01/83	--	10.9	135,228	Eagle Creek	--
1981	Clackamas R.	Eagle Creek	smolt	05/03/83	--	11.9	117,501	Eagle Creek	--

Table 1 (TR). (cont.) Hatchery releases of coho into the Clackamas River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip
1981	Clackamas R.	Eagle Creek	smolt	05/04/83	--	13.7	168,734	Eagle Creek	--
1981	Clackamas R.	Eagle Creek	smolt	05/04/83	--	13.7	25,342	Eagle Creek	05-11-32
1981	Clackamas R.	Eagle Creek	smolt	05/04/83	--	13.7	25,342	Eagle Creek	05-11-33
1981	Clackamas R.	Eagle Creek	smolt	05/04/83	--	13.7	25,342	Eagle Creek	05-11-34
1981	Clackamas R.	Eagle Creek	smolt	05/04/83	--	13.7	25,342	Eagle Creek	05-11-35
1981	Clackamas R.	Eagle Creek	smolt	05/04/83	--	13.7	25,342	Eagle Creek	05-11-36
1981	Clackamas R.	Eagle Creek	smolt	05/04/83	--	13.7	25,342	Eagle Creek	05-11-38
1982	Sandy R.[d]	Gnat Creek	fry	02/16/83	--	1,175	37,600	Bear Creek	--
1982	Sandy R.[d]	Gnat Creek	fry	02/16/83	--	1,175	111,625	Delph Creek	--
1982	Sandy R.[d]	Gnat Creek	fry	02/16/83	--	1.175	24,675	Eagle Creek (Lower)	--
1982	Sandy R.[d]	Gnat Creek	fry	02/16/83	--	1,175	24,675	Grabenheim Creek	--
1982	Sandy R.[d]	Gnat Creek	fry	02/16/83	--	1,175	172,725	NFk Eagle Creek	--
1982	Sandy R.[d]	Gnat Creek	fry	02/16/83	--	1,175	24,675	Trout Creek	--
1982	Sandy R.[d]	STEP	fry	01/23/83	--	1,107	24,354	Clear Creek	--
1982	Sandy R.[d]	STEP	fry	01/22/83	--	1,126	23,642	Clear Creek (Lower)	--
1982	Sandy R.[d]	STEP	fry	01/15/83	--	1,094	45,927	Deep Creek	--
1982	Tanner Cr.[d]	Cascade	fry	02/25/83	--	1,150	25,300	Richardsons Creek	--
1982	Sandy R.[d]	Cascade	fing.	05/18/83	--	202.0	25,250	Cedar Creek (Lower)	--
1982	Sandy R.[d]	Cascade	fing.	05/18/83	--	202.0	13,130	Clear Creek	--
1982	Sandy R.[d]	Cascade	fing.	05/18/83	--	202.0	74,740	Clear Creek (Lower)	--
1982	Sandy R.[d]	Cascade	fing.	05/19/83	--	189.0	99,200	Deep Creek	--
1982	Sandy R.[d]	Cascade	fing.	05/19/83	--	189.0	34,378	Goose Creek	--
1982	Sandy R.[d]	Cascade	fing.	05/18/83	--	202.0	12,120	nosier Creek	--
1982	Sandy R.[d]	Cascade	fing.	05/20/83	--	195.0	12,675	NFk Deep Creek	--
1982	Sandy R.[d]	Cascade	fing.	05/18/83	--	202.0	29,896	NFk Deep Creek	--
1982	Sandy R.[d]	Cascade	fing.	05/20/83	--	195.0	76,050	Tickle Creek	--
1982	Clackamas R.	Eagle Creek	smolt	05/31/84	--	12.0	95,263	Eagle Creek	--
1982	Clackamas R.	Eagle Creek	smolt	05/01/84	--	13.8	322,855	Eagle Creek	--
1982	Clackamas R.	Eagle Creek	smolt	05/02/84	--	14.0	423,654	Eagle Creek	--
1982	Clackamas R.	Eagle Creek	smolt	01/01/84	--	15.5	156,407	Eagle Creek	--
1982	Clackamas R.	Eagle Creek	smolt	05/03/84	--	16.1	32,232	Eagle Creek	--
1982	LCER	Eagle Cr NFH	adult	10/28/82	--		201	Clear Cr	--
1983	Sandy R.[d]	Sandy	fing.	05/31/84	--	199.0	14,129	Tickle Creek	--
1983	Sandy R.[d]	Oxbow (Herman)	fing.	07/06/84	--	217.0	31,031	Bear Creek	--
1983	Sandy R.[d]	Oxbow (Herman)	fing.	07/06/84	--	217.0	11,935	NFk Eagle Creek	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/27/84	--	368.0	48,944	Clear Creek	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/27/84	--	368.0	37,109	Clear Creek (Lower)	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/27/84	--	368.0	56,672	Deep Creek	--
1983	Cowlitt River	Oxbow (Herman)	fry	06/27/84	--	368.0	37,168	NFk Deep Creek	--
1983	Cowlitt River	Oxbow (Herman)	fry	07/06/84	--	280.0	81,200	NFk Eagle Creek	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/27/84	--	368.0	37,168	Tickle Creek	--

Table 1 (TR). (cont.) Hatchery releases of coho into the Clackamas River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT/ Fin clip
1983	Cowlitz River	Oxbow (Herman)	fry	07/06/84	--	280.0	24,640	Trout Creek	--
1983	Clackamas R.	Eagle Creek	smolt	05/23/85	--	14.8	241,163	Eagle Creek	--
1983	Clackamas R.	Eagle Creek	smolt	05/01/85	--	15.1	781,342	Eagle Creek	--
1984	Sandy R.[d]	Sandy	fry	05/30/85	--	278.0	51,986	Delph Creek	--
1984	Clackamas R.	Eagle Creek	fing.	06/12/85	--	176.0	129,360	Eagle Creek	--
1984	Sandy R.[d]	Bonneville	fing.	04/29/85	--	158.0	30,652	Bear Creek	--
1984	Sandy R.[d]	Bonneville	fing.	05/02/85	--	161.0	33,488	Cedar Creek (Lower)	--
1984	Sandy R.[d]	Bonneville	fing.	05/01/85	--	161.0	48,300	Clear Creek	--
1984	Sandy R.[d]	Bonneville	fing.	05/01/85	05/02/85	161.0	70,679	Clear Creek (Lower)	--
1984	Sandy R.[d]	Bonneville	fing.	05/03/85	--	167.0	60,120	Deep Creek	--
1984	Sandy R.[d]	Bonneville	fing.	05/02/85	--	171.0	28,557	Deep Creek	--
1984	Sandy R.[d]	Bonneville	fing.	05/02/85		161.0	14,973	Hosier Creek	--
1984	Sandy R.[d]	Bonneville	fing.	05/02/85	--	171.0	55,575	NFk Deep Creek	--
1984	Sandy R.[d]	Bonneville	fing.	04/29/85	--	153.0	53,856	NFk Eagle Creek	--
1984	Sandy R.[d]	Bonneville	fing.	04/29/85	--	158.0	54,668	NFk Eagle Creek	--
1984	Sandy R.[d]	Bonneville	fing.	05/02/85	--	171.0	85,158	Tickle Creek	--
1984	Sandy R.	Bonneville	fins.	04/29/85	--	153.0	30,294	Trout Creek	--
1984	Clackamas R.	Eagle Creek	smolt	05/01/86	--	13.9	582,103	Eagle Creek	--
1984	Clackamas R.	Eagle Creek	smolt	06/01/86	--	15.0	200,268	Eagle Creek	--
1984	LCER	Sandy	adult	11/15/84	--	--	100	Tickle Cr	--
1984	LCER	Sandy	adult	11/07/84	11/15/84	--	400	Deep Cr	--
1984	LCER	Sandy	adult	11/07/84	--	--	400	Clear Cr	--
1985	Clackamas-wild	Clackamas	fry	06/24/86		265.0	5,035	Fish Creek Ponds	--
1985	Sandy R.[c,d]	Oxbow (Herman)	fing.	05/21/86	--	201.0	17,085	Cedar Creek (Lower)	--
1985	Sandy R.[d]	Oxbow (Herman)	fing.	05/21/86	--	201.0	48,240	Clear Creek	--
1985	Sandy R.[d]	Oxbow (Herman)	fing.	05/19/86	--	201.0	101,505	Deep Creek	--
1985	Sandy R.[d]	Oxbow (Herman)	fing.	05/21/86	--	201.0	35,175	Little Clear Cr.	--
1985	Sandy R.[d]	Oxbow (Herman)	fins.	05/21/86	--	201.0	30,150	NFk Deep Creek	--
1985	Sandy R.[d]	Oxbow (Herman)	fing.	05/19/86	--	201.0	100,500	NFk Eagle Creek	--
1985	Sandy R.	Oxbow (Herman)	fing.	05/21/86	--	201.0	70,350	Tickle Creek	--
1985	Clackamas R.	Eagle Creek	smolt	04/29/87	--	15.0	313,504	Eagle Creek	--
1985	Clackamas R.	Eagle Creek	smolt	04/23/87	--	15.2	284,888	Eagle Creek	--
1985	Clackamas R.	Eagle Creek	smolt	04/30/87	--	16.3	207,429	Eagle Creek	--
1985	Clackamas-wild	South Santiam	smolt	05/19/87	--	13.0	3,786	Clackamas River	07-28-59
1985	Clackamas-wild	South Santiam	smolt	05/19/87	--	13.0	6,200	Clackamas River	07-33-38
1985	Clackamas-wild	South Sentiam	smolt	05/19/87	--	13.1	4,952	Clackamas River	--
1985	Clackamas-wild	South Santiam	smolt	05/19/87	--	13.1	1,219	Clackamas River	07-28-59
1985	Clackamas-wild	South Santiam	smolt	05/19/87	--	13.1	3,848	CLackamas River	07-33-38
1985	Clackamas-wild	South Santiam	smolt	05/21/87	--	14.0	7,502	CLackamas River	--

Table 1 (TR). (cont.) Hatchery releases of coho into the Clackamas River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CUT/ Fin clip
1985	Clackamas-wild	South Santiam	smolt	05/21/87	--	14.1	7,543	Clackamas River	··
1985	Clackamas-wild	South Santiam	smolt	05/22/87	--	14.4	7,485	Clackamas River	··
1985	Clackamas-wild	South Santiam	smolt	05/26/87	--	14.5	14,040	Clackamas River	··
1985	Clackamas-wild	South Santiam	smolt	05/20/87	--	14.1	9,997	Clear Creek	··
1985	Clackamas-wild	South Santiam	smolt	05/20/87	--	14.3	10,004	Clear Creek	··
1985	Clackamas-wild	South Santiam	smolt	05/19/87	--	13.0	4,710	Collawash River	··
1985	Clackamas-wild	South Santiam	smolt	05/19/87	--	13.0	1,442	Collawash River	07-28-59
1985	Clackamas-wild	South Santiam	smolt	05/19/87	--	13.0	3,842	Collawash River	07-33-38
1985	Clackamas-wild	South Santiam	smolt	05/20/87	--	14.3	7,722	Deep Creek	··
1985	Clackamas-wild	South Santiam	smolt	05/26/87	--	14.5	6,668	Deep Creek	··
1985	Clackamas-wild	South Santiam	smolt	05/20/87	--	13.2	3.326	Hot Springs Fork	··
1985	Clackamas-wild	South Santiam	smolt	05/20/87	--	13.2	'819	Hot Springs Fork	07-28-59
1985	Clackamss-wild	South Santiam	smolt	05/20/87	--	13.2	2,585	Hot Springs Fork	07-33-38
1985	LCER	Sandy	adult	11/12/85	--	··	100	Tickle Cr	··
1985	LCER	Sandy	adult	11/13/85	--	··	200	Deep Cr	··
1985	LCER	Sandv	adult	11/13/85	11/21/85	··	400	Clear Cr	··
1986	LCER	Eagle Cr NFH	fing.	06/15/88[c]	--	250.0	226,093	Eagle Cr	··
1986	LCER	Bonneville	fing.	06/01/87	--	190.0	140,600	Clackamas R	··
1986	Clackamas-wild	South Santiam	fing.	10/08/87	10/09/87	52.7	14,998	Fish Creek Ponds	··
1986	Sandy R.[d]	Oxbow (Herman)	fing.	05/29/87	--	147.0	44,100	Clear Creek	··
1986	Sandy R.[d]	Oxbow (Herman)	fing.	05/29/87	--	147.0	76,440	Deep Creek	··
1986	Sandy R.[d]	Oxbow (Herman)	fing.	05/29/87	--	147.0	39,690	Little Clear Cr.	··
1986	Sandv R.[d]	Oxbow (Herman)	fing.	05/29/87	--	147.0	39,690	NFk Deep Creek	··
1986	Tanner Cr	Bonneville	fing.	06/02/87	--	188.0	30,080	Bear Creek	··
1986	Tanner Cr	Bonneville	fing.	06/01/87	--	214.0	35,310	Cedar Creek (Lower)	··
1986	Tanner Cr	Bonneville	fing.	06/01/87	--	214.0	49,220	Clear Creek	··
1986	Tanner Cr	Bonneville	fing.	06/01/87	--	214.0	39,590	Clear Creek (Lower)	··
1986	Tanner Cr	Bonneville	fing.	06/01/87	--	190.0	68,400	Delph Creek	··
1986	Tanner Cr	Bonneville	fing.	06/01/87	--	190.0	39,900	Eagle Creek (Lower)	··
1986	Tanner Cr	Bonneville	fing.	06/02/87	--	188.0	30,080	Goose Creek	··
1986	Tanner Cr	Bonneville	fing.	06/01/87	--	190.0	30,400	Grabenheim Creek	··
1986	Tanner Cr	Bonneville	fing.	06/01/87	--	214.0	14,980	Mosier Creek	··
1986	Tanner Ct.	Bonneville	fing.	06/02/87	--	188.0	9,964	NFk Eagle Creek	··
1986	Tanner Cr	Bonneville	fing.	05/27/87	--	217.0	82,460	NFk Eagle Creek	··
1986	Tanner Cr	Bonneville	fing.	06/02/87	--	188.0	30,080	Richardsons Creek	··
1986	Tanner Cr	Bonneville	fing.	06/02/87	--	188.0	70,876	Tickle Creek	··
1986	Tanner Cr	Bonneville	fing.	06/02/87	--	188.0	30,080	Trout Creek	··
1986	Tanner Cr	Bonneville	fing.	06/02/87	--	188.0	50,008	Wade Creek	··
1986	Clackamas R.	Eagle Creek	smolt	04/29/88	--	17.1	312,406	Eagle Creek	··

Table 1 (TR). (cont.) Hatchery releases of coho into the Clackamas River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT/ Fin clip
1986	Clackamas R.	Eagle Creek	smolt	04/27/88	..	17.7	529,243	Eagle Creek	..
1986	Clackamas R.	Eagle Creek	smolt	04/25/88	..	17.8	164,678	Eagle Creek	--
1986	Clackamas-wild	South Santiam	smolt	05/10/88	..	13.5	19,571	Clackamas River	..
1986	Clackamas-wild	South Santiam	smolt	05/10/88	..	14.0	17,496	Clackamas River	..
1986	Clackamas-wild	South Santiam	smolt	05/11/88	..	14.0	8,044	Clackamas River	07-49-49
1986	Clackamas-wild	South Santiam	smolt	05/10/88	..	15.0	8,019	Clackamas River	07-49-49
1986	Clackamas-wild	South Santiam	smolt	05/10/88	..	14.5	8,048	Collawash River	07-49-49
1986	Clackamas-wild	South Santiam	smolt	05/10/88	..	15.0	8,005	Hot Springs Fork	07-49-49
1986	LCER	Sandy	adult	11/21/86	..	..	100	Tickle Cr	..
1986	LCER	Sandy	adult	11/24/86	..	..	100	Little Clear Cr	..
1986	LCER	Sandy	adult	11/24/86	..	..	100	Delph Cr	..
1986	LCER	Sandy	adult	11/20/86	..	..	400	Deep Cr	..
1986	LCER	Sandy	adult	11/24/86	..	..	600	Clear Cr	..
1987	Clackamas R.	Eagle Creek	fry	07/08/88	..	614.0	30,700	Eagle Creek	..
1987	Clackamas R.	Eagle Creek	fing.	06/01/88	..	165.5	141,834	Eagle Creek	..
1987	Clackamas R.	Eagle Creek	fing.	06/01/88	..	177.7	71,064	Eagle Creek	..
1987	Clackamas R.	Eagle Creek	fing.	06/01/88	..	203.0	13,195	Eagle Creek	..
1987	Clackamas R.	Eagle Creek	fing.	06/01/88	..	250.0	226,093	Eagle Creek	..
1987	Clackamas R.	Eagle Creek	smolt	05/01/89	..	20.0	8,000	Clackamas River	07-45-03
1987	Clackamas R.	Eagle Creek	smolt	05/01/89	..	20.0	8,800	Collawash River	07-45-03

a Modified from Oregon Department of Fish and Wildlife (1990); and Oregon Department of Fish and Wildlife's hatchery production database.
b LCER refers to Lower Columbia Early Run Stock, a "catchall" name for early run hatchery stocks, including Eagle Creek, Clackamas River, Sandy River, and Tanner Creek stocks. These stocks have been previously grouped as early run Toutle stock, or just early run coho. The wild Clackamas River stock is a late run stock. Cowlitz stock part of a late run stock group.
c Day(s) of release unknown. Standardized to the 15th of the month.
d Sandy Fish Hatchery stock.
e Cascade Hatchery stock.
f U.S. Fish and Wildlife Service hatchery stock, excluding fish from Hagerman Fish Hatchery.

Table 2 (RH). Total escapement of LCER stock coho salmon to Eagle Creek NFX, by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1973	--	4,632	--	--	--	--	4,632
1974	420	790	--	--	--	1,210	790
1975	2,655	3,307	--	--	--	5,962	3,307
1976	1,567	7,042	--	--		8,609	7,042
1977	708	12,539	--	--		13,247	12,539
1978	1,864	2,301	--	--		4,165	2,301
1979	1,693	10,605	--	--	--	12,298	10,605
1980	558	1,873'	--	--		2,431	1,873
1981	105[c]	2,116	--			2,271	2,116
1982	239	4,461	--	--		4,700	4,461
1983	877	14,467	--			15,344	14,467
1984	127	2,360	--			2,487	2,360
1985	152	3,453	--			3,605	3,453
1986	367	9,915	--		--	10,282	9,915
1987	113	1,316	--			1,429	1,316
1988	1,895	--	--			--	--

[a] Estimates are from U.S. Fish and Wildlife Service (unpublished data).
[b] Data available by total age only: all coho salmon were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).
[c] Scale analysis was used to adjust estimate to account for small fish returning to the facility.

Table 3 (AC). Age composition (freshwater.ocean) by brood year for LCER stock coho salmon at Eagle Creek NFH[a].

Brood, Year	N	Age Composition (%)								
		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1974	1,210	--	--	--	--	. .	35	65	. .	
1975	5,962	--	--	--	--	. .	45	55	. .	--
1976,	8,609	--	--	--	--	--	18	82	. .	--
1977	13,247	--		--	--	--	5	95	--	--
1978	4,165	. .		--		--	45	55		. .
1979	12,298	. .	--	--	--	--	14	86		. .
1980	2,431	. .	--	--	--		23	77	--	. .
1981	2,271	--	--	--	--		5	95	--	. .
1982	4,700	. .	--	--	--	--	5	95	--	. .
1983	15,344	. .		--	--	--	6	94	--	--
1984	2,487	--		--	--	--	5	95	--	. .
1985	3,605	. .	--	--		--	4	96		. .
1986	10,282	. .	--	--		--	4	96		
1987	1,429	. .	--	--		--	8	92		--

[a] Estimates of age structure are based on brood returns to Eagle creek NFH (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 4 (AC-a). Age composition (freshwater.ocean) by run year for LCER stock coho salmon at Eagle Creek NFH[a].

Run Year	N	Age Composition (%)								
		1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1976	5,052		--	--	--		8	92	--	
1977	3,445		--	--	--		77	23		
1978	4,874		--	--	--		32	68		
1979	7,750		--	--	--	--	9	91		--
1980	14,403				--		13	87		--
1981	3,994			--	--		42	58		
1982	11,163			--	--		5	95		
1983	1,978			--	--		5	95	--	
1984	2,405			--	--	--	10	90		
1985	5,338		--		--		16	84		
1986	14,594		--				1	99		
1987	2,512		--		--	--	6	94		
1988	3,820	--	--		--	--	10	90	--	
1989	10,028		--		--	--	1	99	--	--
1990	3,211		--		--	--	59	41	--	

[a] Estimates of age structure are based on brood returns to Eagle Creek NFH (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 5 (AS). Percent females by brood year and age class (freshwater.ocean) for LCER stock coho salmon at Eagle creek NFH[a,b].

Females (%)

Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1974	--	--		--		0	53		--
N	--	--		--		420	790		--
et. dev.	--	--		--		--	--		--
1975	--	--		--	--	0	50	--	--
N	--	--		--		2,655	3,307	--	--
st. dev.	--	--		--		--	--		--
1976	--	--		--		0	53		--
N	--	--			--	1,567	7,042		--
st. dev.	--	--		--		--	--		--
1977	--	--				0	50		--
N	--	--	--			708	12,539		--
st. dev.	--	--				--	--	--	--
1978	--	--	--		--	0	40		--
N	--	--				1,864	2,301	--	--
at. dev.	--	--		--		--	--	--	--
1979	--	--				0	47		--
N	--	--	--		--	1,693	10,605		--
et. dev.	--	--				--	--		--

Table 5 (AS). (cont.) Percent females by brood year and age class (freshwater.ocean) for LCER stock coho salmon at Eagle Creek NFH[a,b].

Females (%)

Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1980	--	--	--	--	--	0	46	--	--
N	--	--	--	--	--	558	1,873	--	--
st. dev.	a-	--	--	--	--	--	--	--	--
1981	--	--	--	--	--	0	47	--	--
N	--	--	--	--	--	105	2,166	--	--
st. dev.	--	--	--	--	--	--	--	--	
1982	--	--	--	--	--	0	49	--	
N	--	--	--	--	--	239	4,461	--	--
st. dev.	--	--	--	--	--	--	--	--	--
1983	--	--	--	--	--	0	46	--	--
N	--	--	--	--	--	877	14,467	--	--
st. dev.	--	--	--	--	--	--	--	--	--
1984	--	--	--	--	--	0	33	--	--
N	--	--	--	--	--	127	2,360		--
et. dev.	--	--	--	--	--	--	--	--	--
1985	--	--	--	--	--	0	32	--	--
N	--	--	--	--	--	152	3,453	--	--
st. dev.	--	--	--	--	--	--	--	--	--

Table 5 (AS). (cont.) Percent females by brood year and age class (freshwater.ocean) for LCER stock coho salmon at Eagle Creek NFH[a,b].

	Females (%)								
Brood Year	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1986	--	--	--	--	--	0	37	--	--
N	--	--	--	--	--	367	9,915	--	--
at. dev.	--	--	--	--	--	--	--	--	--
1987	--	--	--	--	--	0	36	--	--
N	--	--	--	--	--	113	1,316	--	--
st. dev.	--	--	--	--	--	--	--	--	--
1988	--	--	--	--	--	0	--	--	--
N	--	--	--	--	--	1,895	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--

a Estimates are from U.S. Fish and Wildlife Service (unpublished data).
b Data available by total age only; all coho salmon were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Sex Ratio).

Table 6 (AF). Mean fecundity (eggs per female) by brood year and age class (freahwater.ocean) for LCER stock coho salmon at Eagle Creek NFH[a,b].

Mean Fecundity

Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1969	--	--	--	--	--	1,781	--	--	--	
N	--	--	--	--	--	2,150	--	--	--	
st. dev.	--	--	--	--	--	--	--	--	--	
1970	--	--	--	--	--	3,000	--	--	--	
N	--	--	--	--	--	1,984	--	--	--	
st. dev.	--	--	--	--	--	--	--	--	--	
1971	--	--	--	--	--	2,641	--	--	--	
N	--	--	--	--	--	640	--	--	--	
st. dev.	--	--	--	--	--	--	--	--	--	
1972	--	--	--	--	--	3,420	--	--	--	--
N	--	--	--	--	--	941	--	--	--	
at. dev.	--	--	--	--	--	--	--	--	--	
1973	--	--	--	--	--	1,229	--	--	--	
N	--	--	--	--	--	1,526	--	--	--	
st. dev.	--	--	--	--	--	--	--	--	--	
1974	--	--	--	--	--	2,693	--	--	--	
N	--	--	--	--	--	405	--	--	--	
st. dev.	--	--	--	--	--	--	--	--	--	

Table 6 (AF). (cont.) Mean fecundity (eggs per female) by brood year and age class (freshwater.ocean) for LCER stock coho salmon at Eagle Creek NFH[a,b].

Mean Fecundity

Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1975	--	--				2,361			--	--
N	--	--	--			1,083				--
st. dev.	--	--	--	--		--				--
1976	--	--	--			1,987				--
N	--	--	--			1,194			--	--
st. dev.	--	--	--			--				--
1977	--	--	--		--	2,820		--		
N	--	--	--			438				
st. dev.	--	--	--		--	--	--	--		--
1978	--	--	--		--	3,052				
N	--	--	--		--	394				--
st. dev.	--	--	--		--	--				
1979	--	--	--		--	3,000		--		
N	--	--	--		--	542				--
st. dev.	--	--	--		--	--			--	--
1980	--	--			--	1,718				--
N	--	--	--		--	816	--	--		
st. dev.	--	--			--	--				--

Table 6 (AF). (cont.) Mean fecundity (eggs per female) by brood year and age class (freahwater.ocean) for LCER stock coho salmon at Eagle Creek NFH[a,b].

Mean Fecundity

Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1981	--	--	-^	--	--	2,920	--	. .	. .	--
N	--	--	--	--	--	720	--	. .	--	--
st. dev.	--	--	--		--	--	--	. .	. .	--
1982	--	--	--	--	--	2,625	--	. .	. .	--
N	--	--	--	--	--	738	--	. .	. .	--
at. dev.	--	--	--	--	--	--	--	--	. .	--
1983	--	--	--	--	--	2,370	--	. .	. .	--
N	--	--	--	--	--	1,143		--	. .	--
at. dev.	--	--	--		--	--		. .	. .	--
1984	--	--	--		--	2,198	--	. .	--	--
N	--	--	--	--	--	646	--	. .	. .	--
st. dev.	--	--	--	--	--	--	--	. .	. .	
1985	--	--	--	--	--	3,251		. .	. .	--
N	--	--	--	--	--	646		. .	. .	--
at. dev.	--	--	--	--	--	--		. .	. .	--
1986	--	--	--	--	--	--	--	. .	. .	--
N	--	--	--	--	--	--	--	. .	. .	--
at. dev.	--	--	--	--		--	--	. .	. .	--

Table 6 (AF). (cont.) Mean fecundity (eggs per female) by brood year and age class (freshwater.ocean) for LCER stock coho salmon at Eagle Creek NFH[a,b].

	Mean Fecundity									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1987	--	--	--	--	--	2,406	--	--	--	--
N	--	--	--	--	--	452	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--

[a] Estimates are from U.S. Fish and Wildlife Service (unpublished data).
[b] Data available by total age only; all coho salmon were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Fecundity).

Table 7 (AE). Emigration of coded wire tagged hatchery coho salmon released as juveniles into the Clackamas River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(e)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Clackamas River	Willamette River	Spawner Surveys		
	1982	--	1	2
	1983	--	--	--
	1984	--	1	1
Clackamas River	Little White Salmon	Hatchery Returns		
	1983	--	1	1

[a] Based on the following tag codes: 05-08-26, 05-10-39, 05-11-37.
[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

REFERENCES

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CLACKAMAS RIVER SUBBASIN

Naturally Produced Summer Steelhead

GEOGRAPHIC LOCATION

The Clackamas River originates on the west slope of the Cascade Mountains, between Mount Hood and Mount Jefferson. The Clackamas River flows into the Willamette River at River Mile (RM) 24.8. Major tributaries of the Clackamas River include the Roaring and Collawash rivers, the North and Oak Grove forks, and Clear, Deep, Eagle, and Fish creeks (see CLACKAMAS RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The Clackamas river subbasin drains an area of 934 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Summer steelhead are not thought to be native to the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990). Summer steelhead returning to the subbasin are primarily hatchery fish although some natural production results from hatchery fish that spawn in the subbasin (see CLACKAMAS RIVER SUBBASIN, Hatchery Produced Summer Steelhead; Oregon Department of Fish and Wildlife 1990). An analysis of scales taken from summer steelhead caught in the 1985 and 1986 Clackamas River sport fishery indicates that only 8% of the summer steelhead harvested in the subbasin were naturally produced fish (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Summer steelhead spawn primarily above North Fork Dam (Oregon Department of Fish and Wildlife 1990). Available spawning and rearing habitat in the Clackamas subbasin is rated as "excellent" and "good" quality (Tables 1 and 2).

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced summer steelhead are not available, estimates by run year for the combined sport hat-vest of naturaly and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for naturally produced summer steelhead are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Numbers: Although brood year specific estimates of spawner escapement for naturally produced summer steelhead are not available, estimates by run year for the combined spawner escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Clackamas River subbaain summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	65.4	29.7	4.3	0.6	--	82.9	
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Clackamas River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	0.0	0.0	100.0	--	0.3	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humane.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Clackamas River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

CLACKAMAS RIVER SUBBASIN

Hatchery Produced Summer Steelhead

ORIGIN

The summer steelhead stock used for hatchery supplementation in the Clackamas River subbasin is a derivative of the Skamania stock of summer steelhead (Oregon Department of Fish and Wildlife 1990; Howell et al. 1985). Currently, this hatchery stock is still commonly referred to as the Skamania stock but is also known more specifically as the Foster stock (Oregon Department of Fish and Wildlife 1990).

Supplementation of the Clackamas River subbasin began in 1969 to provide increased angling opportunities (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery summer steelhead are primarily released at various locations located in the mainstem Clackamas River (Table 1). Summer steelhead are released as yearling smolts in late April and early May (Oregon Department of Fish and Wildlife 1990).

Approximations of the temporal distribution of adult holding and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. Estimates are for Skamania/Foster stock summer steelhead that spawn and rear in the wild. The methodology used to generate these approximations is unknown.

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

There are no records of releases in the subbasin.

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Gnat Creek, Oak Springs and Roaring River hatcheries (Table 1). Annual numbers released ranged from 7,661 to 188,994 fish (Table 1). Size at release ranged from 95.0 to 17.6 fish per pound (Table 1). Fingerling releases were discontinued in 1986 (Oregon Department of Fish and Wildlife 1990).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Gnat Creek, Roaring River, Alsea, and Oak Springs hatcheries (Table 1).

Annual numbers released ranged from 39,967 to 194,557 fish (Table 1). Size at release ranged from 11.4 to 4.5 fish per pound (Table 1).

Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery summer steelhead are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Timing of the summer steelhead run to the Clackamas River subbasin is based on timing of harvest and passage at North Fork Dam (Oregon Department of Fish and Wildlife 1990). Summer steelhead are harvested as early as May (Oregon Department of Fish and Wildlife 1990) and upstream migrants pass the North Fork Dam passage as early as April and as late as December (Oregon Department of Fish and Wildlife 1990). Estimates of run timing past North Fork Dam for the combined run of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

An approximation of the temporal distribution of the run was reported in Oregon Department of Fish and Wildlife (1990) and is presented in Figure 1. The methodology used to generate this approximation is unknown.

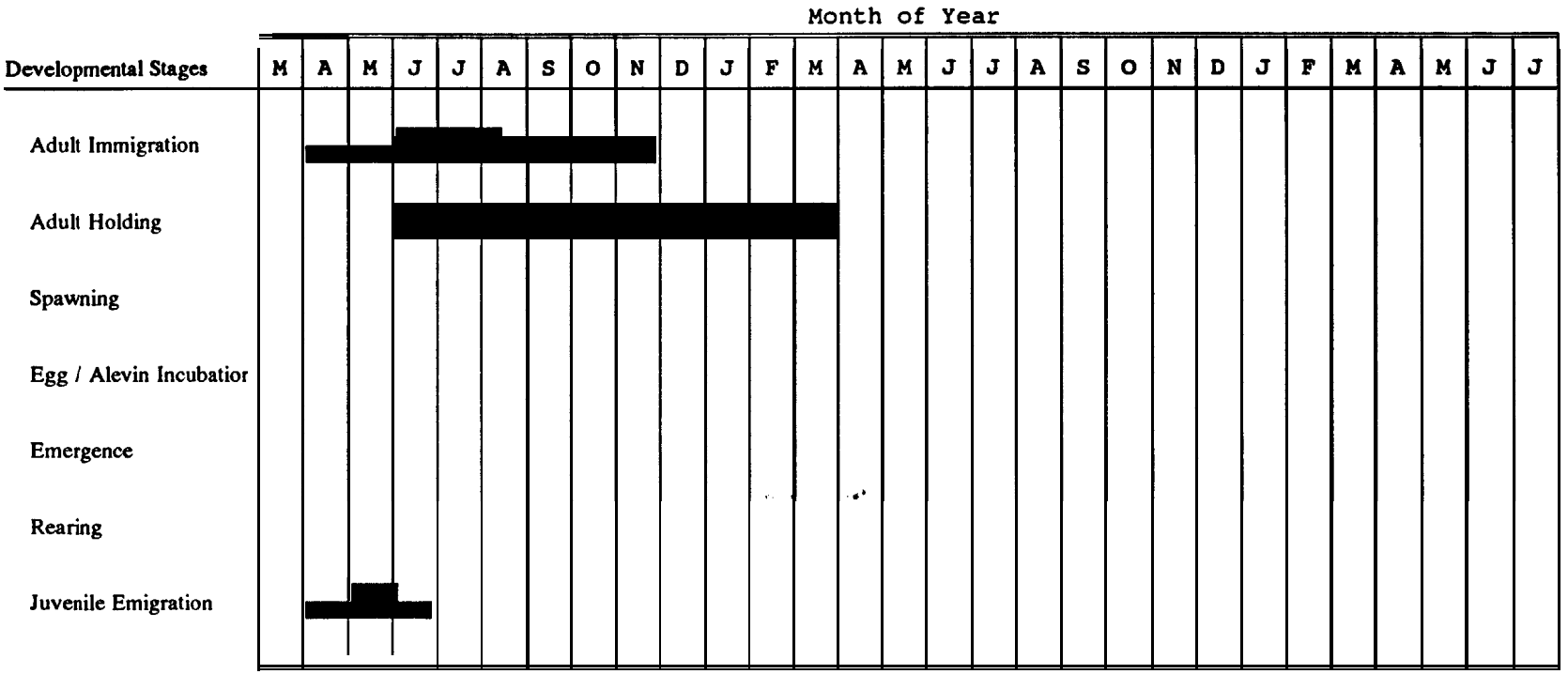
Numbers: Although brood year specific estimates of run size for hatchery summer steelhead are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Hatchery Facilities

There are no hatchery facilties located in the subbasin that collect or spawn returning fish for subbasin hatchery production.

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES and see SANTIAM RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate adult immigration, spawning, and juvenile emigration.
3. Wide bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

Figure 1 (TT). Skamania/Foster stock summer steelhead freshwater life history in the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (TR). Hatchery summer steelhead releases into the Clackamas River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1968	Skamania	Oak Springs	fing.	02/05/69	--	28.0	23,780	N. Fk. Reservoir	--
1969	Skamania	Oak Springs	fing.	02/17/70	--	23.0	26,450	N. Fk. Reservoir	--
1969	Skamania	Gnat Creek	smolt	06/01/70	06/02/70	7.4	39,967	Collawash River	--
1970	Skamania	Oak Springs	fing.	09/28/70	--	95.0	40,825	N. Fk. Reservoir	--
1970	Skamania	Oak Springs	fing.	01/02/71	--	20.0	21,975	N. Fk. Reservoir	--
1971	Skamania	Gnat Creek	smolt	04/12/72	--	7.9	26,070	Clackamas River	--
1971	Skamania	Gnat Creek	smolt	04/11/72	--	8.7	24,012	Collawash River	--
1972	Skamania	Roaring River	smolt	04/16/73	04/17/73	7.2	62,926	Collawash River	--
1972	Skamania	Alsea	smolt	04/18/73	04/24/73	7.7	32,915	Clackarnas River	--
1972	Skamania	Alsea	smolt	04/19/73	--	11.1	10,323	Clackamas R., blw River Mill	--
1973	Skamania	Alsea	smolt	05/08/74	05/16/74	7.6	56,163	Collawash River	--
1973	Skamania	Alsea	smolt	05/07/74	05/09/74	7.4	53,028	Clackamas River	--
1974	Skamania	Alsea	smolt	05/07/75	05/09/75	8.3	76,529	Clackamas River	--
1974	Skamania	Alsea	smolt	05/08/75	--	8.2	42,795	Collawash River	--
1974	Skamania	Gnat Creek	smolt	05/06/75	--	6:0	35,100	Clackamas River	--
1975	Skamania	Alsea	smolt	04/28/76	--	6.6	52,912	Clackamas River	--
1975	Skamania	Alsea	smolt	04/07/76	04/13/76	6.5	66,837	Clackarnas River	--
1975	Skamania	Alsea	smolt	04/08/76	04/13/76	6.5	41,093	Collawash River	--
1976	Skamania	Alsea	smolt	04/28/77	05/02/77	9.4	78,472	Clackamas River	--
1976	Skamania	Gnat Creek	smolt	05/06/77	05/12/77	6.9	80,233	Clackamas River	--
1976	Skamania	Gnat Creek	smolt	05/06/77	05/12/77	7.1	30,206	Collawash River	--
1977	Skamania	Alsea	smolt	05/02/78	05/23/78	7.0	66,757	N Fk fish ladder	--
1977	Skamania	Gnat Creek	smolt	05/15/78[c]	--	6.4	34,427	Clack. R, Three Lynx	--
1977	Skamania	Gnat Creek	smolt	05/15/78[c]	--	5.9	34,615	Clack. R, Stockpile #5	--
1977	Skamania	Gnat Creek	smolt	05/15/78[c]	--	6.2	17,440	Collawash R, Tom's Mdw Brdg	--
1977	Skamania	Gnat Creek	smolt	05/15/78[c]	--	7.0	25,230	Clack. R, Carter Brdg	--
1977	Skamania	Gnat Creek	smolt	05/15/78[c]	--	6.5	16,088	Collauash R, Hot Spr Fk Brdg	--
1978	Skamania	Alsea	smolt	05/15/79[c]	--	8.0	10,800	Clackamas R, Three Lynx	--
1978	Skamania	Alsea	smolt	05/15/79[c]	--	8.0	47,570	Clackamas R, Carter Bridge	--
1978	Skamania	Gnat Creek	smolt	05/15/79[c]	--	5.9	36,867	Clack. R, Three Lynx	--
1978	Skamania	Gnat Creek	smolt	05/15/79[c]	--	5.9	17,011	Clack. R, Graham Pass	--
1978	Skamania	Gnat Creek	smolt	05/15/79[c]	--	5.9	19,711	Collawash R, Tom's Mdw Brdg	--
1978	Skamania	Gnat Creek	smolt	05/15/79[c]	--	5.9	31,538	Clack. R, Stockpile #5	--
1978	Skamania	Gnat Creek	smolt	05/15/79[c]	--	5.9	18,525	Collawash R, Hot Spr Fk Brdg	--
1979	Skamania R.	Alsea	smolt	05/05/80	--	6.0	30,870	Clackamas River	--
1979	Skamania	Roaring River	fins.	09/13/79	--	59.0	57,230	Clack. R, N Fk Reservoir	--
1979	Skamania R.	Gnat Creek	smolt	04/28/80	--	5.3	16,271	Clackamas River	--
1979	Skamania R.	Gnat Creek	smolt	04/25/80	04/29/80	5.9	36,037	Clackamas River	--
1979	Skamania R.	Gnat Creek	smolt	04/30/80	05/01/80	6.2	18,656	Collawash River	--

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Clackamas River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1979	Skamania R.	Gnat Creek	smolt	04/30/80	--	5.9	18,054	Not Springs Fork	--
1979	Skamania R.	Gnat Creek	smolt	04/28/80	--	5.3	10,865	NFk Clackamas River	--
1979	Skamania R.	Gnat Creek	smolt	04/29/80	--	5.9	9,793	NFk Clackamas River	--
1979	Skamania R.	Gnat Creek	smolt	04/25/80	04/30/80	6.2	10,291	NFk Clackamas River	--
1979	Skamania R.	Gnat Creek	smolt	04/25/80	--	6.7	'6,097	NFk Clackamas River	--
1980	Skamania R.	Gnat Creek	smolt	04/22/81	04/23/81	6.0	39.298	Clackamas River	--
1980	Skamania R.	Gnat Creek	smolt	04/24/81	--	6.1	10,340	Clackamas River	--
1980	Skamania R.	Gnat Creek	smolt	04/24/81	--	6.2	21,359	Clackamas River	--
1980	Skamania R.	Gnat Creek	smolt	04/30/81	--	6.5	5,005	Clackamas River	--
1980	Skamania R.	Gnat Creek	smolt	04/29/81	04/30/81	6.6	45,838	Clackamas River	--
1980	Skamania R.	Gnat Creek	smolt	04/28/81	--	6.8	15,402	Clackamas River	--
1980	Skamania R.	Gnat Creek	smolt	05/01/81	--	6.6	6,415	Collawash River	--
1980	Skamania R.	Gnat Creek	smolt	04/30/81	--	6.6	5,016	Oak Grove Fork	--
1981	Skamania R.	Gnat Creek	smolt	05/03/82	--	4.7	15,923	Clackamas River	--
1981	Skamania R.	Gnat Creek	smolt	05/04/82	--	4.9	30,737	Clackamas River	--
1981	Skamania R.	Gnat Creek	smolt	05/04/82	05/05/82	5.1	20,552	Clackamas River	--
1981	Skamania R.	Gnat Creek	smolt	05/05/82	--	5.3	6,022	Clackamas River	--
1981	Skamania R.	Gnat Creek	smolt	05/05/82	05/06/82	5.7	36,372	Clackamas River	--
1981	Skamania R.	Gnat Creek	smolt	05/05/82	--	5:3	15,899	Hot Springs Fork	--
1981	Skamania R.	Gnat Creek	smolt	05/05/82	_	5.3	4,235	NFk Clackamas River	--
1982	Skamania R.	Gnat Creek	smolt	04/26/83	--	4.9	4,214	Clackamas River	--
1982	Skamania R.	Gnat Creek	smolt	04/25/83	04/28/ 83	5.0	70,912	Clackamas River	--
1982	Skamania R.	Gnat Creek	smolt	04/27/83	04/29/ 83	5.1	15.400	Clackamas River	--
1982	Skamania R.	Gnat Creek	smolt	04/29/83	--	5.4	9; 963	Clackamas River	--
1982	Skamania R.	Gnat Creek	smolt	05/02/83	--	5.5	4.730	Clackamas River	--
1982	Skamania R.	Gnat Creek	smolt	04/28/83	--	4.9	4,210	NFk Clackamas River	--
1982	Skamania R.	Gnat Creek	smolt	04/26/83	04/29/83	5.0	25,321	NFk Clackamas River	--
1982	Skamania R.	Gnat Creek	smolt	04/29/83	--	5.1	4,335	NFk Clackamas River	--
1982	Skamania R.	Gnat Creek	smolt	05/02/83	--	5.5	3,293	NFk Clackamas River	--
1982	Skamania R.	Oak Springs	smolt	05/05/83		4.5	5,390	Clackamas River	--
1982	Skamania R.	Oak Springs	smolt	05/05/83	--	4.6	5,520	Clackamas River	--
1983	Skamania R.	Gnat Creek	fing.	11/10/83	--	24.2	63,888	Clackamas River	--
1983	Skamania R.	Gnat Creek	fing.	11/09/83	11/10/83	28.0	74,150	Clackamas River	--
1983	Skamania R.	Gnat Creek	fing.	11/10/83	--	28.0	50,956	NFk Clackamas River	--
1983	Skamania R.	Gnat Creek	smolt	04/ 30/84	05/01/84	5.6	28,331	Clackamas River	AD
1983	Skamania R.	Gnat Creek	smolt	05/02/84	--	5.9	5,073	Clackamas River	--
1983	Skamania R.	Gnat Creek	smolt	05/02/84		5.9	20,177	Clackamas River	AD
1983	Skamania R.	Gnat Creek	smolt	05/01/84	--	6.0	4,890	Clackamas River	--
1983	Skamania R.	Gnat Creek	smolt	04/30/84	05/02/84	6:0	79,324	Clackamas River	AD
1983	Skamania R.	Gnat Creek	smolt	05/02/84		5.9	15,281	Collawash River	AD

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Clackamas River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1983	Skamania R.	Gnat Creek	smolt	05/02/84	--	6.0	5,070	Collauash River	AD
1983	Skamania R.	Oak Springs	smolt	04/13/84	--	5.0	7,000	Clackamas River	AD
1983	Skamania R.	Oak Springs	smolt	04/12/84	--	5.1	5,202	Clackamas River	AD
1984	Skamania R.	Gnat Creek	smolt	05/06/85	--	5.0	4,550	Clackamas River	AD
1984	Skamania R.	Gnat Creek	smolt	05/06/85	--	5.2	7,760	Clackamas River	AD
1984	Skamania R.	Gnat Creek	smolt	05/06/85	05/08/85	5.3	29,028	Clackamas River	AD
1984	Skamania R.	Gnat Creek	smolt	05/07/85	--	5.4	23,444	Clackamas River	AD
1984	Skamania R.	Gnat Creek	smolt	05/07/85	05/08/85	5.7	10,372	Clackamas River	AD
1984	Skamania R.	Gnat Creek	smolt	05/08/85	--	5.8	2,088	Clackamas River	AD
1984	Skamania R.	Gnat Creek	smolt	05/08/85	05/10/85	6.0	56,690	Clackamas River	AD
1984	Skamania R.	Gnat Creek	smolt	05/08/85	--	6:1	5,246	Clackamas River	AD
1984	Skamania R.	Gnat Creek	smolt	05/10/85	--	5.9	19,996	Collawash River	AD
1984	Skamania R.	Gnat Creek	smolt	05/09/85	--	6.0	5,370	Collawash River	AD
1985	Skamania R.	Gnat Creek	fins.	11/29/85	--	39.8	7,661	Clackamas River	--
1985	Skamania R.	Gnat Creek	snloit	05/05/86	05/06/86	4.7	25,331	Clackamas River	AD
1985	Skamania R.	Gnat Creek	smolt	05/05/86	05/06/86	4.8	15,376	Clackamas River	AD
1985	Skamania R.	Gnat Creek	smolt	05/06/86	05/08/86	5.0	71,415	Clackames River	AD
1985	Skamania R.	Gnat Creek	smolt	04/09/86	04/11/86	5.3	30,262	Clackamas River	AD
1985	Skamania R.	Gnat Creek	smolt	11/29/85	--	11.4	5,935	Clackamas River	--
1985	Skamania R.	Gnat Creek	smolt	05/07/86	--	5.0	10,515	Collawash River	AD
1986	Skamania R.	Gnat Creek	fing.	1 0/06/86	--	17.6	18,478	Clackamas River	--
1986	Skamania R.	Gnat Creek	fins.	1 0/06/86	--	45.9	5,508	Clackamas River	--
1986	Skamania R.	Gnat Creek	smolt	04/28/87	--	4.8	30,960	Clackamas River	AD
1986	Skamania R.	Gnat Creek	smolt	04/27/87	04/30/87	4.9	72,272	Clackamas River	AD
1986	Skamania R.	Gnat Creek	smolt	04/28/87	04/29/87	5.1	35,162	Clackamas River	AD
1986	Skamania R.	Gnat Creek	smolt	04/28/87	--	4.8	9,365	Collawash River	AD
1986	Skamania R.	Gnat Creek	smolt	04/28/87	--	4.9	5,635	Collawash River	AD
1987	Skamania R.	Gnat Creek	smolt	04/28/88	04/29/88	5.8	40,335	Clackamas River	AD
1987	Skamania R.	Gnat Creek	smolt	04/25/88	04/28/88	6.1	36,463	Clackamas River	AD
1987	Skamania R.	Gnat Creek	smolt	04/26/88	04/27/88	6.2	30,964	Clackamas River	AD
1987	Skamania R.	Gnat Creek	smolt	04/27/88	--	6.3	38,942	Clackamas River	AD
1987	Skamania R.	Gnat Creek	smolt	04/26/88	--	6.1	15,003	Collauash River	AD
1988	Skamania R.	Gnat Creek	smolt	04/27/89	04/28/89	6.7	73,461	Clackamas River	AD
1988	Skamania R.	Gnat Creek	smolt	04/27/89	--	6.8	51,540	Clackamas River	AD
1988	Skamania R.	Gnat Creek	smolt	04/26/89	--	7.0	35,129	Clackamas River	AD
1988	Skamania R.	Gnat Creek	smolt	04/27/89	--	6.8	14,994	Hot Springs Fork	AD
1988	Skamania R.	Gnat Creek	smolt	04/27/89		6.8	4,998	NFk Clackamas River	AD
1988	Skamania R.	Oak Springs	smolt	04/28/89	--	6.1	12,200	Oak Grove Fork	AD
1989	Skamania R.	Gnat Creek	smolt	05/02/90	05/04/90	5.6	45,414	Clackamas River	AD
1989	Skamania R.	Gnat Creek	smolt	04/30/90	05/07/90	5.7	84,938	Clackamas River	AD
1989	Skamania R.	Gnat Creek	smolt	05/04/90	05/07/90	5.8	24,702	Clackamas River	AD

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Clackamas River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1989	Skamania R.	Gnat Creek	smolt	05/04/90	--	5.8	14,964	Collawash River	AD
IWO	Skamsnia R.	Gnat Creek	smolt	04/24/91	--	5.5	19,351	Clackamas River	AD
IWO	Skamsnia R.	Gnat Creek	smolt	04/24/91	--	5.8	36,016	Clackamas River	AD
IWO	Skamania R.	Gnat Creek	smolt	04/25/91	--	5.9	50,407	Clackamas River	AD
IWO	Skamania R.	Gnat Creek	smolt	04/26/91	04/30/91	6.4	62,459	Clackamas River	AD
IWO	Skamania R.	Gnat Creek	smolt	04/24/91	--	5.8	15,104	Hot Springs Fork	AD

a Modified from Oregon Department of Fish and Wildlife (unpublished data); and Oregon Department of Fish and Wildlife's hatchery production database.

b D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = Left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CR = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

c Day(s) of release unknown. Standardized to the 15th of the month.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Clackamas River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

CLACKAMAS RIVER SUBBASIN

Naturally Produced Winter Steelhead

GEOGRAPHIC LOCATION

The Clackamas River originates on the west slope of the Cascade Mountains, between Mount Hood and Mount Jefferson. The Clackamas River flows into the Willamette River at River Mile (RM) 24.8. Major tributaries of the Clackamas River include the Roaring and Collawash rivers, the North and Oak Grove forks, and Clear, Deep, Eagle, and Fish creeks (see CLACKAMAS RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The Clackamas River subbasin drains an area of 934 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Late run winter steelhead are native to the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990). The majority of winter steelhead returning to the subbasin are believed to be hatchery fish (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Winter steelhead spawn throughout the Clackamas River subbasin, including the upper mainstem, the Oak Grove, North and Hot Springs forks, the Roaring and Collawash rivers, and Deep, Clear, Eagle, and Fish creeks (Oregon Department of Fish and Wildlife 1990). The available spawning and rearing habitat is rated as primarily of "excellent" and "good" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult holding, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of harvest for native winter steelhead are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

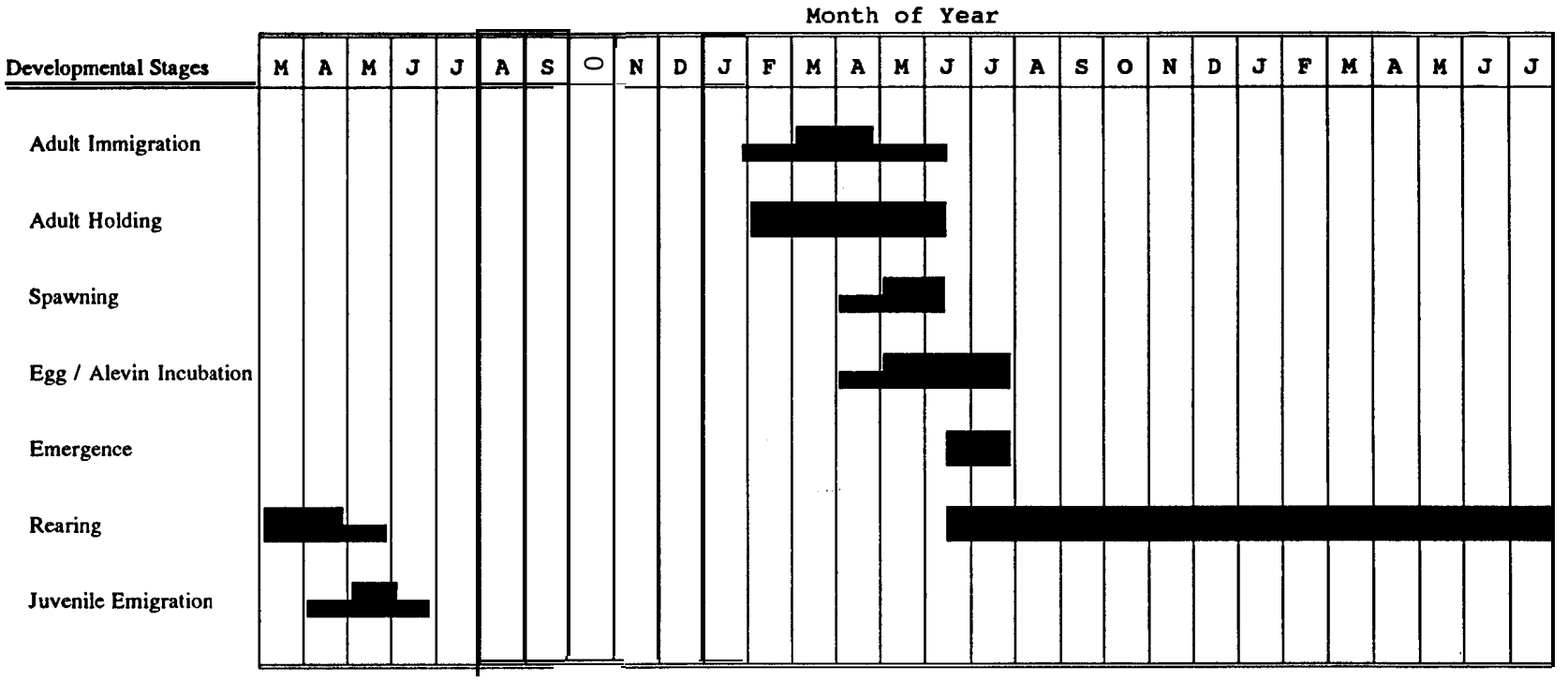
Timing: Timing of passage at North Fork Dam provides the only indication of timing of the wild winter steelhead run in the Clackamas River subbasin. Prior to the introduction of Big Creek stock winter steelhead into the subbasin, run timing at North Fork Dam peaked in May (Oregon Department of Fish and Wildlife 1990). More recently, a larger proportion of returning adults pass the North Fork Dam from November through April (Oregon Department of Fish and Wildlife 1990).

An approximation of the temporal distribution of the run was reported in Oregon Department of Fish and Wildlife (1990) and is presented in Figure 1. The methodology used to generate this approximation is unknown.

Numbers: Although brood year specific estimates of run size for native winter steelhead are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Timing: Data from the recoveries of kelts indicate that most spawning is completed by June (Gunsolus and Eicher 1970, cited by Howell et al. 1985; Howell et al. 1985). An approximation of the temporal distribution of spawning was reported in Oregon Department of Fish and Wildlife (1990) and is presented in Figure 1. The methodology used to generate this approximation is unknown.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate adult immigration, spawning, and juvenile emigration.
3. Wide bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

Figure 1 (TT). Native winter steelhead freshwater life history in the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Clackamas River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	50.0	41.5	8.1	0.4	--	253.9	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Clackamas River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	100.0	0.0	--	0.1	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

REFERENCES

Gunsolus, R.T. and G.J. Eicher. 1970. Evaluation of fish-passage facilities at the North Fork project on the Clackamas River in Oregon. Research Project Report of the Fish Commission of Oregon, Oregon Game Commission, United States Bureau of Commercial Fisheries, United States Bureau of Sport Fisheries and Wildlife, and Portland General Electric Company. (As reported by Howell et al. 1985).

Howell, P.J., K. Jones, D. Scamecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume II: steelhead stock summaries, stock transfer guidelines-information needs. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

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CLACKAMAS RIVER SUBBASIN

Hatchery Produced Winter Steelhead

ORIGIN

The Clackamas River subbasin has been supplemented with hatchery reared native stock and the Big and Eagle creek hatchery winter steelhead stocks (Oregon Department of Fish and Wildlife 1990). Coastal stocks were also released into the subbasin but it is believed that survival rates were low for these brood releases (Oregon Department of Fish and Wildlife 1990).

Eagle Creek stock is reared at Eagle Creek National Fish Hatchery (NFH; Oregon Department of Fish and Wildlife 1990). Eagle Creek stock is derived from early run Big Creek stock and late run native Clackamas stock. Originally, Big Creek stock eggs were obtained from Big Creek Hatchery and native Clackamas broodstock were collected in Delph and Eagle creeks. Currently, returns to Eagle Creek NFH are collected throughout the run and used as hatchery broodstock (Oregon Department of Fish and Wildlife 1990).

Since 1985, some of the fry produced from the late spawning portion of the Eagle Creek stock have been transferred from Eagle Creek NFH to Clackamas Hatchery for continued rearing and release (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery supplementation in the subbasin began in 1958 with the release of hatchery reared Clackamas stock (Table 1). The first release of non-native stock was in 1964 (Table 1). The hatchery program primarily releases smolts into the subbasin although fry, fingerling, and adult releases have also been made (Table 1). Smolts have been released at various locations in Eagle Creek and the mainstem Clackamas River during April and May (Table 1).

Approximations of the temporal distribution of adult immigration, adult. holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. Estimates are for Big Creek stock winter steelhead that spawn and rear in the wild. The methodology used to generate these approximations is unknown.

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

The only hatchery facility in which fry were reared or acclimated prior to release in the subbasin was Eagle Creek National Fish Hatchery (Table 1). Annual numbers released ranged from 17,295 to 601,602 fish (Table 1). Size at release ranged from 3,886 to 249

fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Roaring River Hatchery and Eagle Creek National Fish Hatchery (Table 1). Annual numbers released ranged from 6,700 to 372,000 fish (Table 1). Size at release ranged from 371.0 to 16.2 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Eagle Creek NFH and Gnat Creek, Clackamas, Alsea, Cedar Creek, and Roaring River hatcheries and Trojan Pond (Table 1). Annual numbers released ranged from 93,816 to 398,984 fish (Table 1). Size at release ranged from 43.0 to 3.0 fish per pound (Table 1).

Adult

Hatchery facilities in which adults were held prior to-release in the subbasin include Marion Forks, Big Creek, and Klaskanine hatcheries and Eagle Creek NFH (Table 1). Annual numbers released ranged from 69 to 975 fish (Table 1).

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery winter steelhead are not available, estimates by run year for the combined harvest of natural and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Hatchery Facilities

Timing: Winter steelhead are spawned at Eagle Creek NFH from January to April (Howell et al. 1985).

Numbers: Estimates of escapement, by brood year, are available for Big Creek stock winter steelhead returning to Eagle Creek NFH (Table 2). No estimates are available for a complete brood return. In addition, returns by run year are available in Oregon Department of Fish and Wildlife (1990).

Age Structure

Age structure was estimated for Big Creek stock winter steelhead returning to Eagle Creek NFH (Table 3).

Annual estimates of age structure, by run year, ranged from 9-80% 2 salt fish, 18-91% 3 salt fish, and 1-2% 4 salt fish (Table 3).

Sex Ratio

Sex ratios (percent females) were estimated for Big Creek stock winter steelhead returning to Eagle Creek NFH (Table 4).

Annual estimates of sex ratio ranged from 16-26% for 2 salt fish and 59-72% for 3 salt fish (Table 4). Run year specific estimates of sex ratio for total returns are available in Oregon Department of Fish and Wildlife (1990).

Fecundity

Although brood year specific estimates of fecundity are not available, run year specific estimates of mean fecundity are available in Oregon Department of Fish and Wildlife (1990).

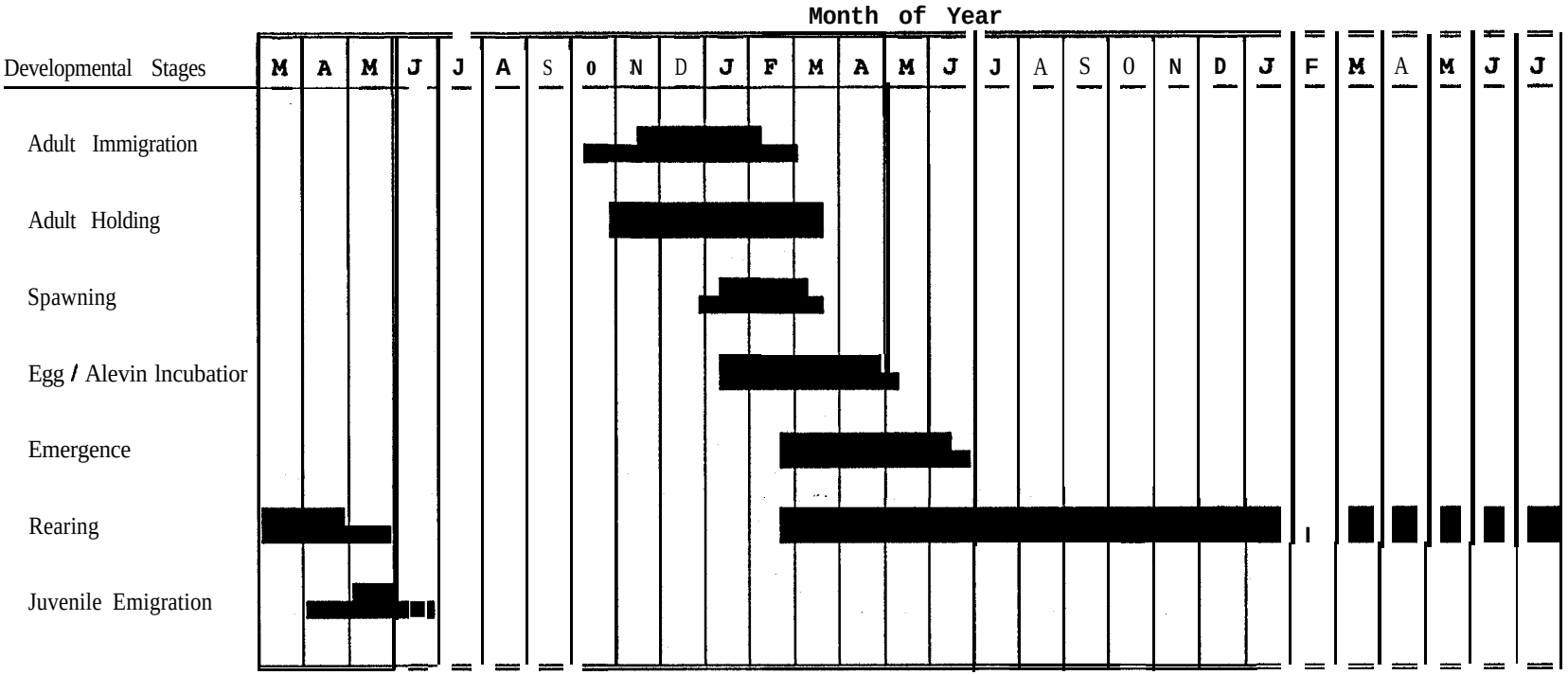
BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile Eagle Creek and native hatchery winter steelhead stocks were sampled from Eagle Creek NFH and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele mobilities and allele frequencies were determined for 21 enzyme systems (Appendix Table 4). No rare alleles were detected.

Schreck et al. (1986) classified Columbia River Basin steelhead into several clusters of similar stocks based on biochemical, morphological and life history characters. Columbia River Basin steelhead stocks segregated into two primary groups, those from west of the Cascade Mountains and those from east of the Cascades. As expected, Eagle Creek and native winter steelhead stocks from Eagle Creek NFH clustered with other stocks from west of the Cascades. This primary group consisted of 3 subgroups. At the subgroup level, Eagle Creek and native winter steelhead stocks from Eagle Creek NFH were more similar to other hatchery stocks of summer and winter steelhead than to other steelhead from west of the Cascades. This subgroup was characterized by the earliest average spawning time; the lowest average head and maxillary length, the lowest number of scales in the lateral series and above the lateral line, and the highest average caudal peduncle length. This group also had the lowest frequency of the common malate dehydrogenase allele, and the greatest average frequencies of the common L-lactate dehydrogenase and dipeptidase alleles. The summer stocks placed in this group are all originally from the Skamania Hatchery stock of summer steelhead.

DISEASES

Various diseases have been detected at Clackamas Hatchery and Eagle Creek NFH, including BKD, furunculosis, and coldwater disease (Table 5). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see SANTIAM RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES and see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate adult immigration, spawning, and juvenile emigration.
3. Wide bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

Figure 1 (TT). Winter steelhead (Big Creek stock) freshwater life history in the Clackamas River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (TR). Hatchery releases of winter steelhead into the Cleckemas River subbasin by brood year and if merked, by coded wire tag code'.

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1958	Clackamas	Eagle Cr NFH	smolt	03/15/60[c]	--	7.9	32,057	Clear Creek	--
1958	Clackamas	Eagle Cr NFH	smolt	03/15/60[c]	--	6.0	148,064	Eagle Creek	--
1959	Clackamss	Eagle Cr NFH	smolt	10/15/60[c]	12/15/60[c]	5.8-7.9	145,056	Eagle Creek	--
1960	Clackames	Eagle Cr NFH	smolt	05/15/61[c]	--	13.0	18,816	CLear Creek	--
1960	Clackamas	Eagle Cr NFH	smolt	05/15/61[c]	--	11.0	75,000	Eagle Creek	--
1960	Clackamas	Eagle Cr NFH	smolt	01/15/62[c]	--	7.6	49,700	Eagle Creek	--
1961	Clackamas	Eagle Cr NFH	fing.	04/15/62'	--	33.0	61,527	N. Fk. Clackamss	--
1961	Clackamas	Eagle Cr NFH	smolt	04/15/62[c]	--	12.0	68,500	Eagle Creek	
1961	Clackamas	Eagle Cr NFH	smolt	05/15/62[c]	--	17.0	181,564	Eagle Creek	--
1962	Ctackamas	Eagle Cr NFH	fing.	06/15/63[c]	--	30.0	102,200	N. Fk. Eagle Creek	--
1962	Clackames	Eagle Cr NFH	smolt	04/15/63[c]	--	14.0	16,013	N. Fk. Clackamas	--
1962	Clackamss	Eagle Cr NFH	smolt	05/15/63[c]	--	18.0	151,364	Eagle Creek	--
1962	Clackamas	Eagle Cr NFH	smolt	06/15/64[c]	--	9.7	44,363	Eagle Creek	--
1963	Clackamas	Eagle Cr NFH	fing.	05/15/64'	--	22.0	128,879	Eagle Creek	--
1963	Clackamas	Eagle Cr NFH	smolt	12/15/64[c]	--	13.8	92,487	Eagle Creek	--
1964	Eagle Cr	Eagle Cr NFH	fing.	12/15/64[c]	--	48.2	52,665	Eagle Creek	--
1964	Eagle Cr	Eagle Cr NFH	fing.	05/15/65[c]	--	44.4	20,050	Deep Creek	--
1964	Eagle Cr	Eagle Cr NFH	fing.	05/15/65[c]	--	21.6	72,280	Eagle Creek	—
1964	Eagle Cr	Eagle Cr NFH	fing.	05/15/65[c]	--	37.5	25,031	Clear Creek	—
1964	Eagle Cr	Eagle Cr NFH	smolt	03/15/66[c]	--	7.3	55,155	Deep Creek	--
1964	Big Creek	Marion Forks	adult	05/06/65	05/07/65	--	315	Collawash R	--
1965	Eagle Cr	Eagle Cr NFH	smolt	03/15/66[c]	05/15/66[c]	7.6-11.7	213,233	Eagle Creek	--
1965	Eagle Cr	Eagle Cr NFH	smolt	05/11/66[c]	--	18.0	84,657	Clear Creek	--
1965	Alsea	Alsea/Gnat Creek	smolt	02/15/67[c]	--	51.0 9.4	45,939	Clackames River	--
1966	Eagle Cr	Eagle Cr NFH	fing.				5,300	Deep Creek	--
1966	Eagle Cr	Eagle Cr NFH	fing.	06/15/67[c]	--	28.0	129,916	Deep Creek	--
1966	Eagle Cr	Eagle Cr NFH	fing.	06/15/67[c]	--	28.0	83,682	Clear Creek	--
1966	Eagle Cr	Eagle Cr NFH	smolt	03/15/67[c]	05/15/67[c]	10-12	228,285	Eagle Creek	--
1966	Alsea	Alsea	smolt	04/03/67	---	7.3	20,070	Clackamas River	--
1967	Eagle Cr	Eagle Cr NFH	fing.	05/15/68[c]	--	21.6	57,300	Clackamas River	--
1967	Eagle Cr	Eagle Cr NFH	smolt	05/15/68[c]	--	16.6	264,500	Eagle Creek	--
1967	Alsea	Alsea	smolt	04/01/68	04/12/68	6.4-8.8	19,001	Clackamas River	--
1967	Big Creek	Gnat Creek	smolt	05/10/68	--	7.4	16,056	Clackamas River	--
1967	Big Creek	Big Creek	adult	02/08/67	--	--	285	Clackamas River above N. Fk.	--
1967	Big Creek	Klaskanine	adult	01/23/67	02/02/67	--	690	Clackamas River above N. Fk.	--
1968	Eagle Cr	Eagle Cr NFH	fing.	08/15/68[c]	---	371.0	89,000	Clackamas River	--
1968	Eagle Cr	Eagle Cr NFH	smolt	04/15/69[c]	06/15/69[c]	11-16	341,353	Eagle Creek	--
1968	Eagle Cr	Eagle Cr NFH	smolt	04/15/70[c]	--	6.0	83,620	Eagle Creek	--
1968	Alsea	Alsea	smolt	03/31/69	04/04/69	7.2-7.4	20,061	Clackamas River	—

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the Clackamas River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1968	Big Creek	Gnat Creek	smolt	05/12/69	05/13/69	7.5	22,000	Clackamas River	--
1969	Eagle Cr	Eagle Cr NFH	fry	06/15/69[c]	--	3,886	272,000	Eagle Creek	--
1969	Eagle Cr	Eagle Cr NFH	fing.	01/15/70[c]	--	154.0	372,000	Eagle Creek	--
1969	Eagle Cr	Eagle Cr NFH	smolt	04/15/70[c]	--	19.0	120,900	Eagle Creek	--
1969	Eagle Cr	Eagle Cr NFH	smolt	11/15/70[c]	04/15/70[c]	3.0-5.0	39,488	Eagle Creek	--
1969	Alsea	Alsea				7.0	30,770	Clackamas River	--
1969	Big Creek	Gnat Creek	smolt	05/13/70	05/15/70	6.7	8,040	Eagle Creek	--
1969	Big Creek	Gnat Creek	smolt	05/05/70	05/05/70	7.0	42,648	Clackamas River	--
1970	Eagle Cr	Eagle Cr NFH	fry	06/15/70[c]	--	1,028	442,000	Eagle Creek	--
1970	Eagle Cr	Eagle Cr NFH	smolt	05/15/71[c]	--	12.0	110,920	Eagle Creek	--
1970	Eagle Cr	Eagle Cr NFH	smolt	03/15/72[c]	--	3.0	20,660	Eagle Creek	--
1970	Alsea	Alsea	smolt	04/13/71	04/16/71	8.5	30,013	Clackamas River	--
1970	Big Creek	Gnat Creek	smolt	04/29/71	--	10.7	17,435	Eagle Creek	--
1970	Big Creek	Gnat Creek	smolt	04/27/71	04/28/71	13:o	40,095	Clackamas River	--
1971	Eagle Cr	Eagle Cr NFH	fing.	05/15/72[c]	--	22.5	112,476	Eagle Creek	--
1971	Eagle Cr	Eagle Cr NFH	smolt	05/15/72[c]	--	10.0	183,487	Eagle Creek	--
1971	Big Creek	Gnat Creek	smolt	04/18/72	04/19/72	--	20,020	Clackamas River	--
1971	Big Creek	Cedar Creek	smolt	04/18/72	05/03/72	6.0-7.0	94,350	Clackamas River	--
1972	Eagle Cr	Eagle Cr NFH	fry	05/15/72[c]	06/15/72[c]	1,730	17,295	Clackamas River	--
1972	Big Creek	Roaring River	fing.	03/05/73	--	25.0	6,700	North Fork Reservoir	--
1972	Big Creek	Gnat Creek	fing.	09/05/72	--	59.0	53,100	North Fork Reservoir	--
1972	Eagle Cr	Eagle Cr NFH	smolt	04/15/73[c]	05/15/73[c]	8.0	204,820	Eagle Creek	--
1972	Alsea	Alsea	smolt	04/20/73	04/24/73	11.1	27,192	Clackamas River	--
1972	Big Creek	Gnat Creek	smolt	04/13/73	04/20/73	6.0-8.0	86,602	Clackamas River	--
1973	Eagle Cr	Eagle Cr NFH	fry	06/15/73[c]	--	1,500	211,329	Eagle Creek	--
1973	Eagle Cr	Eagle Cr NFH	smolt	05/15/74[c]	--	9.1-11.5	234,750	Eagle Creek	--
1973	Alsea	Alsea	smolt	04/09/74	04/17/74	8.0	109,562	Clackamas River	--
1973	Big Creek	Cedar Creek	smolt	04/08/74	--	7.5	12,000	Clackamas River	--
1973	Eagle Cr	Eagle Cr NFH	adult	09/28/73	--	--	105	Collauash River	--
1974	Eagle Cr	Eagle Cr NFH	fing.	02/15/75[c]	--	41.0	13,312	Eagle Creek	--
1974	Eagle Cr	Eagle Cr NFH	smolt	05/15/75[c]	--	8.1-9.6	96,890	Eagle Creek	--
1974	Alsea	Alsea	smolt	04/15/75[c]	--	6.8	16,156	Clackamas River	--
1974	Big Creek	Gnat Creek	smolt	04/28/75	04/29/75	6.8	41,929	Clackamas River	--
1974	Big Creek	Cedar Creek	smolt	04/10/75	--	6.2	20,450	Clackamas River	--
1974	Big Creek	Roaring River	smolt	04/14/75	04/15/75	6.8	39,461	Clackamas River	--
1975	Eagle Cr	Eagle Cr NFH	smolt	05/15/76[c]	--	8.0	119,382	Eagle Creek	--
1975	Eagle Cr	Eagle Cr NFH	smolt	05/15/76[c]	--	9.0	44,838	Clackamas River	--
1975	Big Creek	Roaring River	smolt	04/15/76	04/20/76	6.5	99,916	Clackamas River	--
1976	Eagle Cr	Eagle Cr NFH	smolt	05/15/77[c]	--	7.9	95,843	Eagle Creek	--
1976	Big Creek	Gnat Creek	smolt	04/26/77	--	5.9-6.8	113,305	Clackamas River	--
1977	Eagle Cr	Eagle Cr NFH	smolt	04/15/78[c]	--	4.5	56,361	Eagle Creek	--

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the Clackames River subbasin by brood year and if marked, by coded uire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1977	Eagle Cr	Eagle Cr NFH	smolt	04/15/78[c]	--	7.2	51,710	Eagle Creek	--
1977	Big Creek	Gnat Creek	smolt	05/11/78	--	5.4	32,031	Clackamss River @ Barton	--
1977	Big Creek	Gnat Creek	smolt	05/10/78	05/17/78	5.3	43,459	Clackamas River @ Carver	--
1977	Big Creek	Gnat Creek	smolt	05/12/78	05/14/78	5.1	61,801	Clackamss River @ McIver	--
1978	Big Creek	Roaring River	fing.	03/22/79	--	28.6	23,738	Clackames River (mouth)	--
1978	Eagle Cr	Eagle Cr NFH	smolt	04/15/79[c]	--	8.9	86,012	Eagle Creek	--
1978	Eagle Cr	Eagle Cr NFH	smolt	04/15/79[c]	--	10.4	79,902	Eagle Creek	--
1978	Big Creek	Gnat Creek	smolt	04/11/79	04/12/79	6.4	34,840	Clackamas River @ Carver	--
1978	Big Creek	Gnat Creek	smolt	04/10/79	04/11/79	6.4	33,004	Clackamas River @ Barton	--
1978	Big Creek	Gnat Creek	smolt	04/13/79	04/18/79	6.4	48,409	Clackamas River @ McIver	--
1979	Eagle Cr	Eagle Cr NFH	smolt	05/15/80[c]	--	7.1	165,841	Eagle Creek	--
1979	Big Cr[d]	Gnat Creek	smolt	04/21/80	04/22/80	6.0	36,510	Clackamss River	--
1979	Big Cr[d]	Gnat Creek	smolt	04/10/80	--	6.5	5,902	Clackamss River	--
1979	Big Cr[d]	Gnat Creek	smolt	04/24/80	--	6.6	20,030	Clackamas River	--
1979	Big Cr[d]	Gnat Creek	smolt	04/11/80	--	7.0	6,370	Clackamss River	--
1979	Big Cr[d]	Gnat Creek	smolt	04/10/80	--		6,192	Clackamas River	--
1979	Big Cr[d]	Gnat Creek	smolt	04/23/80	--	5::	21,608	Clackamas River	--
1980	Eagle Cr	Eagle Cr NFH	fing.	09/15/80[c]	--	144.0	223,054	Eagle Creek	--
1980	Eagle Cr	Eagle Cr NFH	smolt	05/15/81[c]	--	8.0	148,900	Eagle Creek	--
1980	Big Creek	Gnat Creek	smolt	04/30/81	05/07/81	5.7	40,236	Clackamas River @ Carver	--
1980	Bio Creek	Gnat Creek	smolt	04/29/81	05/12/81	5.5	21,431	Clackames River @ McIver	--
1980	Big Creek	Gnat Creek	smolt	05/16/81	--	6:0 5.0	8,066	Clackames R. @ Clack. Hat.	--
1980	Big Creek	Gnat Creek	smolt	05/07/81	05/08/81		42,058	Clackamas River @ Barton	--
1980	Eagle Cr	Eagle Cr NFH	adult	04/23/80	--	--	69	Clear Creek	--
1981	Big Cr[d]	Roaring River	smolt	04/26/82	--	5.2	12,319	Clackames River	--
1981	Big Cr[d]	Roaring River	smolt	04/27/82	05/03/82	5.6	28,219	Clackamas River	--
1981	Big Cr[d]	Roaring River	smolt	04/26/82	04/27/82	5.7	25,194	Clackamas River	--
1981	Eagle Cr	Eagle Cr NFH	smolt	05/04/82	--	7.0	100,796	Eagle Creek	--
1981	Eagle Cr	Eagle Cr NFH	smolt	05/02/83	--	6.7	113,089	Eagle Creek	--
1982	Eagle Cr	Eagle Cr NFH	fry	05/27/82	--	1,413	59,346	Clear Creek	--
1982	Eagle Cr	Eagle Cr NFH	frv	05/27/82	--	1,413	19,782	NFk Clackamss River	--
1982	Eagle Cr	Eagle Cr NFH	fry	05/27/82	--	1,413	39,564	North Fork Reservoir	--
1982	Eagle Cr	Eagle Cr NFH	smolt	05/02/83	--	6.7	113,098	Eagle Creek	--
1982	Big Cr[d]	Gnat Creek	smolt	04/21/83	05/03/83	5.0	20,939	Clackamas River	--
1982	Big Cr[d]	Gnat Creek	smolt	04/21/83	--	5.1	22,335	Clackamas River	--
1982	Big Cr[d]	Gnat Creek	smolt	04/22/83	--	5.3	22,246	Clackamas River	--
1982	Big Cr[d]	Gnat Creek	smolt	05/04/83	05/05/83	5.4	22,842	Clackamas River	--
1982	Big Cr[d]	Gnat Creek	smolt	05/10/83	--	5.7	22,654	Clackamas River	--
1982	Big Cr[d]	Gnat Creek	smolt	05/03/83	05/11/83	6.0	9,899	Clackamas River	--
1982	Big Cr[d]	Gnat Creek	smolt	05/09/83	--	6.2	4.461	Clackamas River	--

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the Clackamas River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1982	Big Cr[d]	Gnat Creek	smolt	05/11/83	--	6.3	4,407	Clackamas River	--
1982	Big Cr[d]	Roaring River	smolt	05/18/83		4.6	7,121	Clackamas River	--
1982	Big Cr[d]	Roaring River	smolt	05/18/83	--	4.8	6,624	Clackamas River	--
1982	Big Cr[d]	Roaring River	smolt	04/15/83	--	5.5	21,174	Clackamas River	--
1983	USFUS[e]	STEP	fry	04/15/83	04/28/83	1,700	66,080	Clear Creek	--
1983	USFWS[e]	STEP	fry	04/20/83	--	1,700	24,412	Clear Creek (Lower)	--
1983	Big Cr[d]	Eagle Cr NFH	smolt	05/01/84	--	8.0	99,758	Eagle Creek	--
	Big Cr[d]	Gnat Creek	smolt	05/08/84	--	5.3	9,167	Clackamas River	--
1983	Big Cr[d]	Gnat Creek	smolt	05/08/84	--	5.8	7,361	Clackamas River	--
1983	Big Cr[d]	Gnat Creek	smolt	05/05/84	05/14/84	5.9	81,518	Clackamas River	--
1983	Big Cr[d]	Gnat Creek	smolt	05/04/84	--	6.4	19,616	Clackamas River	--
1983	Big Cr[d]	Gnat Creek	smolt	05/15/84	--	6.7	21,437	Clackamas River	--
1983	Big Cr[d]	Roaring River	smolt	04/06/84	04/09/84	5.4	9,018	Clackamas River	--
1983	Eagle Cr	Eagle Cr NFH	adult	03/07/83	--	--	150	Clear Creek	--
1983	Eagle Cr	Eagle Cr NFH	adult	03/22/83	--	--	80	Deep Creek	--
1984	Eagle Cr	Eagle Cr NFH	fing.	06/08/85	--	16.2	58,080	Eagle Creek	--
1984	Eagle Cr	Eagle Cr NFH	fry	08/07/84	--	280.0	50,400	NFk Clackamas River	--
1984	Eagle Cr	Eagle Cr NFH	smolt	05/30/85	--	10.5	95,669	Eagle Creek	--
1984	Big Cr[d]	Gnat Creek	smolt	05/15/85	--	4.7	18,000	Clackamas River	--
1984	Big Cr[d]	Gnat Creek	smolt	05/10/85	05/22/85	4.9	32,904	Clackamas River	--
1984	Big Cr[d]	Gnat Creek	smolt	05/10/85	05/24/85	5.0	57,108	Clackamas River	--
1984	Big Cr[d]	Gnat Creek	smolt	05/23/85	--	5.1	18,001	Clackamas River	--
1984	Big Cr[d]	Gnat Creek	smolt	05/17/85	--		17,997	Clackamas River	--
1985	Big Cr[d]	Gnat Creek	fing.	11/08/85	--	2:::	25,426	Clear Creek	--
1985	Eagle Cr	Eagle Cr NFH	smolt	04/28/86	--	7.4	156,144	Eagle Creek	--
1985	Big Cr[d]	Gnat Creek	smolt	04/30/86	--	4.9	11,706	Clackamas River	--
1985	Big Cr[d]	Gnat Creek	smolt	04/29/86	05/09/86	5.0	81,588	Clackamas River	--
1985	Big Cr[d]	Gnat Creek	smolt	04/30/86	05/13/86	5.1	28,790	Clackamas River	--
1985	Big Cr[d]	Gnat Creek	smolt	05/01/86	--	5.2	31,313	Clackamas River	--
1985	Unknown	Clackamas	smolt	05/14/86	--	5.5	4,895	Clackamas River	--
1985	Unknown	Clackamas	smolt	05/13/86	05/14/86	5.6	15,119	Clackamas River	--
1985	Unknoun	Clackamas	smolt	05/14/86	--	5.7	6,209	Clackamas River	--
1985	Unknown	Clackamas	smolt	05/13/86	--	5.8	4,988	Clackamas River	--
1985	Unknown	Clackamas	smolt	05/13/86	--	5.9	5,132	Clackamas River	--
1985	Unknown	Clackamas	smolt	05/13/86	--	6.0	4,860	Clackamas River	--
1986	Eagle Cr	Eagle Cr NFH	smolt	04/27/87	--	7.5	169,412	Eagle Creek	--
1986	Big Cr[d]	Gnat Creek	smolt	04/20/87	04/22/87	5.0	83,809	Clackamas River	--
1986	Big Cr[d]	Gnat Creek	smolt	04/20/87	04/21/87	5.2	41,222	Clackamas River	--
	Big Cr[d]	Gnat Creek	smolt	04/21/87	04/22/87	5.4	18,926	Clackamas River	--
1986	Big Cr[d]	Gnat Creek	smolt	04/21/87	--	5.8	35,088	Clackamss River	--

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the Clackamas River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1986	Unknown	Clackamas	smolt	04/30/87	--	5.4	12,810	Clackamas River	--
1986	Unknown	Clackamas	smolt	04/30/87		6.8	3,332	Clackames River	--
1986	Unknown	Clackemas	smolt	04/30/87	--	6.9	15,890	Clackamas River	--
1986	Unknown	Clackamas	smolt	04/30/87	--	7.0	3,835	Clackamas River	--
1987	Eagle Cr	Eagle Cr NFH	fry	06/30/87	--	249.0	76,973	Eagle Creek	--
1987	Eagle Cr	Eagle Cr NFH	fry	06/23/87	--	298:0	82,397	Eagle Creek	--
1987	Eagle Cr	Eagle Cr NFH	fing.	09/21/87		40.0	41,200	Clackames River	--
1987	Eagle Cr	Eagle Cr NFH	fing.	07/15/88[c]		250.0	109,333	Eagle Creek	--
1987	Eagle Cr	Eagle Cr NFH	smolt	05/03/88		7.2	155,422	Eagle Creek	--
1987	Big	Gnat Creek	smolt	04/21/88	04/22/88	5.6	10,664	Clackamas River	--
1987	Big Cr Cr	Gnat Creek	smolt	04/25/88		5.8	1,160	Clackamas River	--
1987	Big Cr	Gnat Creek	smolt	04/25/88		5.9	15,835	Clackamas River	--
1987	Big Cr	Gnat Creek	smolt	04/21/88	--	6.2	29,481	Clackames River	--
1987	Big Cr	Trojan Pond	smolt	04/19/88	04/20/88	6.2	88,680	Clackamas River	--
1987	Unknown	Clackamas	smolt	04/07/88	--	5.8	13,050	Clackamas River	--
1987	Unknown	Clackamas	smolt	04/07/88		6.1	37,058	Clackames River	--
1987	Unknown	Clackames	smolt	04/07/88	--	6.3	13,414	Clackames River	--
1988[f]	Eagle Cr	Eagle Cr NFH	fry	06/13/89	--	1,200	51,764	Clear Creek	--
1988[f]	Eagle Cr	Eagle Cr NFH	smolt	01/01/89	12/31/89[g]	--	15,911	Clackamas River Subbasin	--
1988[f]	Eagle Cr	Eagle Cr NFH	smolt	01/01/89	12/31/89[g]	7	114,005	Clackamas River Subbasin	--
1988[f]	Eagle Cr	Eagle Cr NFH	smolt	01/01/89	12/31/89[g]	43	18,834	Clackamas River Subbasin	--
1988	Big Cr	Gnat Creek	smolt	04/10/89	--	5.3	38,320	Clackamas River	--
1988	Big Cr	Gnat Creek	smolt	04/12/89	--	5.6	22,904	Clackamas River	--
1988	Big Cr	Gnat Creek	smolt	04/11/89	04/13/89	5.7	73,951	Clackamas River	--
1988	Unknown	Clackamas	smolt	04/24/89	--	5.9	14,213	Clackames River	--
1988.	Unknoun	Clackamas	smolt	04/24/89	04/25/89	6.0	15,480	Clackames River	--
1989[f]	Eagle Cr	Eagle Cr NFH	fry	01/01/89	12/31/89[g]	--	30,700	Clackames River Subbesin	--
1989[f]	Eagle Cr	Eagle Cr NFH	smolt	01/01/90	12/31/90[g]	--	23,306	Clackames River Subbasin	--
1989[f]	Eagle Cr	Eagle Cr NFH	smolt	01/01/90	12/31/90[g]	6	123,509	Clackamas River Subbasin	--
1989[f]	Eagle Cr	Eagle Cr NFH	smolt	01/01/90	12/31/90[g]	11	22,510	Clackames River Subbasin	--
1989	Big Cr	Gnat Creek	smolt	05/09/90	--	5.4	16,545	Clackames River	AD
1989	Big Cr	Gnat Creek	smolt	04/25/90	--	5.5	35,242	Clackames River	AD
1989	Big Cr	Gnat Creek	smolt	04/26/90	04/27/90	5.6	39,928	Clackames River	AD
1989	Big Cr	Gnat Creek	smolt	04/26/90	--	5.7	35.213	Clackamas River	AD
1989	Big Cr	Gnat Creek	smolt	04/24/90	04/27/90	5.8	29,547	Clackamas River	AD
1989	Unknown	Clackames	smolt	04/23/90		5.9	16,609	Clackamas River	RV
1989	Unknown	Clackames	smolt	04/23/90	--	6.0	15,210	Clackamss River	RV
1990[f]	Eagle Cr	Eagle Cr NFH	fry	01/01/90	12/31/90[g]	--	601,602	Clackamas River Subbesin	--
1990[f]	Eagle Cr	Eagle Cr NFH	fing.	01/01/90	12/31/90[g]	--	74,546	Clackames River Subbasin	--
1990[f]	Eagle Cr	Eagle Cr NFH	smolt	01/01/91	12/31/91[g]	7	167,040	Clackames River Subbasin	--

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the Clackamas River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
						5.4			
1990	Big Cr[d]	Gnat Creek	smolt	04/22/91	--	5.5	5,049	Clackamas River	AD
1990	Big Cr[d]	Gnat Creek	smolt	04/18/91	04/22/91		110,322	Clackamss River	AD
1990	Big Cr[d]	Gnat Creek	smolt	04/18/91	--	5.6	'10,080	Clackamas River	AD
1990	Big Cr[d]	Gnat Creek	smolt	04/17/91	--	5.4	14,988	Clackamas River	AD
1990	Unknown	Clackamas	smolt	04/22/91	--	5.5	15,005	Clackamss River	RV-RM
1990	Unknown	Clackamas	smolt	04/22/91	--		15,066	Clackamas River	RV-RM

a Modified from Oregon Department of Fish and Uildlife (unpublished data); and Oregon Department of Fish and Wildlife's hatchery production database.

b D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = Left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

c Day(s) of release unknown. Standardized to the 15th of the month.

d Big Creek Hatchery stock.

e U-S. Fish and Uildlife Service hatchery stock, excluding fish from Hagerman Fish Hatchery.

f Brood year unknown, estimated from release year.

g Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.

Table 2 (RI-I). Total escapement of Big Creek stock winter steelhead to Eagle Creek NFH by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1984	--	--	--	7	--	--	--
1985	--	--	81	2	--	--	--
1986	--	355	405	--	--	--	--
1987	--	38	--	--	--	--	--

a Personal communication on 4/14/92 with Steve Pastor, U.S. Fish and Wildlife Service, Vancouver, Washington,

b Age based on scale analysis; the sample may include a small number of strays and wild fish (less than 1%).

Table 3 (AC-a). Age composition (freshwater.ocean) by run year for Big Creek stock winter steelhead at Eagle Creek NFH[a,b].

Run Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4
1989-90	443	--	80	18	2	--	--	--	--	--
1990-91	445	--	9	91	<1	--	--	--	--	--

[a] Personal communication on 4/14/92 with Steve Pastor, U.S. Fish and Wildlife Service, Vancouver, Washington.

[b] Age was determined based on an analysis of scales. Data was available by ocean age only; returning adults were assumed to have migrated as age 1 smolts. Samples may include a small number of strays and wild fish (less than 1%).

Table 4 (AS). Percent females by brood year and age class (freshwater.ocean) for Big Creek stock winter steelhead at Eagle Creek NFH[a,b].

	Females (%)			
Brood Year	1.1	1.2	1.3	1.4
1984			--	100
N			--	7
et. dev.	--	--	--	--
1985	--	--	72	0
N	--	--	81	2
st. dev.	--	--	--	--
1986	--	26	59	--
N	--	355	405	--
st. dev.	--	--	--	
1987	--	16	--	--
N	--	38	--	--
st. dev.	--	--	--	--

[a] Personal communication on 4/14/92 with Steve Pastor, U.S. Fish and Wildlife Service, Vancouver, Washington.

[b] Age was determined based on an analysis of scales. Data was available by ocean age only; returning adults were assumed to have migrated as age 1 smolts. Samples may include a small number of strays and wild fish (less than 1%).

Table 5 (TD). Parasites and diseases of winter steelhead at hatcheries located in the Clackamas River[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Clackamas	Gill amoeba
Parasite	Clackamas	Costia (*Ichthyobodo* sp.)
Parasite	Clackamas	*Trichodina spp.*
Bacteria	Eagle Creek NFH	Furunculosis *(Aeromonas salmonicida)*
Bacteria	Eagle Creek NFH	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Clackamas	*Flexibacter columnaris*
Bacteria	Clackamas	*Ichthyophthirius sp.* (ICH)
Bacteria	Clackamas	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Clackamas	*Aeromonas spp.*
Bacteria	Clackamas	Bacterial gill disease
Bacteria	Clackamas	Furunculosis *(Aeromonas salmonicida)*

[a] Data for Clackamas Hatchery are from Oregon Department of Fish and Wildlife (unpublished data) and for Eagle Creek NFH from personal communication, 1991, J. Holway, U.S. Fish and Wildlife Service, cited by Howell et al. (1985).

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MOLALLA AND PUDDING RIVERS SUBBASIN

Naturally Produced Spring Chinook Salmon

GEOGRAPHIC LOCATION

The Molalla River originates on the western slopes of the Cascade Mountains and flows into the Willamette River at River Mile (RM) 36 (see MAINSTEM WILLAME'ITE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Molalla River include the North Fork and the Table Rock Fork. The Molalla River system drains an area of 348 square miles (Oregon Department of Fish and Wildlife 1990).

The Pudding River originates in the Waldo Hills, although some tributaries originate at higher elevations in the Cascade Mountains. The Pudding River flows into the Molalla River at RM 0.75. Major tributaries of the Pudding River include Abiqua, Butte, and Silver creeks. The Pudding River system drains an area of 530 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Spring chinook are native to the Molalla River and to Abiqua Creek on the Pudding River (Oregon Department of Fish and Wildlife 1990). It is believed that the native run in the Molalla went extinct in the mid-1970's (Oregon Department of Fish and Wildlife 1990). The current status of the native Abiqua Creek population is unknown but believed to be small (Oregon Department of Fish and Wildlife 1990). Presently, natural production occurs as a result of releases of hatchery fish (see MOLALLA AND PUDDING RIVERS SUBBASINS, Hatchery Produced Spring Chinook Salmon; Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery spring chinook have been released annually into the subbasin since 1981 and temporal distribution of natural production is in part controlled by the location of release (Oregon Department of Fish and Wildlife 1990). Spring chinook spawn in the mainstem Molalla (RM 26.5 to RM 46), the North Fork (RM 0 to RM 5.5), the Table Rock Fork (RM 0 to RM 8), and possibly Abiqua Creek (RM 7 to RM 13.5; Oregon Department of Fish and Wildlife 1990). Habitat considered suitable for spawning and rearing is rated as primarily of "good" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, and emergence were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Brood year specific estimates of harvest are not available. Mean annual harvest in the Molalla River system for the 1975-79 run years was estimated at eight fish (Oregon Department of Fish and Wildlife 1990). The fishery was closed from 1980-87 (Oregon Department of Fish and Wildlife 1990).

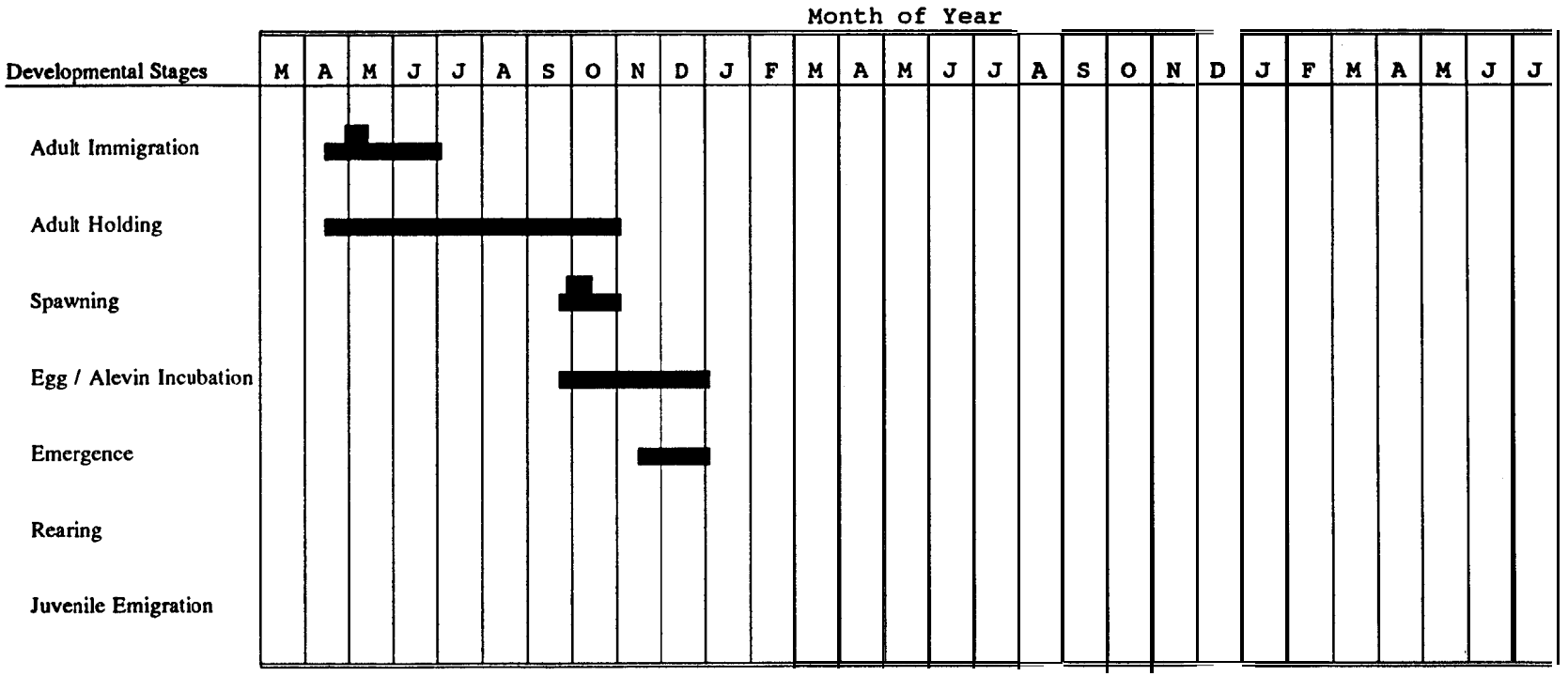
The sport fishery in Abiqua Creek has been closed since 1986 and there are no harvest estimates reported prior to the closure (Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for naturally produced spring chinook are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Wide bars indicate periods of peak activity.

Figure 1 (TT). Spring chinook freshwater life history in the Molalla/Pudding subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Molalla River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	10.8	57.6	4.3	27.3	--	65.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). **Estimated amount of rearing only habitat by quality of Molalla River subbasin spring chinook production area[a].**

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	0.0	100.0	0.0	--	3.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Molalla and Pudding Rivers). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

MOLALLA/PUDDING 6

MOLALLA AND PUDDING RIVERS SUBBASINS

Hatchery Produced Spring Chinook Salmon

ORIGIN

The Molalla and Pudding rivers subbasin has been supplemented with hatchery Willamette stock spring chinook (Table 1). The hatchery Willamette stock was derived primarily from the native Willamette stock (Howell et al. 1985).

Supplementation of the subbasin with hatchery Willamette spring chinook began in the 1980's to establish a self sustaining run and to provide a recreational fishery in the Molalla River (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery spring chinook have been released into the mainstem Molalla River, the North and Table Rock Forks, and Abiqua Creek (Table 1). Smolts are released in November and in March, and fingerlings are generally released in March and April (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Marion Forks, Willamette, McKenzie, and Oxbow hatcheries (Table 1). Annual numbers released ranged from 450,860 to 1508,978 fish (Table 1). Size at release ranged from 594 to 127.5 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include McKenzie and Willamette hatcheries (Table 1). Annual numbers released ranged from 30 to 277,730 fish (Table 1). Size at release ranged from 125.0 to 110.0 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Dexter Ponds and McKenzie, Oak Ridge, and Willamette hatcheries (Table 1). Annual numbers released ranged from 30,162 to 119,270 fish (Table 1). Size at

release ranged from 9.4 to 6.1 fish per pound (Table 1).

Jack and Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Brood year specific estimates of sport harvest for hatchery spring chinook in the Molalla River system are not available. The Pudding River system has been closed to spring chinook angling since 1986 (Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for hatchery spring chinook are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see MCKENZIE RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES; see MIDDLE FORK RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES; and see SANTIAM RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery spring chinook released into the Holalla and Pudding rivers subbasin by brood year and, if marked, coded uire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1980	S Santiam R.	Oakridge	smolt	11/10/81	--	6.8	47,274	Molalla River	--
1980	S Santiam R.	Oakridge	smolt	11/10/81	--	6.9	9,433	Molalla River	--
1980	S Santiam R.	Oakridge	smolt	11/12/81	--	7.0	26,738	Molalla River	--
1980	S Santiam R.	Oakridge	smolt	11/12/81	--	7.0	16,516	Table Rock Fork	--
1981	MFk Will.[c]	McKenzie	smolt	11/08/82	--	6.1	7,624	Molalla River	--
1981	MFk Will.[c]	McKenzie	smolt	11/08/82	--	6.2	24,518	Molalla River	--
1981	MFk Will.[c]	McKenzie	smolt	11/09/82	--	6.4	7,741	Holalla River	--
1981	MFk Will.[c]	McKenzie	smolt	11/09/82	--	6.8	8,224	Molalla River	--
1981	MFk Will.[c]	McKenzie	smolt	11/09/82	11/10/82	7.0	31,990	Molalla River	--
1981	MFk Will.[c]	McKenzie	smolt	11/09/82	--	7.0	12,325	NFk Molalla River	--
1981	MFk Will.[c]	McKenzie	smolt	11/08/82	--	6.2	7,390	Table Rock Fork	--
1982	MFk Will.[c]	Marion Forks	fry	04/28/83	--	520.0	54,080	Abiqua Creek	--
1982	MFk Will.[c]	Marion Forks	fry	04/28/83	--	550.0	94,600	Abiqua Creek	--
1982	MFk Will.[c]	Marion Forks	fry	04/29/83	--	520.0	140,400	Butte Creek	--
1982	MFk Will.[c]	Marion Forks	fry	06/13/83	--	370.0	148,700	NFk Molalla River	--
1982	MFk Will.[c]	Marion Forks	fry	06/13/83	--	369.0	148,607	Table Rock Fork	--
1982	MFk Will.[c]	Uillamette	fry	03/22/83	--	397.0	392,263	Nolalla River	--
1982	MFk Will.[c]	Uillamette	fry	03/22/83	--	544.0	439,352	Molalla River	--
1982	MFk Will.[c]	Uillamette	fry	03/22/83	--	594.0	90,976	Molalla River	--
1982	Uillamette	Dexter	adult	01/01/82	12/31/82[d]	--	209	Molalla River	--
1983	MFk Will.[c]	Uillamette	fry	05/29/84	--	222.0	92,252	Abiqua Creek	--
1983	MFk Will.[c]	Uillamette	fry	05/15/84	--	163.0	24,583	Molalla River	--
1983	MFk Will.[c]	Uillamette	fry	05/15/84	--	186.0	102,838	Molalla River	--
1983	MFk Will.[c]	Uillamette	fry	05/15/84	--	213.0	36,180	Molalla River	--
1983	MFk Will.[c]	Willamette	fry	05/15/84	--	272.0	401,626	Molalla River	--
1983	MFk Will.[c]	Uillamette	fry	05/15/84	--	311.0	150,225	Holalla River	--
1983	MFk Will.[c]	Uillamette	fry	05/16/84	--	283.0	151,092	NFk Molalla River	--
1983	MFk Will.[c]	Uillamette	fry	OS/I&/84	--	283.0	107,000	Table Rock Fork	--
1983	MFk Will.[c]	Uillamette	fry	05/16/84	--	311.0	43,074	Table Rock Fork	--
1983	MFk Will.[c]	McKenzie	fry	04/23/84	--	127.5	168,090	Molalla River	--
1983	MFk Will.[c]	McKenzie	fry	04/25/84	--	139.0	122,765	Molalla River	--
1983	MFk Will.[c]	McKenzie	fing.	04/23/84	--	112.0	92,960	Molalla River	--
1983	MFk Will.[c]	McKenzie	fing.	04/23/84	--	114.0	103,720	Holalla River	--
1983	MFk Will.[c]	McKenzie	fing.	04/23/84	--	125.0	81,050	Molalla River	--
1984	MFk Will.[c]	Uillamette	fry	05/09/85	--	314.0	124,952	Abiqua Creek	--
1984	MFk Will.[c]	Uillamette	fry	05/09/85	--	334.0	25,045	Abiqua Creek	--
1984	MFk Will.[c]	Uillamette	fry	04/23/85	--	357.0	360,113	Molalla River	--
1984	MFk Will.[c]	Uillamette	fry	04/24/85	--	431.0	232,000	Wolalla River	--
1984	MFk Will.[c]	Uillamette	fry	04/24/85	--	443.0	162,398	Nolalla River	--

Table 1 (TR). (cont.) Hatchery spring chinook released into the Molalla and Pudding rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Fin	Code/ Clip
1984	MFk Will.[c]	Uillamette	fry	04/29/85	--	575.0	246,740	Molalla River		
1984	MFk Will.[c]	Uillamette	fry	04/29/85	--	575.0	150,075	NFk Holalla River	--	
1984	MFk Will.[c]	Willamette	fry	04/23/85	--	431.0	150,399	Table Rock Fork		
1984	S Santiam R.	STEP	fing.	06/03/85	--	114.8	30	Abiqua Creek		
1985	S Santiam R.	Willamette	fing.	06/18/86	--	110.0	38,500	Butte Creek	--	
1985	MFk Will.[c]	Willamette	fry	04/18/86	--	378.0	283,200	Holalla River	--	
1985	MFk Will.[c]	Willamette	fry	04/18/86	--	393.0	683,342	Holalla River	--	
1985	MFk Will.[c]	Willamette	fry	04/18/86	--	393.0	168,890	NFk Molalla River	--	
1985	MFk Will.[c]	Willamette	fry	04/18/86	--	378.0	162,490	Table Rock Fork	--	
1985	S Santiam R.	Willamette	fry	06/18/86	--	203.7	119,141	Butte Creek	--	
1986	MFk Will.[c]	Willamette	fry	04/28/87	--	348.0	700,124	Molalla River	--	
1986	MFk Will.[c]	Willamette	fry	04/27/87	--	425.0	286,725	Molalla River	--	
1986	MFk Will.[c]	Uillamette	fry	04/27/87	--	348.0	29,530	NFk Molella River	--	
1986	MFk Will.[c]	Willamette	fry	04/27/87	--	425.0	125,275	NFk Molalla River		
1986	MFk Will.[c]	Willamette	fry	04/27/87	--	425.0	156,825	fable Rock Fork	--	
1986	MFk Will.[c]	Willamette	smolt	11/11/87	--	6.6	2,899	Molalla River	--	
1986	MFk Will.[c]	Uillamette	smolt	11/11/87	--	7.0	27,263	Holalla River	--	
1986	MFk Will.[c]	Dexter Pond	smolt	03/10/88	--	8.9	68,016	Molalla River	--	
1987	MFk Will.[c]	Willamette	fry	04/19/88	--	319.0	153,070	Molalla River	--	
1987	MFk Will.[c]	Willamette	fry	04/19/88	--	326.0	297,790	Molalla River		
1987	MFk Will.[c]	Willamette	smolt	11/18/88	--	7.1	33,030	Molalla River	--	
1987	MFk Will.[c]	Dexter Pond	smolt	03/06/89	--	9.4	69,303	Molalla River	--	
1988	MFk Will.[c]	Willamette	fry	04/17/89	--	417.0	227,105	Molalla River	--	
1988	MFk Will.[c]	Willamette	fry	04/17/89	--	441.0	299,324	Molalla River	--	
1988	MFk Will.[c]	Willamette	fry	04/17/89	--	451.0	249,805	Molalla River	--	
1988	MFk Will.[c]	Willamette	fry	04/17/89	--	467.0	249,795	Molalla River	--	
1988	MFk Will.[c]	Willamette	fry	04/17/89	--	417.0	58,360	NFk Molalla River	--	
1988	MFk Will.[c]	Willamette	fry	04/17/89	--	467.0	93,370	NFk Molalla River	--	
1988	MFk Will.[c]	Dexter Pond	smolt	03/07/90	--	9.3	98,213	Molella River	--	
1989	MFk Will.[c]	Willamette	fry	05/15/90	--	264.0	224,400	Molalla River	--	
1989	MFk Will.[c]	Willamette	fry	05/15/90	--	271.0	154,295	Molalla River	--	
1989	MFk Will.[c]	Willamette	fry	05/15/90	--	278.0	91,710	Molalla River	--	
1989	MFk Will.[c]	Willamette	fry	05/15/90	--	290.0	259,750	Molalla River	--	
1989	MFk Will.[c]	Willamette	fry	05/15/90	--	320.0	156,700	Molalla River	--	
1989	MFk Will.[c]	Willamette	fry	05/16/90	--	416.0	112,295	Molalla River	--	
1989	MFk Will.[c]	Willamette	fry	05/15/90	--	278.0	150,020	NFk Molalla River	--	
1989	MFk Will.[c]	Dexter Pond	molt	03/08/91	--	8.5	85,398	Molalla River	--	
1990	Clackames R.	Oxbou (Herman)	fry	05/20/91	--	170.0	71,380	Molalla River	--	
1990	Eagle Cr.	McKenzie	fry	05/16/91	--	188.0	195,520	Molalla River	--	

Table 1 (TR). (cont.) Hatchery spring chinook released into the Molalla and Pudding rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip
1990	Eagle Cr.	McKenzie	fry	05/16/91	--	213.0	229,990	Molalla River	--
1990	S. Santiam R.	McKenzie	fry	05/16/91	--	206.0	219,378	Molalla River	--
1990	S. Santiam R.	McKenzie	fry	05/16/91	--	245.0	296,437	Molalla River	--
1990	S. Santiam R.	McKenzie	fry	05/16/91	--	206.0	150,355	NFk Molalla River	--
1990	MFk Will.[c]	Dexter Pond	smolt	11/14/91	--	7.4	33,872	Molalla River	--

a Modified from Oregon Department of Fish and Wildlife (1990); and Oregon Department of Fish and Wildlife's hatchery production database.
b North Santiam, South Santiam, Clackamas, and Middle Fork Willamette rivers stocks, and Eagle Creek stock are all considered part of the Uillamette River stock.
c Willamette Hatchery stock.
d Month(s) and day(s) of release unknown. Standardized to thefirst and last day of the year.

REFERENCES

Howell, P.J., K. Jones, D. Scamecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

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MOLALLA AND PUDDING RIVERS SUBBASINS

Naturally Produced Fall Chinook Salmon

GEOGRAPHIC LOCATION

The Molalla River originates on the western slopes of the Cascade Mountains and flows into the Willamette River at River Mile (RM) 36 (see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Molalla River include the North Fork and the Table Rock Fork. The Molalla River system drains an area of 348 square miles (Oregon Department of Fish and Wildlife 1990).

The Pudding River originates in the Waldo Hills, although some tributaries originate at higher elevations in the Cascade Mountains. The Pudding River flows into the Molalla River at RM 0.75. Major tributaries of the Pudding River include Abiqua, Butte, and Silver creeks. The Pudding River system drains an area of 530 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Fall chinook are not native to the Molalla and Pudding rivers subbasin (Oregon Department of Fish and Wildlife 1990). Natural production of fall chinook occurs as a result of releases of hatchery fish into the subbasin (see MOLALLA AND PUDDING RIVERS SUBBASINS, Hatchery Produced Fall Chinook Salmon; Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery fall chinook have been released fairly regularly into the subbasin since 1967 and temporal distribution of natural production is controlled primarily by the location of release (Oregon Department of Fish and Wildlife 1990). The majority of spawning occurs in the mainstem Molalla, below RM 18.5 (Oregon Department of Fish and Wildlife 1990). Habitat considered suitable for spawning and rearing is rated as primarily of "good" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, and rearing were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for naturally produced

fall chinook are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Timing: Fall chinook spawn from mid-August through mid-November (Figure 1; Oregon Department of Fish and Wildlife 1990).

Numbers: There are no brood year specific estimates of spawner escapement available for fall chinook in the Molalla and Pudding rivers subbasin. Spawning ground counts are available for the mainstem Molalla River in Oregon Department of Fish and Wildlife (1990). Additional information is available in Hansen (1977, cited by Oregon Department of Fish and Wildlife 1990), Hansen (1978, cited by Oregon Department of Fish and Wildlife 1990), Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990), Smith et al. (1982, cited by Oregon Department of Fish and Wildlife 1990), Smith et al. (1983, cited by Oregon Department of Fish and Wildlife 1990), Smith et al. (1985, cited by Oregon Department of Fish and Wildlife 1990), and Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Age Structure

Although brood year specific estimates of age structure are not available, run year specific data for combined samples of naturally and hatchery produced fish is available in Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990).

Sex Ratio

Although brood year specific estimates of sex ratio are not available, run year specific data for combined samples of naturally and hatchery produced fish are available in Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990).

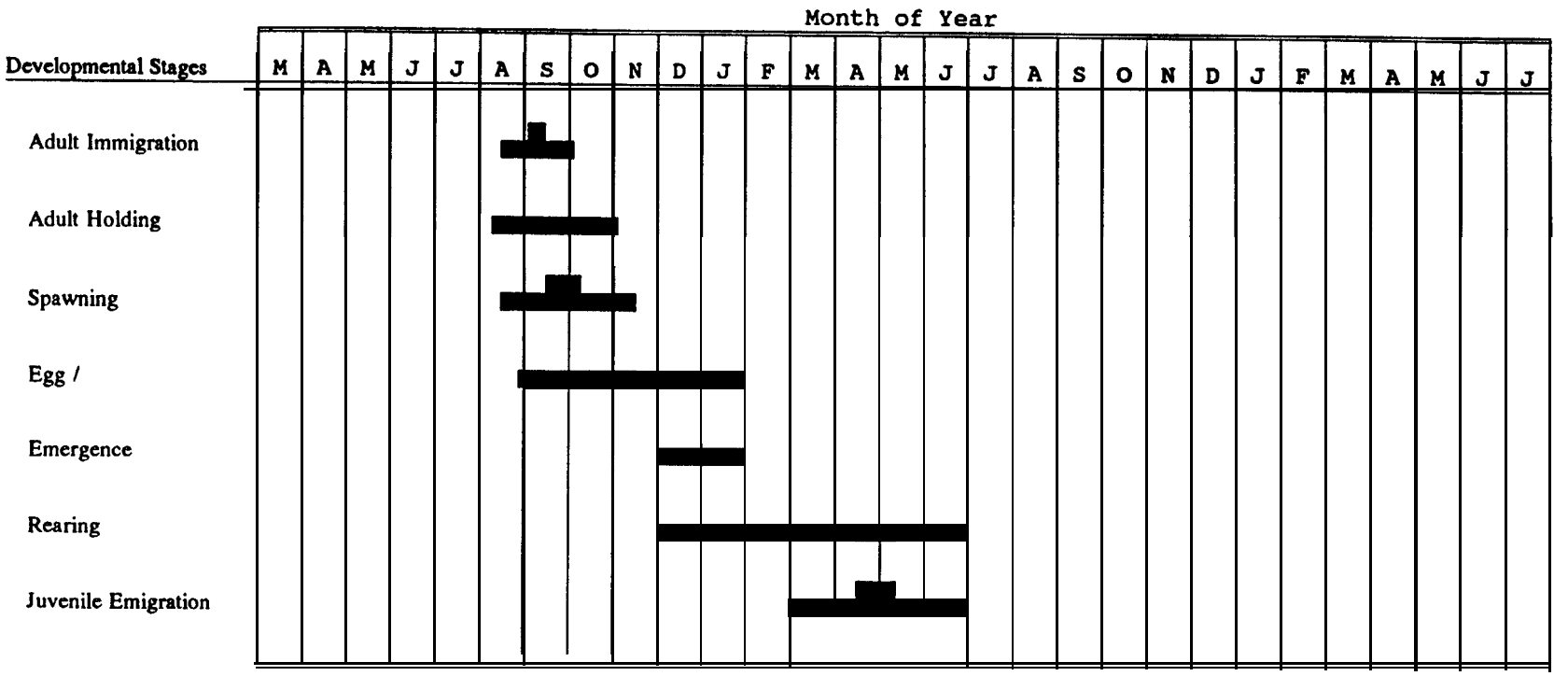
JUVENILE LIFE HISTORY

Age Structure

Juvenile fall chinook generally emigrate from the Molalla at 5 months of age (Hansen 1978, cited by Oregon Department of Fish and Wildlife 1990).

Migration Timing:

The majority of juvenile fall chinook outmigrate in April (Hansen 1978, cited by Oregon Department of Fish and Wildlife 1990). An approximation of the temporal distribution of migration was reported in Oregon Department of Fish and Wildlife (1990) and is presented in Figure 1. The methodology used to generate this approximation is unknown.



Notes:

1. The developmental stage timing represents basin wide averages, local may cause some variability.
2. Wide bars indicate periods of peak activity.

Figure 1 (TT). Fall chinook freshwater life history in the Molalla/Pudding subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Molalla River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	67.8	11.2	21.0	--	38.3	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Molalla River subbasin fall chinook production area".

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

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Smith et al. 1985. (As reported in Oregon Department of Fish and Wildlife 1990).

MOLALLA/PUDDING 18

MOLALLA AND PUDDING RIVERS SUBBASINS

Hatchery Produced Fall Chinook Salmon

ORIGIN

Hatchery fall chinook were released into the Molalla and Pudding rivers subbasin beginning in 1967 (Table 1). Fall chinook releases have been primarily of the Willamette River substock of the Lower Columbia River Hatchery (LRH) stock (Table 1). LRH stock, along with Bonneville Pool Hatchery stock, are informally called 'Yules" (Howell et al. 1985; see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook, ORIGIN).

DISTRIBUTION

Subbasin

Smolts are currently released into the Molalla and Pudding rivers subbasin from late April through early May (Oregon Department of Fish and Wildlife 1990). Hatchery fish are primarily released into the Molalla River (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Big Creek, Cascade, and Spring Creek hatcheries (Table 1). Annual numbers released ranged from 9,960 to 1,271,235 fish (Table 1). Size at release of the 1982 brood was 996.0 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Big Creek and Oxbow hatcheries, and Stayton and Aumsville ponds (Table 1). Annual numbers released ranged from 305,161 to 1,165,305 fish (Table 1). Size at release ranged from 96.8 to 43.2 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Salem and Stayton ponds (Table 1). Annual numbers released ranged from 471,924 to 1,383,990 fish (Table 1). Size at release is unknown.

Jack and Adult

There are no records of releases in the subbasin.

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for hatchery produced fall chinook are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Age Structure

Although brood year specific estimates of age structure are not available, run year specific data for combined samples of naturally and hatchery produced fish are available in Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990).

Sex Ratio

Although brood year specific estimates of sex ratio are not available, run year specific data for combined samples of naturally and hatchery produced fish are available in Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990).

Mark Recoveries

Coded wire tagged hatchery fall chinook, released as juveniles into the Molalla and Pudding rivers subbasin, were recovered in the Willamette River (Table 2); a necessary migration corridor to the Molalla and Pudding rivers subbasin.

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery fall chinook releases into the Molalla and Pudding rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1966	LRH	Big Creek	fry	01/01/67	12/31/67[d]	--	479,235	Mollala/Pudding Subbasin	--
1966	LRH	Cascade	fry	01/01/67	12/31/67[d]	--	792,000	Mollala/Pudding Subbasin	--
1966	LRH	Big Creek	fing.	01/01/67	12/31/67[d]	--	510,150	Mollala/Pudding Subbasin	--
1966	LRH	Oxbow	fing.	01/01/67	12/31/67[d]	--	500,132	Mollala/Pudding Subbasin	--
1967	BPH	Spring Creek	fry	01/01/68	12/31/68[d]	--	1,032,000	Mollala/Pudding Subbasin	--
1969	LRH	Salem Pond	snlolt	01/01/70	12/31/70[d]	--	646,803	Mollala/Pudding Subbasin	--
1970	LRH	Salem Pond	smolt	01/01/71	12/31/71[d]	--	478,743	Mollala/Pudding Subbasin	--
1971	LRH	Stayton Pond	smolt	01/01/72	12/31/72[d]	--	513,583	Mollala/Pudding Subbasin	--
1972	LRH	Stayton Pond	smolt	01/01/73	12/31/73[d]	--	1,383,990	Mollala/Pudding Subbasin	--
1973	LRH	Stayton Pond	smolt	01/01/74	12/31/74[d]	--	1,109,676	Mollala/Pudding Subbasin	--
1974	LRH	Stayton Pond	smolt	01/01/75	12/31/75[d]	--	1,077,025	Mollala/Pudding Subbasin	--
1975	LRH	Stayton Pond	smolt	01/01/76	12/31/76[d]	--	471,924	Mollala/Pudding Subbasin	--
1978	LRH	Stayton Pond	smolt	01/01/79	12/31/79[d]	--	829,405	Mollala/Pudding Subbasin	--
1979	Tanner Creek	Stayton Pond	fing.	04/29/80		79.2	75,766	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	04/29/80		79.2	3,987	Molalla River	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	04/28/80		81.1	95,715	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	04/28/80		81.1	3,988	Molalla River	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	04/29/80	--	83.2	97,406	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	04/29/80	--	83.2	4,058	Molalla River	CUT
1979	Tanner Creek	Stayton Pond	fing.	04/29/80		84.9	168,689	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	04/29/80	--	84.9	7,903	Molalla River	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	05/02/80	--	85.8	91,277	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	05/02/80	--	85.8	4,804	Molalla River	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	04/28/80	--	86.2	104,725	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	04/28/80	--	86.2	5,511	Molalla River	CUT
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	86.9	102,583	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	86.9	4.274	Molalla River	CUT
1979	Tanner Creek	Stayton Pond	fing.	04/28/80		88.5	106,954	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	04/28/80	--	88.5	4,456	Molalla River	CUT
1979	Tanner Creek	Stayton Pond	fing.	05/05/80		91.9	59,552	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	05/05/80	--	91.9	2,481	Molalla River	AD-CUT
1979	Tanner Creek	Stayton Pond	fing.	04/29/80	--	93.8	98,865	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	04/29/80	--	93.8	5,203	Molalla River	CUT
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	96.8	111,253	Molalla River	--
1979	Tanner Creek	Stayton Pond	fing.	05/01/80	--	96.8	5,855	Molalla River	AD-CUT
1980	Tanner Creek	Aunsville Ponds	fing.	04/29/81	--	70.8	74,191	Molalla River	--
1980	Tanner Creek	Aunsville Ponds	fing.	04/29/81	--	70.8	223	Molalla River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	69.2	96,516	Molalla River	--
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	69.2	290	Molalla River	AD-CUT

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Molalla and Pudding rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	71.6	175,508	Molalla River	--
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	71.6	528	Holalla River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	73.5	117,011	Molalla River	--
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	75.1	469	Molalla River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	75.1	192,411	Molalla River	--
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	....	772	Molalla River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	75.8	107,875	Molalla River	--
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	75.8	433	Molalla River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	76.6	109,119	Molalla River	
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	76.6	548	Molalla River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	80.6	116,426	Molalla River	--
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	80.6	467	Molalla River	AD-CUT
1981	Tanner Creek	Stayton Pond	fing.	05/03/82	05/06/82	84.2	1,038,104	Molalla River	--
1981	Tanner Creek	Stayton Pond	fing.	05/03/82	05/06/82	84.2	45,511	Molalla River	07-26-62[e]
1982	Tanner Creek	STEP	fry	11/14/82	--	996.0	9,960	Canv Creek	--
1982	Tanner Creek	Stayton Pond	fins.	04/27/83	05/03/83	81.0	1,067,131	Molalla River	07-23-28[f,g]
1982	Tanner Creek	Stayton Pond	fing.	04/27/83	05/03/83	81.0	3,815	Molalla River	07-28-30[h]
1982	Tanner Creek	Stayton Pond	fing.	04/27/83	05/03/83	81.0	3,815	Molalla River	07-28-31[h]
1982	Tanner Creek	Stayton Pond	fing.	04/27/83	05/03/83	81.0	3,815	Molalla River	07-28-32[h]
1982	Tanner Creek	Stayton Pond	fing.	04/27/83	05/03/83	81.0	3,815	Molalla River	07-28-33[h]
1982	Tanner Creek	Stayton Pond	fing.	04/27/83	05/03/83	81.0	3,815	Molalla River	07-28-34[h]
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/23/84	59.6	666,492	Molalla River	--
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/23/84	59.6	4,122	Molalla River	07-31-44[h]
1983	Tanner Creek	Stayton Pond	fins.	05/08/84	05/23/84	59.6	4,122	Molalla River	07-31-45[h]
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/23/84	59.6	4,122	Molalla River	07-31-46[h]
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/23/84	59.6	4,122	Molalla River	07-31-47[h]
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/23/84	59.6	4,122	Molalla River	07-31-48[h]
1985	Tanner Creek	Stayton Pond	fing.	04/30/86	05/12/86	69.8	844,147	Molalla River	
1985	Tanner Creek	Stayton Pond	fing.	04/30/86	05/12/86	69.8	7,401	Molalla River	07-38-18[h]
1985	Tanner Creek	Stayton Pond	fing.	04/30/86	05/12/86	69.8	7,401	Molalla River	07-38-19[h]
1985	Tanner Creek	Stayton Pond	fing.	04/30/86	05/12/86	69.8	7,401	Molalla River	07-38-20[h]
1985	Tanner Creek	Stayton Pond	fins.	04/30/86	05/12/86	69.8	7,401	Molalla River	07-38-21[h]
1985	Tanner Creek	Stayton Pond	fing.	04/30/86	05/12/86	69.8	7,401	Molalla River	07-38-22[h]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.7	707,218	Molalla River	--
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.7	4,224	Molalla River	07-40-50[h]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.7	4,224	Molalla River	07-40-51[h]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.7	4,224	Holalla River	07-40-52[h]

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Molalla and Pudding rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1986	Tanner Creek	Stayton Pond	f ing.	04/28/87	05/06/87	60.7	4,224	Molalla River	07-40-53[h]
1986	Tanner Creek	Stayton Pond	f ing.	04/28/87	05/06/87	60.7	4,224	Molalla River	07-40-54[h]
1987	Tanner Creek	Stayton Pond	f ing.	04/27/88	05/06/88	54.1	509,241	Molalla River	--
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/06/88	54.1	4,023	Molalla River	07-45-26[h]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/06/88	54.1	4,023	Molalla River	07-45-27[h]
1987	Tanner Creek	Stayton Pond	f ing.	04/27/88	05/06/88	54.1	4,023	Molalla River	07-45-28[h]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/06/88	54.1	4,023	Molalla River	07-45-29[h]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/06/88	54.1	4,023	Molalla River	07-45-30[h]
1988	Tanner Creek	Stayton Pond	fing.	04/25/89	04/28/89	61.7	385,603	Molalla River	--
1988	Tanner Creek	Stayton Pond	fing.	04/25/89	04/28/89	61.7	14,400	Molalla River	07-50-12[h]
1989	Tanner Creek	Stayton Pond	fing.	05/01/90	05/07/90	43.2	294,481	Molalla River	--
1989	Tanner Creek	Stayton Pond	fing.	05/01/90	05/07/90	43.2	10,680	Molalla River	07-52-18[f]
1990	Tanner Creek	Stayton Pond	f ing.	04/30/91	--	55.9	319,374	Molalla River	--
1990	Tanner Creek	Stayton Pond	f ing.	04/30/91	--	55.9	1,503	Molalla River	07-52-27[i]
1990	Tanner Creek	Stayton Pond	f ing.	04/30/91	--	55.9	1,503	Molalla River	07-52-28[i]
1990	Tanner Creek	Stayton Pond	fing.	04/30/91	--	55.9	1,503	Molalla River	07-52-29[i]
1990	Tanner Creek	Stayton Pond	fing.	04/30/91	--	55.9	1,503	Molalla River	07-52-30[i]
IWO	Tanner Creek	Stayton Pond	fing.	04/30/91	--	55.9	1,503	Molalla River	07-52-31'

a Modified from Oregon Department of Fish and Wildlife (1990); and Oregon Department of Fish and Wildlife's hatchery production database.

b For the 1966-78 brood years, the stock is unknown, but assumed to be LRH stock (Lower Columbia River Hatchery stock) or BPH stock (Bonneville Pool Hatchery stock), based on the associated hatchery. Both LRH and BPH stocks are informally called tules. Tanner Creek stock is part of the LRH stock group.

c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = Left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the Location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold'brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

d Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.

e Juveniles with this tag group were also released into the Santiam and Calepooia rivers, Middle Fork Uillamette River, and mainstem Uillamette River subbasins.

f Jweniles with this tag group were also released into the mainstem Uillamette River, Santiam and Calapooia rivers, and louer Columbia River subbasins.

g This coded wire tag mark is reported as having been used to mark juveniles from the 1984 brood releases in the louer Columbia River subbasin.

h Juveniles with this tag group uere also released into the mainstem Uillamette River and Santiam and Calapooia rivers subbasins.

i Juveniles with this tag group *uere* also released into the louer Columbia River and Santiam and Calapooia rivers subbasins.

Table 2 (AE). Emigration of coded wire tagged hatchery fall chinook salmon released as juveniles into the Molalla and Pudding rivers subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Molalla, Pudding	Willamette River 1982	Trap Returns --	4	4

[a] Based on the following tag codes: 07-16-26, 07-19-18.
[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

REFERENCES

Hansen, H.L., and R.H. Williams. 1979. Stock assessment and enhancement of fall salmon species in the Willamette River system. Oregon Department of Fish and Wildlife, Annual Progress Report, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

Howell, P.J., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Molalla and Pudding Rivers). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

MOLALLA AND PUDDING RIVERS SUBBASINS

Naturally Produced Coho Salmon

GEOGRAPHIC LOCATION

The Molalla River originates on the western slopes of the Cascade Mountains and flows into the Willamette River at River Mile (RM) 36(see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Molalla River include the North Fork and the Table Rock Fork. The Molalla River system drains an area of 348 square miles (Oregon Department of Fish and Wildlife 1990).

The Pudding River originates in the Waldo Hills, although some tributaries originate at higher elevations in the Cascade Mountains. The Pudding River flows into the Molalla River at RM 0.75. Major tributaries of the Pudding River include Abiqua, Butte, and Silver creeks. The Pudding River system drains an area of 530 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Coho are not native to the Molalla and Pudding rivers subbasin (Oregon Department of Fish and Wildlife 1990). Natural production occurs as a result of hatchery releases into the subbasin (see MOLALLA AND PUDDING RIVERS SUBBASINS, Hatchery Produced Coho Salmon; Oregon Department of Fish and Wildlife 1990). Current run sixes of naturally produced fish are unknown but believed to be small (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Information on the spatial distribution of natural production is not available but it is believed that distribution of natural production is controlled by the location of hatchery releases in the subbasin (Oregon Department of Fish and Wildlife 1990). Spawning ground surveys conducted in the 1960's and 1970's indicate that coho were spawning in the mainstem Molalla River and Milk Creek; and in Butte, Abiqua and Silver creeks, in the Pudding River drainage (Oregon Department of Fish and Wildlife 1990). Habitat considered suitable for spawning and rearing is rated as primarily of "fair" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Estimates of sport harvest in the Molalla and Pudding rivers subbasin are not available but harvest is believed to be minimal (Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

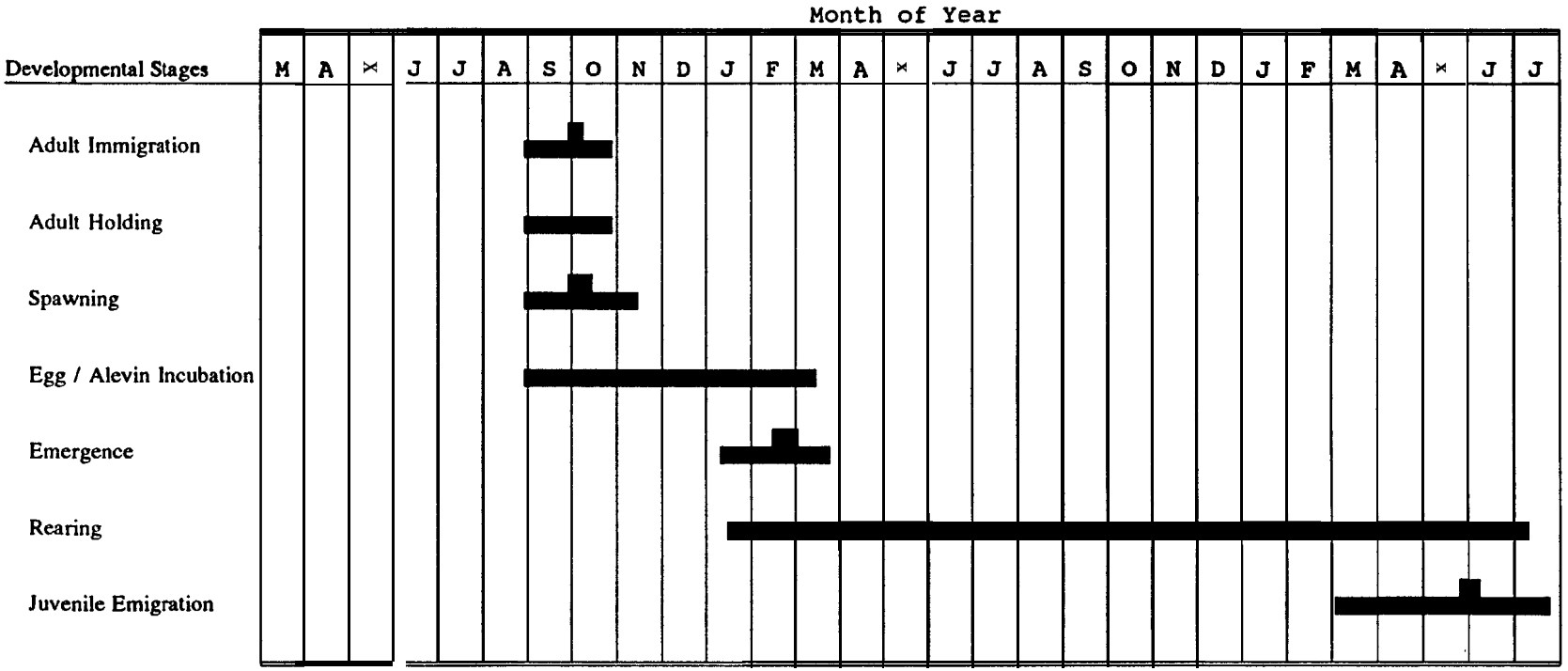
Subbasin

Timing: Coho return to the Molalla and Pudding rivers subbasin from early September through late October with peak migration occurring from late September through early October (Figure 1).

JUVENILE LIFE HISTORY

Migration Timing

Coho migrate as smolts from early March through late July with peak migration occurring in mid- to late May (Figure 1; Oregon Department of Fish and Wildlife 1990).



Notes:

1. The developmental stage timing represents basin wide averages, local may cause some variability
2. Wide bars indicate periods of peak activity.

Figure 1 (TT). Coho salmon freshwater life history in the Molalla/Pudding subbasin Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Molalla River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	3.7	18.7	61.6	16.0	--	111.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Molalla River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Molalla and Pudding Rivers). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft .)

MOLALLA/PUDDING 3 2

MOLALLA AND PUDDING RIVERS SUBBASINS

Hatchery Produced Coho Salmon

ORIGIN

Hatchery coho were released into the subbasin beginning in the early 1950's. Releases were discontinued in 1988 (Table 1). The majority of coho releases in the subbasin have been of Lower Columbia Early Run (LCER), or Toutle, stock (Table 1; see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, ORIGIN). Trask and unknown stocks were infrequently released into the subbasin (Table 1).

Coho were released into the subbasin in the 1960's and 1970's to establish a self-sustaining run to the upper Willamette River Basin. In the 1980's, coho were released into the subbasin to contribute to ocean and Columbia River fisheries (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery fish were released into the mainstem Molalla River and various tributaries of the Molalla and Pudding rivers (Table 1). Releases were not as widespread in the 1980's as they were in the 1960's and 1970's (Oregon Department of Fish and Wildlife 1990). Fry are generally released in February and March and fingerlings in May and June (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Trask, McKenzie, Sandy, Cascade, Bonneville, Oxbow, Big Creek, and Klaskanine hatcheries (Table 1). Annual numbers released ranged from 24,000 to 1,762,469 fish (Table 1). Size at release ranged from 1,150 to 262 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Sandy, Cascade, Bonneville, Big Creek, Oxbow, and Klaskanine hatcheries, and Eagle Creek National Fish Hatchery (Table 1). Annual numbers released ranged from 6,000 to 386,405 fish (Table 1). Size at release ranged from 217 to 139 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Alsea, Sandy, Cascade, Bonneville, and Klaskanine hatcheries (Table 1). Annual numbers released ranged from 6,000 to 316,389 fish (Table 1). Size at release is unknown.

Jack and Adult

Hatchery facilities in which adult coho were held prior to release in the subbasin include Cascade, Sandy, Big Creek, Bonneville, and Eagle Creek hatcheries (Table 1). Annual numbers released ranged from 171 to 2,023 fish (Table 1).

Harvest

Sport

Subbasin: Brood year specific estimates of sport harvest for hatchery produced fish are not available but harvest is believed to be minimal (Oregon Department of Fish and Wildlife 1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES and see SANDY RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES.

Table 1 (TR). Hatchery coho releases into the Molalla and Pudding rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release location	CUT code
--	LCER	Bonneville	fing.	01/01/52	12/31/52[c]	--	50,000	Molalla River	--
--	LCER	Sandy	smolt	01/01/55	12/31/55[c]	--	6,000	Milk Creek	
--	LCER	Sandy	fing.	01/01/54	12/31/54[c]	--	50,000	Milk Creek	
--	LCER	Sandy	fing.	01/01/55	12/31/55[c]	--	6,000	Milk Creek	--
--	LCER	Sandy	smolt	01/01/57	12/31/57[c]	--	25,000	Milk Creek	--
--	LCER	Sandy	fing.	01/01/57	12/31/57[c]	--	50,000	Milk Creek	
--	LCER	Sandy	fing.	01/01/58	12/31/58[c]	--	52,000	Abiqua Creek	
--	LCER	Sandy	fing.	01/01/58	12/31/58[c]	--	52,000	Butte Creek	
--	LCER	Big Creek	fing.	01/01/58	12/31/58[c]	--	39,520	Milk Creek	
--	LCER	Sandy	fing.	01/01/59	12/31/59[c]	--	30,000	Silver Creek	
--	LCER	Sandy	fry	01/01/62	12/31/62[c]	--	117,356	Molalla River and tribs	
--	LCER	Sandy	fry	01/01/62	12/31/62[c]	--	43,840	Butte Creek	
--	LCER	Sandy	fry	01/01/63	12/31/63[c]	--	324,329	Molalla River tribs	
--	LCER	cascade	fry	01/01/63	12/31/63[c]	--	98,460	Abiqua Creek	
--	LCER	Cascade	fry	01/01/63	12/31/63[c]	--	98,460	Butte Creek	--
--	LCER	Cascade	fry	01/01/63	12/31/63[c]	--	165,000	N. and S. Forks Silver Cr	--
--	LCER	Sandy	smolt	01/01/65	12/31/65[c]	--	19,720	N. Fork Molalla River	--
--	LCER	Cascade	adult	01/01/64	12/31/64[c]	--	1,500	Molalla River	--
--	LCER	Sandy	adult	01/01/64	12/31/64[c]	--	523	Butte Creek	
--	LCER	Bonneville	fry	01/01/65	12/31/65[c]	--	259,000	Molalla River	--
--	LCER	Bonneville	fry	01/01/65	12/31/65[c]	--	141,000	Milk Creek	--
--	LCER	Bonneville	fing.	01/01/65	12/31/65[c]	--	120,800	Abiqua Creek	
--	LCER	Bonneville	fing.	01/01/65	12/31/65[c]	--	60,095	Silver Creek	
--	LCER	Klaskanine	fing.	01/01/65	12/31/65[c]	--	50,400	Butte Creek	--
--	LCER	Sandy	smolt	01/01/66	12/31/66[c]	--	14,116	Abiqua Creek	--
--	LCER	Sandy	fry	01/01/66	12/31/66[c]	--	90,000	Butte Creek	
--	LCER	Cascade	fry	01/01/66	12/31/66[c]	--	64,000	Molalla River tribs	--
--	LCER	Bonneville	fry	01/01/66	12/31/66[c]	--	179,124	N. Fork Molalla River	--
--	LCER	Bonneville	fry	01/01/66	12/31/66[c]	--	133,047	Table Rock Fork Molalla R	--
--	LCER	Bonneville	fry	01/01/66	12/31/66[c]	--	475,624	Molalla River and tribs	
--	LCER	Oxbow	fry	01/01/66	12/31/66[c]	--	187,821	Rock Creek	
--	LCER	Big Creek	fry	01/01/66	12/31/66[c]	--	254,148	Abique Creek and tribs	--
--	LCER	Big Creek	fry	01/01/66	12/31/66[c]	--	139,795	E. and W. Forks Drift Cr.	--
--	LCER	Big Creek	fry	01/01/66	12/31/66[c]	--	238,910	N. and S. forks Silver Cr	--
--	LCER	Sandy	fry	01/01/67	12/31/67[c]	--	303,410	Molalla River tribs	
--	LCER	Cascade	fry	01/01/67	12/31/67[c]	--	220,000	Butte Creek	--
--	Trask	Trask	fry	01/01/67	12/31/67[c]	--	168,394	Milk Creek tributary	--
--	LCER	Sandy	fing.	01/01/67	12/31/67[c]	--	127,672	Molalla River	--
--	LCER	Sandy	fing.	01/01/67	12/31/67[c]	--	141,141	Abiqua Creek	--
--	LCER	Cascade	adult	01/01/66	12/31/66[c]	--	150	Butte Creek	--

Table 1 (TR). (cont.) Hatchery coho releases into the Molalla and Pudding rivers s&basin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT code/ Fin Clip
--	LCER	Big Creek	adult	01/01/66	12/31/66[c]	--	160	N. Fork Molalla River	--
--	LCER	gig Creek	adult	01/01/66	12/31/66[c]	--	225	Table Rock Fork Mollala R	--
--	LCER	Big creek	adult	01/01/66	12/31/66[c]	--	200	N. and S. Forks Silver Cr	--
--	LCER	Bonneville	adult	01/01/66	12/31/66[c]	--	138	Butte Creek	--
--	LCER	Sandy	fry	01/01/68	12/31/68[c]	--	653,094	Molalla River and tribs	--
--	LCER	Sandy	fry	01/01/68	12/31/68[c]	--	121,856	Milk Creek	--
--	LCER	Sandy	fry	01/01/68	12/31/68[c]	--	227,467	N 8 S Fks Silver Cr & trib.	--
--	LCER	Sandy	fry	01/01/68	12/31/68[c]	--	113,736	Abiqua Creek tributary	--
--	LCER	Bonneville	fry	01/01/68	12/31/68[c]	--	88,920	Molalla River	--
--	LCER	Cascade	adult	01/01/67	12/31/67[c]	--	150	Butte Creek	--
--	LCER	Bonneville	adult	01/01/67	12/31/67[c]	--	722	Molalla River	--
--	LCER	Sandy	adult	01/01/67	12/31/67[c]	--	342	Abiqua Creek	--
--	LCER	Sandy	fry	01/01/69	12/31/69[c]	--	405,000	Molalla River	--
--	LCER	Cascade	fry	01/01/69	12/31/69[c]	--	22,856	East Fork Drift Creek	--
--	LCER	Cascade	fry	01/01/69	12/31/69[c]	--	228,320	N. and S. Fks Silver Cr	--
--	LCER	Cascade	fry	01/01/69	12/31/69[c]	--	68,496	Abiqua Creek tributary	--
--	LCER	Bonneville	fry	01/01/69	12/31/69[c]	--	420,294	Molalla River tribs	--
--	LCER	Bonneville	fry	01/01/69	12/31/69[c]	--	96,264	Milk Creek	--
--	LCER	Bonneville	fry	01/01/69	12/31/69[c]	--	300,824	Butte Creek	--
--	LCER	Big Creek	fins.	01/01/69	12/31/69[c]	--	155,480	Molalla River	--
--	LCER	Sandy	fins.	01/01/69	12/31/69[c]	--	94,010	Molalla River	--
--	LCER	Sandy	smolt	01/01/70	12/31/70[c]	--	47,975	Abiqua Creek	--
--	LCER	Sandy	snlolt	01/01/70	12/31/70[c]	--	26,307	Drift Creek	--
--	LCER	Klaskanine	smolt	01/01/70	12/31/70[c]	--	46,500	Silver Creek	--
--	LCER	Cascade	adult	01/01/68	12/31/68[c]	--	126	Abiqua Creek	--
--	LCER	Cascade	adult	01/01/68	12/31/68[c]	--	126	Silver Creek	--
--	LCER	Bonneville	adult	01/01/68	12/31/68[c]	--	946	Molalla River and tribs	--
--	LCER	Bonneville	adult	01/01/68	12/31/68[c]	--	240	Abiqua Creek	--
--	LCER	Bonneville	adult	01/01/68	12/31/68[c]	--	140	Butte Creek	--
--	LCER	Cascade	fry	01/01/70	12/31/70[c]	--	74,167	Drift Creek	--
--	LCER	Cascade	fry	01/01/70	12/31/70[c]	--	74,167	North Fork Silver Creek	--
--	LCER	Cascade	fry	01/01/70	12/31/70[c]	--	74,166	Abiqua Creek tributary	--
--	LCER	Cascade	smolt	01/01/71	12/31/71[c]	--	24,563	Abiqua Creek	--
--	LCER	Cascade	smolt	01/01/71	12/31/71[c]	--	24,640	Drift Creek	--
--	LCER	Cascade	smolt	01/01/71	12/31/71[c]	--	15,067	Mill Creek	--
--	LCER	Cascade	smolt	01/01/71	12/31/71[c]	--	48,800	Silver Creek	--
--	Unknoun	Alsea	smolt	01/01/71	12/31/71[c]	--	14,985	Abiqua Creek	--
--	LCER	Sandy	adult	01/01/69	12/31/69[c]	--	150	Abiqua Creek	--
	LCER	Sandy	adult	01/01/69	12/31/69[c]	--	151	Table Rock Fork Molalla R.	--

Table 1 (TR). (cont.) Hatchery coho releases into the Molalla and Pudding rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
--	LEER	Big Creek	adult	01/01/69	12/31/69[c]	--	300	North Fork Molalla River	--
--	LCER	Big Creek	adult	01/01/69	12/31/69[c]	--	350	Butte Creek	--
--	LCER	Big Creek	adult	01/01/69	12/31/69[c]	--	350	Silver Creek and tributary	--
--	LCER	Bonneville	adult	01/01/69	12/31/69[c]	--	150	Molalla River	--
--	Unknom	McKenz i e	fry	01/01/71	12/31/71[c]	--	307,638	Abiqua Creek	--
--	LCER	Cascade	smolt	01/01/72	12/31/72[c]	--	13,815	Abiqua Creek	--
--	LCER	Cascade	smolt	01/01/72	12/31/72[c]	--	13,496	Drift Creek	--
--	LCER	Cascade	smolt	01/01/72	12/31/72[c]	--	53,860	Silver Creek	--
--	Unknom	Alsea	smolt	01/01/72	12/31/72[c]	--	12,144	Abiqua Creek	--
--	LCER	Sandy	adult	01/01/70	12/31/70[c]	--	360	Butte Creek	--
--	LCER	Klaskanine	fry	01/01/72	12/31/72[c]	--	327.444	N. and S. Forks Silver Cr	--
--	LCER	Klaskanine	fry	01/01/72	12/31/72[c]	--	113,888	Silver Creek tributary	--
--	LCER	Klaskanine	fry	01/01/72	12/31/72[c]	--	71,180	Abiqua Creek tributary	--
--	LCER	Bonneville	smolt	01/01/73	12/31/73[c]	--	270,839	Molalla River and tribs	--
--	LCER	Bonneville	smolt	01/01/73	12/31/73[c]	--	17,775	Milk Creek	--
--	LCER	gig Creek	adult	01/01/71	12/31/71[c]	--	150	Abiqua Creek	--
--	LCER	Big Creek	adult	01/01/71	12/31/71[c]	--	150	Butte Creek	--
--	LCER	Bonneville	adult	01/01/71	12/31/71[c]	--	150	Butte Creek	--
--	LCER	Sandy	fry	01/01/73	12/31/73[c]	--	306,696	Molalla River	--
--	LCER	Sandy	fry	01/01/73	12/31/73[c]	--	381,906	Butte Creek	--
--	LCER	Sandy	fry	01/01/73	12/31/73[c]	--	134,400	North Fork Silver Creek	--
--	LCER	Sandy	fry	01/01/73	12/31/73[c]	--	268,800	Silver Creek tributary	--
--	LCER	Cascade	fing.	01/01/73	12/31/73[c]	--	175,888	Molalla River	--
--	LCER	Sandy	smolt	01/01/74	12/31/74[c]	--	62,437	Molalla River tributaries	--
--	LCER	Sandy	smolt	01/01/74	12/31/74[c]	--	56,130	Table Rock Fk. Molalla R.	--
--	LCER	Sandy	smolt	01/01/74	12/31/74[c]	--	20,972	Milk Creek	--
--	LCER	Cascade	smolt	01/01/74	12/31/74[c]	--	100,144	Molalla River trib.	--
--	LCER	Bonneville	smolt	01/01/74	12/31/74[c]	--	76,706	Molalla River tributaries	--
--	LCER	Bonneville	adult	01/01/72	12/31/72[c]	--	150	Abiqua Creek	--
--	LCER	Sandy	adult	01/01/72	12/31/72[c]	--	160	Butte Creek	--
--	LCER	Eagle Creek	adult	01/01/73	12/31/73[c]	--	171	Butte Creek	--
--	LCER	Sandy	fry	01/01/75	12/31/75[c]	--	150,792	Abiqua Creek	--
--	LCER	Big Creek	fry	01/01/75	12/31/75[c]	--	139,654	Silverton Reservoir	--
--	LCER	Big Creek	fing.	01/01/75	12/31/75[c]	--	54,921	Butte Creek	--
--	LCER	Cascade	smolt	01/01/76	12/31/76[c]	--	25,690	Milk Creek	--
--	LCER	Cascade	smolt	01/01/76	12/31/76[c]	--	15,314	Abiqua Creek	--
--	LCER	Sandy	fry	01/01/77	12/31/77[c]	--	270,389	Silver Creek	--
--	LCER	Unknown	fry	01/01/82	12/31/82[c]	--	24,000	Molalla/Pudding subbasin	--
1982	Tanner Cr	Cascade	fry	02/23/83	- -	1,150	11,500	Davis Creek	--

Table 1 (TR). (cont.) Hatchery coho releases into the Molalla and Pudding rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1982	Tanner Cr	Cascade	fry	02/23/83	--	1,150	24,150	EFk Drift Creek	--
1982	Tanner Cr	Cascade	fry	02/23/83	--	1,150	24,150	NFk Silver Creek	--
1982	Tanner Cr	Cascade	fry	02/23/83	--	1,150	11,500	Powers Creek	--
1982	Tanner Cr	Cascade	fry	02/23/83	--	1,150	47,150	Pudding River	--
1982	Tanner Cr	Cascade	fry	02/23/83	--	1,150	11,500	SFk Silver creek	--
1982	Tanner Cr	Cascade	fry	02/23/83	--	1,150	35,650	WFk Drift Creek	--
1984	Clackamas R.	Eagle Creek	fing.	06/19/85	--	139.0	68,109	Butte Creek	--
1984	Clackamas R.	Eagle Creek	fing.	06/05/85	--	187.0	121,737	Butte Creek	--
1984	Clackamas R.	Eagle Creek	fing.	06/05/85	--	185.0	74,370	Milk Creek	--
1984	Sandy R.[d]	Bonneville	fing.	05/09/85	--	217.0	43,183	Silver Creek	--
1984	Sandy R.[d]	Oxbow (Herman)	fing.	05/09/85	--	213.5	25,600	EFk Drift Creek	--
1984	Sandy R.[d]	Oxbou (Herman)	fing.	05/09/85	--	213.5	53,345	Pudding River	--
1984	Sandy R.[d]	STEP	fing.	06/03/85	--	157.2	61	Silver Creek	--
1984	Tanner Cr	Bonneville	fry	05/09/85	--	262.0	99,560	Silver Creek	--
--	L C F R	Unknown	fry	01/01/86	12/31/86[c]	--	118,859	Molalla/Pudding subbasin	--
1985	Sandy R.[d]	Sandy	fing.	06/16/86	--	199.0	43,780	Canyon Creek	--
1985	Sandy R.[d]	Sandy	fing.	06/16/86	--	199.0	9,950	Jackson Creek	--
1985	Sandy R.[d]	Sandy	fing.	06/16/86	--	185.0	88,243	Milk Creek	--
1985	Sandy R.[d]	Sandy	fing.	06/16/86	--	199.0	9,950	Mill Creek	--
1985	Sandy R.[d]	Sandy	fing.	06/16/86	--	199.0	35,820	Nate Creek	--
--	LCER	Unknown	fry	01/01/87	12/31/87[c]	--	167,679	Molalla/Pudding subbasin	--
--	LCER	Unknown	fry	01/01/88	12/31/88[c]		24,592	Molalla/Pudding subbasin	--

[a] Modified from Williams (1983, cited by Oregon Department of Fish and Wildlife 1990); Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990); and Oregon Department of Fish and Wildlife's hatchery production database.

[b] LCER refers to Lower Columbia Early Run stock, a "catchall" name for early run hatchery stocks, including Eagle Creek, Clackamas River, Sandy River, Big Creek, and Tanner Creek stocks. These stocks have been previously grouped as early run Toutle stock, or just early run coho.

[c] Cowlitr stock is part of a late run stock group.

[d] Month(s) and day(s) of release unknown. Standardized to the first and Last day of the year.

Sandy Hatchery stock.

REFERENCES

Howell, P.J., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume II: steelhead stock summaries, stock transfer guidelines-information needs. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Molalla and Pudding Rivers). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

MOLALLA AND PUDDING RIVERS SUBBASINS

Naturally Produced Summer Steelhead

GEOGRAPHIC LOCATION

The Molalla River originates on the western slopes of the Cascade Mountains and flows into the Willamette River at River Mile (RM) 36(see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Molalla River include the North Fork and the Table Rock Fork. The Molalla River system drains an area of 348 square miles (Oregon Department of Fish and Wildlife 1990).

The Pudding River originates in the Waldo Hills, although some tributaries originate at higher elevations in the Cascade Mountains. The Pudding River flows into the Molalla River at RM 0.75. Major tributaries of the Pudding River include Abiqua, Butte, and Silver creeks. The Pudding River system drains an area of 530 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Summer steelhead are not native to the Molalla and Pudding rivers subbasin (Oregon Department of Fish and Wildlife 1990). Natural production is believed to occur as a result of hatchery releases into the mainstem Molalla River (see MOLALLA AND PUDDING RIVERS SUBBASINS, Hatchery Produced Summer Steelhead) but is assumed to be minimal (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Summer steelhead are primarily observed in the mainstem Molalla River below RM 38.5 (Oregon Department of Fish and Wildlife 1990). Habitat considered suitable for spawning and rearing is rated as primarily of "excellent" quality (Tables 1 and 2).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Molalla River subbasin summer steelhead production area".

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	79.4	14.0	6.6	0.0	--	34.9	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Molalla River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Molalla and Pudding Rivers). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

MOLALLA AND PUDDING RIVERS SUBBASINS

Hatchery Produced Summer Steelhead

ORIGIN

The Molalla River subbasin has been supplemented with hatchery summer steelhead since 1984 (Table 1). Hatchery summer steelhead released into the subbasin are from broodstock developed from the Skamania stock of summer steelhead (Howell et al. 1985), and, although still called Skamania, are known more specifically as Foster broodstock, or Stock 24 (Oregon Department of Fish and Wildlife 1990).

Hatchery summer steelhead are released to increase recreational fishing opportunities (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery smolts are released into the mainstem Molalla River in April (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

There are no records of releases in the subbasin.

Fingerling

There are no records of releases in the subbasin.

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Gnat Creek and Roaring River hatcheries (Table 1). Annual numbers released ranged from 56,507 to 115,053 fish (Table 1). Size at release ranged from 7.9 to 5.1 fish per pound (Table 1).

Adult

There are no records of releases in the subbasin.

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: "Summer steelhead enter the Molalla River from early March through late September with peak entry occurring around mid-June to early July" (Oregon Department of Fish and Wildlife 1990).

Numbers: Although no brood year specific estimates of run size for hatchery produced summer steelhead are available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

JUVENILE LIFE HISTORY

Age Structure

Hatchery fish are released as age 1 + smolts (Oregon Department of Fish and Wildlife 1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES and see SANTIAM RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES.

Table 1 (TR). Hatchery summer steelheed releases into the Holalla and Pudding rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release location	CWT Code/ Fin Clip[b]
1983	Skamsnia	Gnat Creek	smolt	01/01/84	12/31/84[c]	--	87,164	Wolalla River, RM 21-35	--
1983	Skamania	Roaring River	smolt	01/01/84	12/31/84[c]	--	27,889	Molalla River, RH 21-35	--
1984	Skamsnia R.	Gnat Creek	slnolt	04/22/85	--	5.5	30,163	Molalla River	AD
1984	Skamsnia R.	Gnat Creek	smolt	04/22/85	--	5.6	6,832	Molalla River	AD
1984	Skemenia R.	Gnat Creek	smolt	04/23/85	--	5.8	5,220	Molalla River	--
1984	Skamsnia R.	Gnat Creek	smolt	04/23/85	--	6.1	6,558	Holalla River	AD
1984	Skamania R.	Roaring River	smolt	04/23/85	04/24/85	6.1	12,078	Holalla River	AD
1985	Skamania R.	Gnat Creek	smolt	04/10/86	--	5.1	6,605	Molalla River	AD
1985	Skamania R.	Gnat Creek	smolt	04/10/86	--	5.2	6,443	Molalla River	--
1985	Skamania R.	Gnat Creek	smolt	04/09/86	--	5.3	6,614	Molalla River	--
1985	Skemania R.	Gnat Creek	smolt	04/09/86	04/10/86	5.3	14,878	Molalla River	AD
1985	Skamsnia R.	Gnat Creek	smolt	04/10/86	--	5.4	8,613	Molalla River	AD
1985	Skamania R.	Roaring River	smolt	04/14/86	--	5.3	16,743	Holalla River	AD
1985	Skamania A.	Roaring River	smolt	04/14/86	--	5.6	10,360	Holalla River	AD
1986	Skamania	Gnat Creek	smolt	01/01/87	12/31/87[c]	--	46,901	Molalla River, RM 21-35	--
1986	Skamenia	Roaring River	smolt	01/01/87	12/31/87[c]	--	9,606	Holalla River, RH 21-35	--
1987	Skamania R.	Gnat Creek	smolt	04/21/88	--	6.1	30,043	Holalla River	AD
1987	Skamsnia R.	Roaring River	smolt	04/26/88	--	5.6	11,560	Holalla River	AD
1987	Skamenia R.	Roaring River	smolt	04/26/88	--	5.7	24,034	Holalla River	AD
1988	Skamsnia R.	Gnat Creek	slnolt	04/19/89		7.0	35,025	Holalla River	AD
1988	Skamania R.	Roaring River	smolt	04/25/89	--	7.9	30,789	Holalla River	AD
1989	Skamania R.	Gnat Creek	smolt	04/24/90	--	6.0	35,036	Wolalla River	AD
1989	Skamsnia R.	Roaring River	smolt	04/17/90	--	5.9	30,052	Holalla River	AD
IWO	Skamania R.	Gnat Creek	smolt	04/19/91	--	5.5	35,058	Holalla River	AD
1990	Skemania R.	Roaring River	smolt	04/17/91	--	6.5	25,538	Holalla River	AD
1990	Skamsnia R.	Roaring River	smolt	04/17/91	--	6.6	5,148	Molalla River	AD

[a] Modified from Oregon Department of Fish and Wildlife (1990); and Oregon Department of Fish and Wildlife's hatchery production database.

[b] D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

[c] Month(s) and day(s) of release unknoun. Standardized to the first and last day of the year.

REFERENCES

Howell, P.J., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume II: steelhead stock summaries, stock transfer guidelines-information needs. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Molalla and Pudding Rivers). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

MOLALLA AND PUDDING RIVERS SUBBASINS

Naturally Produced Winter Steelhead (late run)

GEOGRAPHIC LOCATION

The Molalla River originates on the western slopes of the Cascade Mountains and flows into the Willamette River at River Mile (RM) 36(see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Molalla River include the North Fork and the Table Rock Fork. The Molalla River system drains an area of 348 square miles (Oregon Department of Fish and Wildlife 1990).

The Pudding River originates in the Waldo Hills, although some tributaries originate at higher elevations in the Cascade Mountains. The Pudding River flows into the Molalla River at RM 0.75. Major tributaries of the Pudding River include Abiqua, Butte, and Silver creeks. The Pudding River system drains an area of 530 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Late run winter steelhead are native to the Molalla and Pudding rivers subbasin (Oregon Department of Fish and Wildlife 1990). The run to the subbasin is entirely from natural production with the exception that the Salmon and Trout Enhancement Program (STEP) releases some fry into the Pudding River drainage (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Native winter steelhead are located throughout the Molalla River drainage but probably spawn and rear primarily in the upper reaches of the drainage (Oregon Department of Fish and Wildlife 1990). Habitat considered suitable for spawning and rearing in the Molalla and Pudding rivers subbasin is rated as primarily of "excellent" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, and rearing were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although no brood year specific estimates of sport harvest for native winter steelhead are available, run year specific estimates for the combined sport harvest of native, naturally (Big Creek stock), and hatchery produced fish are available in Oregon Department

of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Native winter steelhead return to the Molalla River drainage from about mid-February through early May with peak returns occurring in late March to early April (Oregon Department of Fish and Wildlife 1990).

Numbers: Although no brood year specific estimates of escapement for native winter steelhead are available, run year specific estimates for the combined escapement of native, naturally (Big Creek stock), and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Timing: Native winter steelhead spawn from about early April through late May with peak spawning occurring in late April to early May (Oregon Department of Fish and Wildlife 1990; Figure 1).

Numbers: No brood year specific estimates of spawner escapement are available. Spawning ground counts are available in Oregon Department of Fish and Wildlife (1990).

Fork Length

Average length of naturally produced 2-salt fish was estimated at 27 inches (Oregon Department of Fish and Wildlife 1990). No stock specific information is available for the native stock or naturally produced Big Creek stock.

Age Structure

The percentage of 1 and 2 salt fish in a sample of naturally produced winter steelhead was 62% and 35 %, respectively (Oregon Department of Fish and Wildlife 1990). No stock specific information is available for the native stock or naturally produced Big Creek stock.

Sex Ratio

The male to female sex ratio for a sample of naturally produced fish was estimated at 0.5:1.0 (Oregon Department of Fish and Wildlife 1990). No stock specific information is available for the native stock or naturally produced Big Creek stock.

Repeat Spawners

The percentage of repeat spawners in a sample of naturally produced fish was estimated at 15% (Oregon Department of Fish and Wildlife 1990). No stock specific information is available for the native stock or naturally produced Big Creek stock.

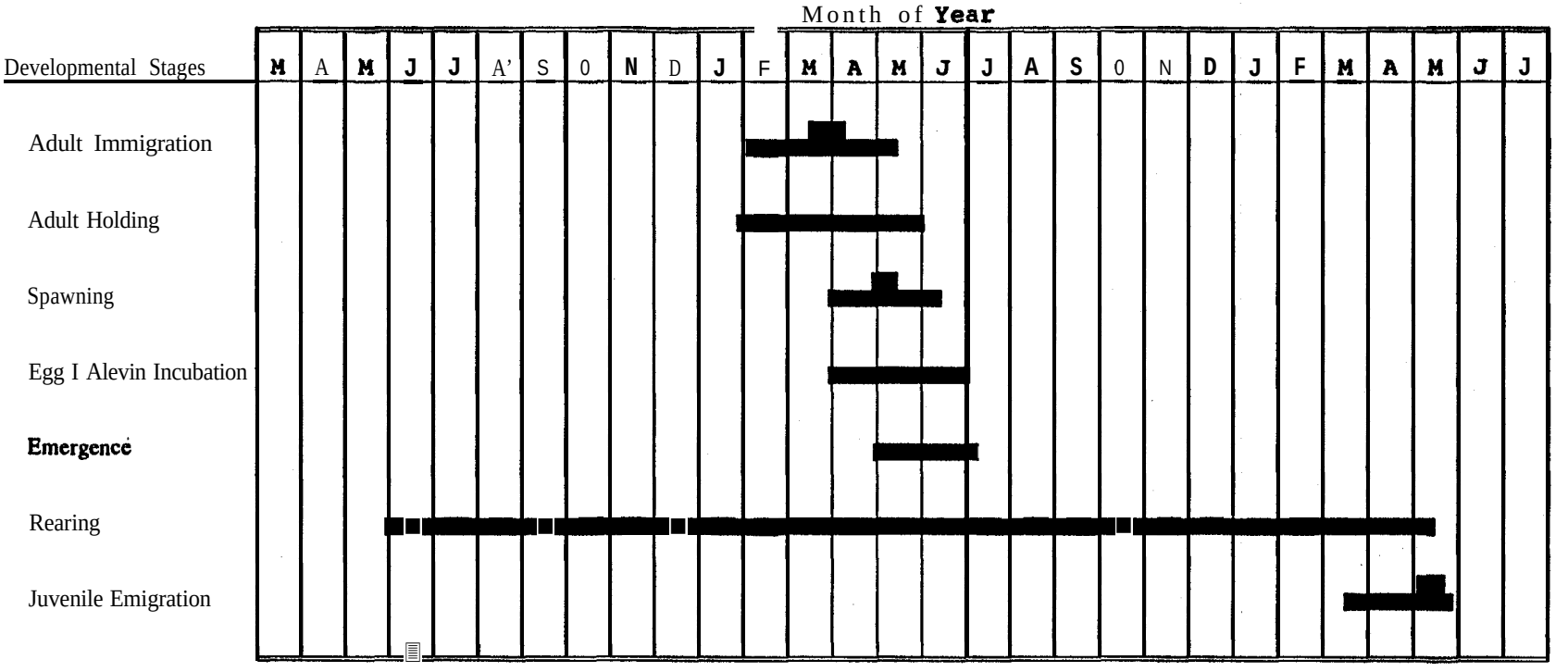
JUVENILE LIFE HISTORY

Age Structure

An analysis of scales from a sample of naturally produced adult fish showed that 88% and 12% had migrated as age 2+ and age 3 + juvenile fish, respectively (Oregon Department of Fish and Wildlife 1990). No stock specific information is available for the native stock or naturally produced Big Creek stock.

Migration Timing

Native winter steelhead migrate from the Molalla River drainage from late March to late May with peak migration in early to mid-May (Buchanan and Wade 1982, cited by Oregon Department of Fish and Wildlife 1990). An approximation of the temporal distribution of juvenile outmigration was reported in Oregon Department of Fish and Wildlife (1990) and is presented in Figure 1. The methodology used to generate this approximation is unknown.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Wide bars indicate periods of peak activity.

Figure 1 (TT). Native winter steelhead freshwater life history in the Molalla/Pudding subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated mount of spawning and rearing habitat by quality of Molalla River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	-Total	Confi-dence
Miles (%)	41.8	18.5	24.6	15.1	--	169.3	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Molalla River subbasin winter steelhead production area".

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	9.6	90.4	0.0	--	20.8	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

REFERENCES

Buchanan, D.V. and M.G. Wade. 1982. Development and assessment of steelhead in the Willamette River basin. Annual Progress Report, Oregon Department of Fish and Wildlife, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990).

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MOLALLA AND PUDDING RIVERS SUBBASINS

Naturally Produced Winter Steelhead (early run)

GEOGRAPHIC LOCATION

The Molalla River originates on the western slopes of the Cascade Mountains and flows into the Willamette River at River Mile (RM) 36(see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Molalla River include the North Fork and the Table Rock Fork. The Molalla River system drains an area of 348 square miles (Oregon Department of Fish and Wildlife 1990).

The Pudding River originates in the Waldo Hills, although some tributaries originate at higher elevations in the Cascade Mountains. The Pudding River flows into the Molalla River at RM 0.75. Major tributaries of the Pudding River include Abiqua, Butte, and Silver creeks. The Pudding River system drains an area of 530 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Early run winter steelhead are probably not native to the Molalla and Pudding rivers subbasin (Oregon Department of Fish and Wildlife 1990). Natural production of the early run Big Creek stock occurs as a result of hatchery releases into the subbasin (see MOLALLA AND PUDDING RIVERS SUBBASINS, Hatchery Produced Winter Steelhead; Oregon Department of Fish and Wildlife 1990). Natural production of early run winter steelhead occurs in Abiqua and Silver creeks, although it is unknown whether these fish are descended from releases of Big Creek stock (Oregon Department of Fish and Wildlife 1990).

North Santiam and Eagle Creek hatchery stocks have also been introduced into the subbasin, although natural production of these stocks is believed to be significantly less than of the Big Creek stock (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

No information on spawning and rearing distribution of early run winter steelhead is available (Oregon Department of Fish and Wildlife 1990). For a summarized description of the quality of the spawning and rearing habitat, see MOLALLA AND PUDDING RIVERS SUBBASINS, Naturally Produced Winter Steelhead (late run), DISTRIBUTION, Subbasin.

PRODUCTION

Harvest

Sport

Subbasin: Although no brood year specific estimates of sport harvest for the Big Creek stock of winter steelhead are available, run year specific estimates for the combined sport harvest of native, naturally (Big Creek stock), and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Spawning Area

Numbers: No brood year specific estimates of spawner escapement are available. Spawning ground counts are available in Oregon Department of Fish and Wildlife (1990).

Fork Length

Average length of naturally produced 2-salt fish was estimated at 27 inches (Oregon Department of Fish and Wildlife 1990). No stock specific information is available for the native stock or naturally produced Big Creek stock.

Age Structure

The percentage of 1 and 2 salt fish in a sample of naturally produced winter steelhead was 62% and 35%, respectively (Oregon Department of Fish and Wildlife 1990). No stock specific information is available for the native stock or naturally produced Big Creek stock.

Sex Ratio

The male to female sex ratio for a sample of naturally produced fish was estimated at 0.5:1.0 (Oregon Department of Fish and Wildlife 1990). No stock specific information is available for the native stock or naturally produced Big Creek stock.

Repeat Spawners

The percentage of repeat spawners in a sample of naturally produced fish was estimated at 15% (Oregon Department of Fish and Wildlife 1990). No stock specific information is available for the native stock or naturally produced Big Creek stock.

JUVENILE LIFE HISTORY

Age Structure

An analysis of scales from a sample of naturally produced adult fish showed that 88% and 12% had migrated as age 2 + and age 3+ juvenile fish, respectively (Oregon Department

of Fish and Wildlife 1990). No stock specific information is available for the native stock or naturally produced Big Creek stock.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Molalla and Pudding Rivers). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

MOLALLA AND PUDDING RIVERS SUBBASINS

Hatchery Produced Winter Steelhead

ORIGIN

Hatchery fish were released into the Molalla and Pudding rivers subbasin beginning in 1958 (Table 1) in order to increase recreational fishing opportunities. The majority of the production releases of winter steelhead have been of Big Creek stock, although releases of North Santiam and Alsea stocks have also occurred (Table 1). STEP (Salmon and Trout Enhancement Program) has released North Santiam and Eagle Creek stocks into the subbasin (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Big Creek stock smolts are currently released into the lower 20 miles of the mainstem Molalla River (Oregon Department of Fish and Wildlife 1990). Smolts are generally released into the subbasin in April (Oregon Department of Fish and Wildlife 1990). Eagle Creek stock hatchbox fry have been released in Milk Creek (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Big Creek stock adults in the late 1960's and early 1970's and North Santiam stock hatchbox fry were released into tributaries of the Pudding River from 1984-88 (Oregon Department of Fish and Wildlife 1990). Currently, the Pudding River and Butte and Abiqua creeks are managed for wild fish (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

The Salmon and Trout Enhancement Program released fry in 1982 and 1983. Annual numbers released ranged from 8,500 to 34,000 fish (Table 1). Size at release ranged from 2,000 to 1,700 fish per pound (Table 1).

Fingerling

In 1977, 80,566 Big Creek stock fingerlings were released into the Molalla River from Big Creek and Gnat Creek hatcheries (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Trojan Pond and Eagle Creek, Gnat Creek, Big Creek, Roaring River, Alsea, and Willamette hatcheries (Table 1). Annual numbers released ranged from 13,815 to 94,524 fish (Table 1). Size at release ranged from 7.1 to 5.0 fish per pound (Table 1).

Adult

Big Creek stock adults from Big Creek and Klaskanine hatcheries were released into the subbasin in the late 1960's and early 1970's. Annual numbers released ranged from 134 to 685 fish (Table 1).

Harvest

Sport

Subbasin: Although no brood year specific estimates of sport harvest for hatchery produced fish are available, run year specific estimates for the combined sport harvest of native, naturally (Big Creek stock), and hatchery produced stocks are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although no brood year specific estimates of escapement for hatchery produced fish are available, run year specific estimates for the combined escapement of native, naturally (Big Creek stock), and hatchery produced stocks are available in Oregon Department of Fish and Wildlife (1990).

Fork Length

The average length from a sample of 2-salt Big Creek hatchery winter steelhead harvested in the Molalla River from 1979-88 was 26.2 inches (Oregon Department of Fish and Wildlife 1990).

Age Structure

The age composition of a sample of Big Creek stock hatchery winter steelhead harvested in the Molalla from 1979-88 was approximately 70% 2-salt fish, 28% 3-salt fish, and 2% 4-salt fish (Oregon Department of Fish and Wildlife 1990).

Sex Ratio

The male to female ratio of a sample of Big Creek hatchery winter steelhead harvested in the Molalla River from 1979-88 was 0.8:1.0 (Oregon Department of Fish and Wildlife 1990). This ratio may not be representative of the returning population, since males turn dark faster than females and are more likely to be released (Oregon Department of Fish and

Wildlife 1990).

Repeat Spawners

The proportion of repeat spawners in a sample of Big Creek hatchery winter steelhead harvested in the Molalla River from 1979-88 was 5% (Oregon Department of Fish and Wildlife 1990).

JUVENILE LIFE HISTORY

Age Structure

Big Creek stock winter steelhead smolts are currently released as age 1+ juvenile fish (Oregon Department of Fish and Wildlife 1990). In 1982, the peak period of outmigration of Big Creek stock smolts occurred in late April and early May (Buchanan and Wade 1982).

Survival Rate

Egg to smolt survival is estimated to be 90% (Oregon Department of Fish and Wildlife unpublished data, Oregon Department of Fish and Wildlife 1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES and see MIDDLE FORK RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES.

Table 1 (TR). Hatchery winter steelhead releases into the Molalla and Pudding rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1957	Big Creek	Eagle Creek	smolt	01/01/58	12/31/58[c]	--	13,815	Abique Creek	--
1968	Big Creek	Big Creek	adult	01/01/68	12/31/68[c]	--	300	Silver Creek	--
1968	Big Creek	Klaskanine	adult	01/01/68	12/31/68[c]	--	385	Abiqua Creek	--
1969	Alsea	Alsea	smolt	01/01/70	12/31/70[c]	--	30,113	Holalla River	--
1969	Big Creek	Gnat Creek	smolt	01/01/70	12/31/70[c]	--	30,113	Molalla River	--
1969	Big Creek	Big Creek	adult	01/01/69	12/31/69[c]	--	134	Silver Creek	--
1970	Big Creek	Big Creek	fing.	01/01/71	12/31/71[c]	--	39,586	Table Rock Fork	--
1970	Big Creek	Gnat Creek	fing.	01/01/71	12/31/71[c]	--	40,980	Holalla River	--
1970	Alsea	Alsea	smolt	01/01/71	12/31/71[c]	--	31,200	Holalla River	--
1970	Big Creek	Unknown	smolt	01/01/71	12/31/71[c]	--	9,999	Molalla River	--
1970	Big Creek	Klaskanine	adult	01/01/70	12/31/70[c]	--	386	Table Rock Fork	--
1970	Big Creek	Klaskanine	adult	01/01/70	12/31/70[c]	--	200	Silver Creek	--
1971	Alsea	Alsea	smolt	01/01/72	12/31/72[c]	--	41,576	Molalla River	--
1971	Big Creek	Big Creek	adult	01/01/71	12/31/71[c]	--	200	Silver Creek	--
1972	Big Creek	Unknown	smolt	01/01/73	12/31/73[c]	--	54,402	Molalla River	--
1972	Big Creek	Big Creek	smolt	01/01/73	12/31/73[c]	--	31,680	Butte Creek	--
1972	Big Creek	Klaskanine	adult	01/01/72	12/31/72[c]	--	200	Silver Creek	--
1973	Alsea	Unknown	smolt	01/01/74	12/31/74[c]	--	53,794	Molalla River	--
1974	Big Creek	Unknown	smolt	01/01/75	12/31/75[c]	--	41,172	Molalla River	--
1975	Big Creek	Unknom	smolt	01/01/76	12/31/76[c]	--	63,012	Molalla River	--
1976	Big Creek	Roaring River	smolt	01/01/77	12/31/77[c]	--	55,202	Molalla River	
1978	Big Creek	Roaring River	smolt	01/01/79	12/31/79[c]	--	81,495	Molalla River	--
1979	Big Cr[d]	Roaring River	smolt	04/17/80	04/18/80	6.5	87,905	Molalla River	--
1980	Big Cr[d]	Roaring River	smolt	04/06/81	04/07/81	5.0	11,400	Molalla River	--
1980	Big Cr[d]	Roaring River	smolt	04/06/81	--	5.3	17,658	Molalla River	--
1980.	Big Cr[d]	Roaring River	smolt	04/06/81		5.5	15,730	Molalla River	--
1980	Big Cr[d]	Roaring River	smolt	04/06/81	--	5.6	23,740	Molalla River	--
1980	N. Santiam R.	Gnat Creek	smolt	04/26/82		5.7	4,047	Molalla River	RV
1980	N. Santiam R.	Gnat Creek	smolt	04/26/82	--	5.8	10,933	Molalla River	RV
1980	N. Santiam R.	Gnat Creek	smolt	04/22/82	--	6.4	8,512	Molalla River	RV
1981	Big Cr[d]	Gnat Creek	smolt	04/26/82	--	5.8	10,140	Molalla River	LV
1981	Big Cr[d]	Gnat Creek	smolt	04/22/82	04/26/82	6.0	18,720	Molalla River	LV
1981	Big Cr[d]	Gnat Creek	smolt	04/22/82		6.4	5,216	Molalla River	LV
1982	Floras Creek[e]	STEP	fry	05/15/82	--	2,000	34,000	Milk Creek	--
1982	Big Cr[d]	Roaring River	smolt	04/12/83	04/14/83	5.7	90,335	Holalla River	--
1983	USFWS[f]	STEP	fry	05/21/83	--	1,700	8,500	Milk Creek	--
1983	Big Cr[d]	Roaring River	smolt	04/1 1/84		5.4	5,886	Molalla River	--
1983	Big Cr[d]	Roaring River	smolt	04/1 1/84	04/12/84	6.0	88,638	Molalla River	--
1984	Big Cr[d]	Trojan Pond	smolt	04/23/85	--	5.1	7,992	Molalla River	--
1984	Big Cr[d]	Trojan Pond	smolt	04/23/85		5.5	8,024	Molalla River	--

Table 1 (TR). (cont.) Hatchery winter steelhead releases into the Rolalla and Pudding rivers s&basin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	life Stage	Release Date (I)	Release Date (2)	Fish/ lb	Number Released	Release location	CWT Code/ Fin Clip[b]
1984	Klaskaaine R.	Roaring River	smolt	04/24/85	04/25/85	6.0	70,498	Molalla River	..
1985	Big Cr	Trojan Pond	smolt	03/19/86	--	5.8	14,035	Molalla River	..
1985	Klaskaaine R.	Roaring River	smolt	04/11/86	--	5.4	72,784	Rolalla River	..
1986	Big Cr[d]	Willamette	smolt	04/07/87	--	6.4	25,964	Molalla River	..
1986	Big Cr[d]	Willamette	smolt	04/07/87	--	7.1	29,373	Molalla River	..
1986	Big Cr[d]	Willamette	smolt	04/08/87	04/17/87	5.7	14,804	Molalla River	..
1987	Klaskanine R.	Roaring River	smolt	04/06/88	--		10,022	Molalla River	RV
1987	Klaskanine R.	Roaring River	smolt	04/06/88	--	5.9	8,014	Molalla River	RV
1987	Klaskanina R.	Roaring River	smolt	04/06/88	--	6.1	18,288	Molalla River	RV
1987	Klaskaaine R.	Roaring River	smolt	04/06/88	--	6.2	40,157	Molalla River	RV
1988	Big Cr	Roaring River	smolt	04/06/89	--	5.5	7,205	Rolalla River	RV
1988	Big Cr[d]	Roaring River	smolt	04/06/89	--	5.6	43,808	Rolalla River	RV
1988	Big Cr[d]	Roaring River	smolt	04/06/89	--	6.1	14,879	Rolalla River	RV
1989	Big Cr[d]	Roaring River	smolt	04/11/90	--	5.5	27,293	Molalla River	RV
1989	Big Cr[d]	Roaring River	smolt	04/11/90	--	5.6	48,105	Molalla River	RV
IWO	Big Cr[d]	Roaring River	smolt	04/11/91	--	5.9	27,399	Molalla River	RV
IWO	Big Cr[d]	Roaring River	smolt	04/11/91	--	6.4	49,526	Rolalla River	RV

a Modified from Oregon Department of Fish and Uildlife (u-published data, cited by Oregon Department of Fish and Uildlife 1990); and Oregon Department of Fish and Wildlife's hatchery production database.

b D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in psrentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

c Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.

d Big Creek Hatchery stock.

e Includes stock from Neu River.

f U.S. Fish and Uildlife Service hatchery stock, excluding fish from Hagerman Fish Hatchery.

REFERENCES

Buchanan, D.V. and M.G. Wade. 1982. Development and assessment of steelhead in the Willamette River basin. Annual Progress Report, Oregon Department of Fish and Wildlife, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990).

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TUALATIN RIVER SUBBASIN

Naturally Produced Coho Salmon

GEOGRAPHIC LOCATION

The Tualatin River originates in the Coast Range Mountains and flows into the Willamette River at River Mile (RM) 28.6 (see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Tualatin River include Fanno, Chicken, McFee, Rock, Dairy, Gales, and Scoggins creeks. The Tualatin River subbasin drains an area of 707 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

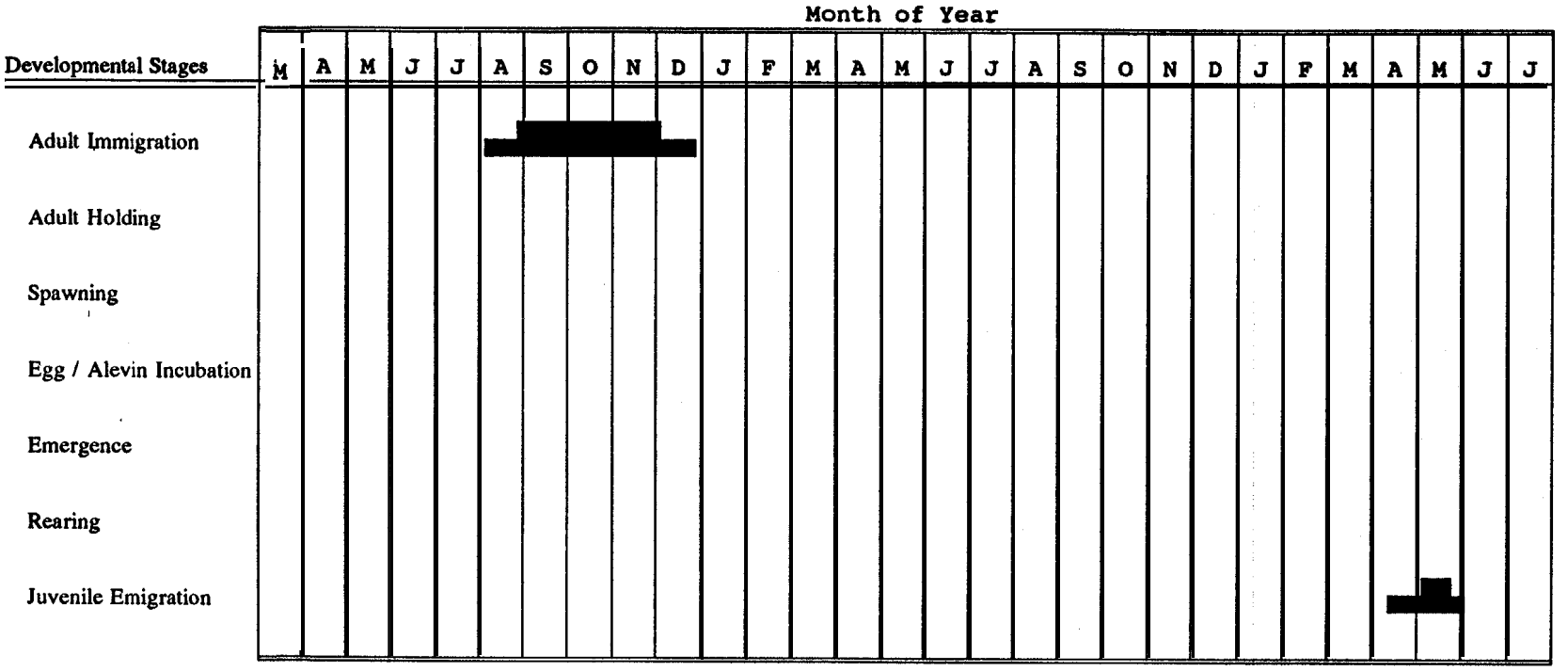
Coho are probably not native to the Tualatin River subbasin (Oregon Department of Fish and Wildlife 1990). The coho run to the subbasin is primarily believed to be comprised of hatchery fish although some naturally produced fish may return as a result of hatchery fish spawning in the subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Habitat in the Tualatin River subbasin considered suitable for spawning and rearing is rated as primarily of "good" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate adult immigration, spawning, and juvenile emigration.
3. Wide bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

Figure 1 (TT). Early run coho freshwater life history in the Tualatin River subbasin (Oregon Department of Fish and Wildlife).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Tualatin River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	16.7	57.1	23.5	2.7	--	157.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Tualatin River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Tualatin River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

TUALATIN RIVER SUBBASIN

Hatchery Produced Coho Salmon

ORIGIN

Supplementation of the Tualatin River subbasin with hatchery coho began in the early 1960's (Table 1). The majority of coho releases in the subbasin have been of Lower Columbia Early Run (LCER) stock (Table 1, see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, ORIGIN). LCER stock is also known as Toutle stock (Howell et al. 1985). Late run Cowlitz stock has been released infrequently into the subbasin (Oregon Department of Fish and Wildlife 1990).

The subbasin is currently supplemented with hatchery coho to mitigate for habitat lost due to the construction of Scoggins Dam (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery coho have been released into the mainstem Tualatin and various tributaries (Table 1). Smolts are usually released in May (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include McKenzie, Oxbow, Sandy, and Cascade hatcheries (Table 1). Annual numbers released ranged from 182,300 to 962,503 fish (Table 1). Size at release ranged from 1,200 to 1,100 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Big Creek and Bonneville hatcheries (Table 1). Annual numbers released ranged from 60,102 to 166,840 fish (Table 1). Size at release ranged from 189.0 to 20.8 fish per pound (Table 1). Releases of fingerlings have been discontinued (Oregon Department of Fish and Wildlife 1990).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Big Creek, Gnat Creek, Cascade, and Roaring River hatcheries (Table 1). Annual numbers released ranged from 53,797 to 413,967 fish (Table 1). Size at release ranged from 17.9 to 13.2 fish per pound (Table 1).

Jack and Adult

In 1964, 1966, and 1968-72, adults of unknown origin (probably LCER stock) were released into the subbasin (Table 1). Annual numbers released ranged from 150 to 635 fish (Table 1).

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery produced coho are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES and see SANDY RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES.

Table 1 (TR). Hatchery coho releases into the Tualatin River subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release location	CUT Code/ Fin Clip
1962	Unknown	Unknown	fry	unknown	--	--	195,000	Tualatin River	--
1964	Unknown	Unknown	adult	unknown	--	--	635	Tualatin River	--
1965	Unknown	Unknown	fry	unknown	--	--	349,700	Tualatin River	--
1966	Unknown	Unknoun	fry	unknown	--	--	195,300	Tualatin River	--
1966	Unknown	Unknown	adult	unknown	--	--	150	Tualatin River	--
1967	Unknown	Unknown	fry	unknown	--	--	685,700	Tualatin River	--
1968	Unknown	Unknown	adult	unknown	--	--	503	Tualatin River	--
1969	Unknown	Unknown	fry	unknown	--	--	740,000	Tualatin River	--
1969	Unknown	Unknown	adult	unknown	--	--	500	Tualatin River	--
1970	Unknoun	Unknown	adult	unknown	--	--	320	Tualatin River	--
1971	Unknown	Unknown	fry	unknown	--	--	454,400	Tualatin River	--
1971	Unknown	Unknown	adult	unknown	--	--	150	Tualatin River	--
1972	Unknown	Unknown	fry	unknown	--	--	182,300	Tualatin River	--
1972	Unknown	Unknown	adult	unknown	--	--	159	Tualatin River	--
1973	Unknoun	Unknown	fry	unknown	--	--	373,000	Tualatin River	--
1973	Unknown	Unknown	smolt	unknown	--	--	94,900	Tualatin River	--
1974	Unknown	Unknown	fry	unknown	--	--	183,100	Tualatin River	--
1974	Unknoun	Unknown	molt	unknown	--	--	59,900	Tualatin River	--
1975	LCER	Gnat Creek	smolt	01/01/76	12/31/76[c]	--	20,090	Gales Creek	
1975	LCER	Cascade	smolt	01/01/77	12/31/77[c]	--	8,540	Scoggins Creek	
1975	LCER	Cascade	smolt	01/01/77	12/31/77[c]	--	90,766	Scoggins Creek	
1975	Cowlitz	Cascade	smolt	01/01/77	12/31/77[c]	--	202,134	Scoggins Creek	
1975	Coulitz	Cascade	smolt	01/01/77	12/31/77[c]	--	92,523	Scoggins Creek	--
1976	LCER	McKenzie	fry	01/01/77	12/31/77[c]	--	204,103	Tualatin River	
1976	LCER	Roaring River	smolt	01/01/77	12/31/77[c]	--	20,004	Gales Creek	--
1976	LCER	Big Creek	smolt	01/01/78	12/31/78[c]	--	68,801	Scoggins Creek	--
1976	Coulitz	Big Creek	smolt	01/01/78	12/31/78[c]	--	71,743	Scoggins Creek	--
1976	LCER, cowlitz	Big Creek	smolt	01/01/78	12/31/78[c]	--	19,338	Scoggins Creek	--
1977	LCER	Gnat Creek	smolt	01/01/78	12/31/78[c]	--	29,640	Gales Creek	
1977	LCER	Big Creek	smolt	01/01/79	12/31/79[c]	--	81,189	Scoggins Creek	--
1977	Cowlitz	Big Creek	smolt	01/01/79	12/31/79[c]	--	74,577	Scoggins Creek	--
1977	LCER, Cowlitz	Big Creek	smolt	01/01/79	12/31/79[c]	--	33,436	Scoggins Creek	--
1978	LCER	Big Creek	smolt	01/01/79	12/31/79[c]	--	83,700	Scoggins Creek	--
1978	Big Cr[d]	Big Creek	fing.	04/14/80	04/15/80	20.8	60,102	Scoggins Creek	--
1978	Cowlitz	Big Creek	smolt	01/01/79	12/31/79[c]	--	80,190	Scoggins Creek	--
1979	Big Cr[d]	Big Creek	smolt	04/13/81	--	17.7	19,617	Scoggins Creek	--
1979	Big Cr[d]	Big Creek	smolt	04/13/81	--	17.9	40,275	Tualatin River	--
1980	Sandy R.[e]	Oxbow (Herman)	fry	03/05/81	--	1,200	86,414	Beaver Creek	--
1980	Sandy R.[e]	Oxbow (Herman)	fry	03/05/81	--	1,200	49,408	Beaver Creek (lower)	--

Table 1 (TR). (cont.) Hatchery coho releases into the Tualatin River subbasin by brood year and, if marked, coded wire tag code".

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1980	Sandy R.[e]	Oxbow (Herman)	fry	03/05/81		1,200	49,408	Ihler Creek	--
1980	Sandy R.[e]	Oxbow (Herman)	fry	03/05/81	--	1,200	111,168	Lee Creek	--
1980	Sandy R.[e]	Oxbow (Herman)	fry	03/05/81	--	1,200	61,760	SFk McFee Creek	--
1980	Sandy R.[e]	Oxbow (Herman)	fry	03/05/81	--	1,200	98,816	Sunday Creek	--
1980	LCER	oxbow	fry	01/01/81	12/31/81[c]	--	84,644	Clear Creek (Gales Cr)	--
1980	Big Cr[d]	Big Creek	smolt	05/12/82	--	15.1	14,641	Scoggins Creek	--
1980	Big Cr[d]	Big Creek	smolt	05/12/82	--	15.1	40,302	Tuelatin River	
1981	Sandy R.[e]	Bonneville	fing.	06/09/82	--	189.0	59,724	Lee Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/09/82	--	189.0	61,236	Sunday Creek	--
1981	Sandy R.[e]	Bonneville	fing.	06/09/82	--	189.0	34,965	Tualatin River	--
1981	Big Cr[d]	Big Creek	smolt	05/12/83	--	14.3	53,797	Tualatin River	--
1982	Sandy R.[e]	STEP	fry	02/13/83	--	1,100	4,000	EFk Dairy Creek	--
1982	Tanner Cr	Oxbow (Herman)	fry	02/22/83	--	1,195	76,480	Beaver Creek (lower)	--
1982	Tanner Cr	Oxbow (Herman)	fry	02/22/83	--	1,195	115,915	Clear Creek	
1982	Tanner Cr	Oxbow (Herman)	fry	02/22/83	--	1,195	127,865	Rock Creek	--
1982	Tanner Cr	Oxbow (Herman)	fry	02/22/83	--	1,195	51,348	SFk McFee Creek	--
1982	Tanner Cr	Oxbow (Herman)	fry	02/22/83	--	1,195	127,865,	Tualatin River	
1982	Sandy R.[e]	Sandy	fry	02/18/83	--	1,177	117,700	'Beaver Creek	--
1982	Sandy R.[e]	Sandy	fry	02/18/83	--	1,177	47,080	EFk McKay Creek	
1982	Sandy R.[e]	Sandy	fry	02/18/83	--	1,177	70,620	Ihler Creek	
1982	Sandy R.[e]	Sandy	fry	02/18/83	--	1,177	47,080	Jackson Creek	--
1982	Sandy R.[e]	Sandy	fry	02/18/83	--	1,177	176,550	McKay Creek	--
1982	Big Cr[d]	Big Creek	smolt	05/14/84	--	13.2	43,824	Tualatin River	--
1982	Big Cr[d]	Big Creek	smolt	05/10/84	--	14.1	16,187	Tualatin River	--
1983	Big Cr[d]	Big Creek	smolt	05/03/85	--	15.0	20,235	Gales Creek	--
1983	Big Cr[d]	Big Creek	smolt	05/03/85	--	15.0	39,775	Tualatin River	--
1984	LCER	Cascade	fry	01/01/85	12/31/85[c]	--	200,000	Rock Creek	--
1984	Sandy R.[e]	Bonneville	fing.	05/01/85	--	153.0	24,074	SFk McFee Creek	--
1984	Sandy R.[e]	Bonneville	fing.	05/01/85	--	160.7	31,472	SFk McFee Creek	--
1984	Sandy R.[e]	Bonneville	fing.	05/01/85	--	153.0	27,846	Tualatin River	--
1984	Sandy R.[e]	Bonneville	fing.	05/02/85	--	171.0	83,448	Tualatin River	--
1985	Tanner Cr	Cascade	smolt	05/04/87	--	13.4	15,236	Tualatin River	--
1985	Tanner Cr	Cascade	smolt	05/04/87	05/05/87	13.7	44,767	Tualatin River	--
1986	Big Cr[d]	Big Creek	smolt	05/05/88	--	15.3	30,846	Tualatin River	--
1986	Big Cr[d]	Big Creek	smolt	05/06/88	--	15.4	29,260	Tualatin River	--
1987	Big Cr[d]	Big Creek	smolt	05/08/89	--	15.5	59,824	Tualatin River	--
1988	Big Cr[d]	Big Creek	smolt	05/15/90	--	15.7	14,974	Tualatin River	--
1988	Big Cr[d]	Big Creek	smolt	05/15/90	--	15.8	44,980	Tualatin River	--
1989	Big Cr[d]	Big Creek	smolt	05/10/91	--	15.7	60,229	Tualatin River	--

(cont.)

TUALATIN 8

Table 1 (TR). (cont.) Hatchery coho releases into the Tualatin River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release location	CUT Fin	Code/ Clip

a Modified from Oregon Department of Fish and Wildlife (1990); and Oregon Department of Fish and Wildlife's hatchery production database.
b LCER refers to Lower Columbia Early Run stock, a "catchall" name for early run hatchery stocks, including Eagle Creek, Clackamas River, Sandy River, Big Creek, and Tanner Creek stacks. These stocks have been previously grouped as early run Toutle stock, or just early run coho. The "Unknown" stocks are probably LCER stock. Cowlitt stock is part of a late run stock group.
c Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.
d gig Creek Hatchery stock.
e Sandy Fish Hatchery stock.

REFERENCES

Howell, P.J., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Tualatin River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

TUALATIN RIVER SUBBASIN

Naturally Produced Winter Steelhead

GEOGRAPHIC LOCATION

The Tualatin River originates in the Coast Range Mountains and flows into the Willamette River at River Mile (RM) 28.6 (see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Tualatin River include Fanno, Chicken, McFee, Rock, Dairy, Gales, and Scoggins creeks. The Tualatin River subbasin drains an area of 707 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Winter steelhead are native to the Tualatin River subbasin. Natural production occurs from hatchery fish, primarily Big Creek hatchery stock, spawning in the subbasin (see TUALATIN RIVER SUBBASIN, Hatchery Produced Winter Steelhead; Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Winter steelhead are believed to spawn in Gales Creek and the mainstem Tualatin River above Scoggins Creek (Oregon Department of Fish and Wildlife 1990). Habitat in the Tualatin River subbasin considered suitable for spawning and rearing is rated as primarily of "good" quality (Tables 1 and 2).

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced winter steelhead are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for naturally produced winter steelhead are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Tualatin River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	19.0	64.3	12.9	3.0	--	111.7	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Tualatin River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	19.0	16.1	64.9	0.0	--	27.9	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Tualatin River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

TUALATIN RIVER SUBBASIN

Hatchery Produced Winter Steelhead

ORIGIN

The Tualatin River subbasin has been supplemented with Big Creek stock hatchery winter steelhead since 1976 (Table 1). The subbasin is currently supplemented with hatchery winter steelhead to mitigate for habitat lost due to the construction of Scoggins Dam and to provide recreational fisheries in and downstream of Gales Creek (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Smolts have been released into Gales Creek and the mainstem Tualatin River in March, April, and May (Table 1).

Approximations of the temporal distribution of adult immigration and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. Estimates are for Big Creek stock winter steelhead that spawn and rear in the wild. The methodology used to generate these approximations is unknown.

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

The U.S. Fish and Wildlife Service supplied winter steelhead for release through the Salmon and Trout Enhancement Program (Table 1). In 1983, 24,500 fry were released at a size of 1,700 fish per pound (Table 1).

Fingerling

There are no records of releases in the subbasin.

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Trojan Pond and Big Creek, Gnat Creek and Roaring River hatcheries (Table 1). Annual numbers released ranged from 7,917 to 42,191 fish (Table 1). Size at release ranged from 8.2 to 4.0 fish per pound (Table 1).

Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery produced winter steelhead are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1987, as cited by Oregon Department of Fish and Wildlife, 1990).

ADULT LIFE HISTORY

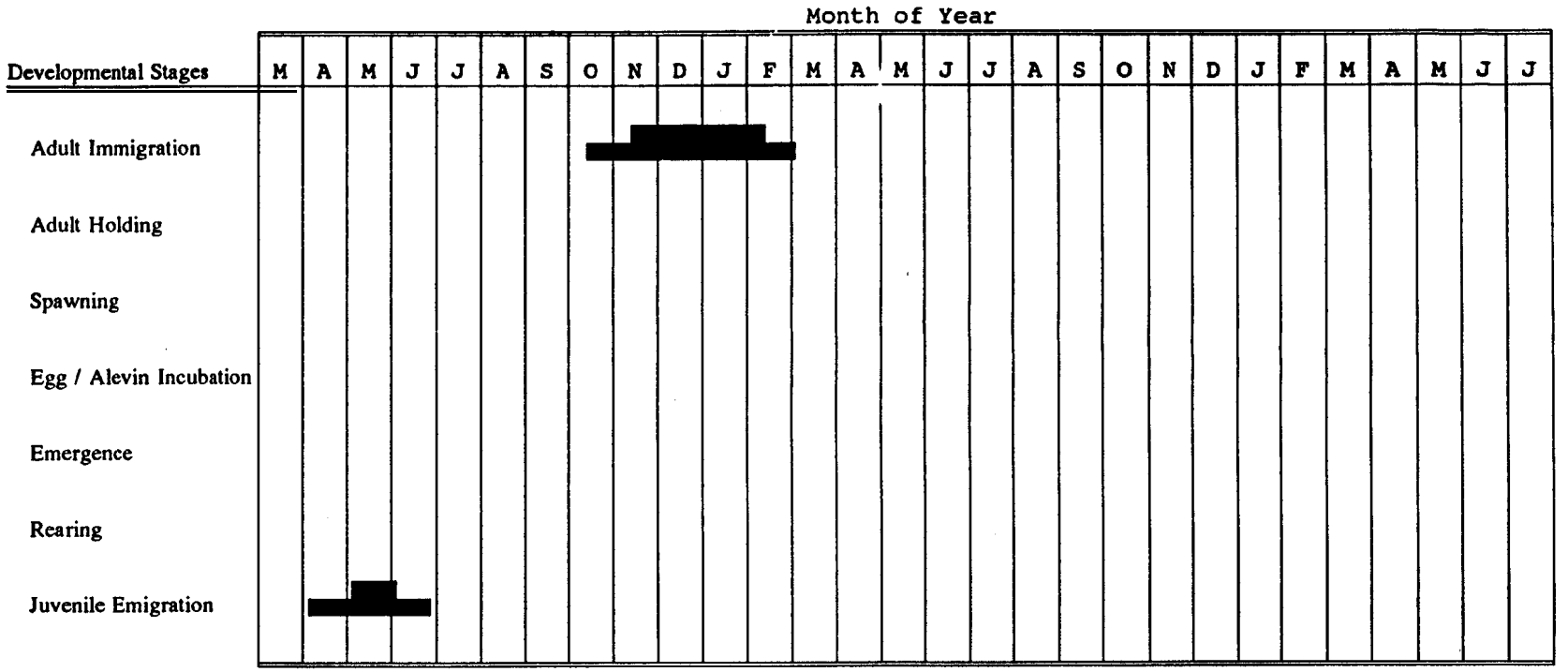
Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for hatchery produced winter steelhead are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate adult immigration, spawning, and juvenile emigration.
3. Wide bars indicate periods of heaviest adult immigration, spawning, and juvenile emigration.

Figure 1 (TT). Big Creek stock winter steelhead freshwater life history in the Tualatin River subbasin (Oregon Department of Fish and Wildlife).

Table 1 (TR). Hatchery winter steelhead releases into the Tualatin River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1975	Big Creek	Big Creek	snlolt	04/15/76[c]	--	7.1	10,003	Scoggins Creek	--
1975	Big Creek	Gnat Creek	smolt	OS/IS/76=	--	8.2	20,090	Gales Creek	--
1976	Big Creek	Big Creek	smolt	04/15/77[c]	--	7.2	10,080	Scoggins Creek	
1976	Big Creek	Roaring River	smolt	05/15/77[c]	--	6.3	20,004	Gales Creek	
1977	Big Creek	Big Creek	smolt	04/15/78'	--	5.5	10,313	Scoggins Creek	
1977	Big Creek	Gnat Creek	smolt	05/15/78[c]	--	5.3	29,640	Gales Creek	
1978	Big Creek	Big Creek	smolt	04/15/79[c]	--	5.8	10,150	Scoggins Creek	
1978	Big Creek	Gnat Creek	smolt	04/15/79[c]	--	6.3	19,747	Gales Creek	--
1979	Big Crd	Big Creek	smolt	04/14/80	--		10,143	Scoggins Creek	--
1979	Big Crd	Gnat Creek	smolt	04/07/80	--	2::	20,554	Gales Creek	--
1980	Big Crd	Big Creek	smolt	04/13/81	--	5.5	9,653	Tualatin River	
1980	Big Crd	Gnat Creek	smolt	04/14/81	--	5.4	18,090	Gales Creek	--
1981	Big Crd	Gnat Creek	smolt	04/09/82	--	6:0	7,917	Gales Creek	LP
1982	Big Crd	Big Creek	smolt	05/06/83	--	5.0	9,023	Tualatin River	--
1982	Big Crd	Gnat Creek	smolt	05/04/83	--	5.0	4,548	Gales Creek	--
1982	Big Crd	Gnat Creek	smolt	05/04/83	--	5.2	4,807	Gales Creek	--
1982	Big Crd	Gnat Creek	smolt	05/04/83	--	5.4	4,643	Gales Creek	--
1982	Big Crd	Gnat Creek	smolt	05/10/83	--	5.7	6,099	Gales Creek	--
1982	Big Crd	Gnat Creek	smolt	05/09/83	--	6.2	6,820	Gales Creek	
1982	Big Crd	Gnat Creek	smolt	05/10/83	--	6.6	4,882	Gales Creek	
1983	USFUS[e]	STEP	fry	05/01/83	-- $	1,700	24,500	EFk Dairy Creek	
1983	Big Crd	Roaring River	smolt	04/05/84	04/06/84	5.4	14,900	Gales Creek	--
1983	Big Crd	Roaring River	smolt	04/05/84	-	5.7	15,028	Gales Creek	--
1983	Big Crd	Roaring River	smolt	04/04/84	--	5.7	10,030	Tualatin River	--
1984	Big Crd	Gnat Creek	smolt	05/21/85	--	4.9	4,064	Gales Creek	--
1984	Big Crd	Gnat Creek	smolt	05/16/85	05/21/85	5.0	18,990	Gales Creek	--
1984	Big Crd	Trojan Pond	smolt	05/02/85	--	5.0	6,800	Gales Creek	
1984	Big Crd	Trojan Pond	smolt	05/02/85	--	4.4	4,903	Tualatin River	--
1984	Big Crd	Trojan Pond	smolt	05/02/85	--	4.5	4,868	Tualatin River	--
1985	Big Crd	Trojan Pond	smolt	03/18/86	--	4.7	6,097	Gales Creek	--
1985	Big Crd	Trojan Pond	smolt	03/17/86	03/20/86	5.3	12,100	Gales Creek	--
1985	Big Crd	Trojan Pond	smolt	03/21/86	--	5.6	8,017	Gales Creek	--
1985	Big Crd	Trojan Pond	smolt	03/19/86	--	5.8	6,075	Gales Creek	--
1985	Big Crd	Trojan Pond	smolt	03/18/86	--	4.7	4,954	Tualatin River	--
1985	Big Crd	Trojan Pond	smolt	03/17/86	--	5.3	4,948	Tualatin River	--
1986	Big Crd	Gnat Creek	smolt	04/14/87	04/17/87	5.3	20,453	Gales Creek	AD
1986	Big Crd	Gnat Creek	smolt	04/17/87	--	5.4	4,859	Gales Creek	AD
1986	Big Crd	Trojan Pond	smolt	05/14/87	--	4.0	9,943	Tualatin River	--
1987	Big Cr	Big Creek	smolt	04/22/88	--	4.6	4,911	Tualatin River	--

Table 1 (TR). Hatchery uinter steelhead releases into the Tualatin River subbasin by brood year and, if marked, coded wire tag code[a].

Brood stock Year	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1987 gig Cr[d]	gig Creek	smolt	04/21/88	--	4.7	5,090	Tualatin River	--
1987 Big Cr[d]	Gnat Creek	smolt	04/22/88	--	5.6	5,990	Gales Creek	--
1987 Big Cr[d]	Gnat Creek	smolt	04/25/88	--	5.8	3,998	Gales Creek	--
1987 Big Cr[d]	Gnat Creek	smolt	04/25/88	--	5.9	14,981	Gales Creek	--
1988 Big Cr[d]	Gnat Creek	smolt	04/12/89		5.6	5,488	Gales Creek	
1988 Big Cr[d]	Gnat Creek	smolt	04/13/89		5.7	12,769	Gales Creek	
1988 Big Cr[d]	Gnat Creek	smolt	04/03/89		5.7	10,004	Tualatin River	--
1989 Big Cr[d]	Gnat Creek	smolt	04/17/90	04/18/90	5.8	10,089	Gales Creek	AD
1989 Big Cr[d]	Gnat Creek	smolt	04/17/90		6.2	5,021	Gales Creek	AD
1989 Big Cr[d]	Gnat Creek	smolt	04/16/90	04/ 17/90	6.2	10,001	Tualatin River	AD
1990 Big Cr[d]	Gnat Creek	smolt	04/17/91	--	5.5	18,589	Gates Creek	RV
1990 Big Cr[d]	Gnat Creek	smolt	04/17/91		5.5	10,010	Tualatin River	RV

a Modified from Oregon Department of Fish end Wildlife (1990); and Oregon Department of Fish and Wildlife's hatchery production database.
b Day(s) of release unknom. Standardized to the 15th of the month.
c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded uire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark uas "U4". The "AU" code has not been identified.
d Big Creek Hatchery stock.
e U.S. Fish and Wildlife Service hatchery stock, excluding fish from Hagerman Fish Hatchery.

REFERENCES

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COAST RANGE RIVERS SUBBASIN

Hatchery Produced Spring Chinook Salmon

ORIGIN

There is only one recorded release of South Santiam stock hatchery fish into the subbasin.

DISTRIBUTION

Subbasin

Hatchery spring chinook were released into Rickreall Creek in 1991 (Table 1). This is the only recorded release of hatchery fish into the Coast Range rivers subbasin (see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1).

PRODUCTION

Releases

Egg

There are no records of in the subbasin.

Fry

There are no records releases in the subbasin.

Fingerling

There are no records of releases in the subbasin.

Smolt

The only hatchery facility in which smolts were reared or acclimated prior to release in the subbasin was Dexter Pond (Table 1). The 199 1 release of 16,485 juveniles into Rickreall Creek is the only recorded release of hatchery fish into the subbasin. Smolts were released at a size of 10.5 fish per pound (Table 1).

Jack and Adult

There are no records of releases in the subbasin.

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see MIDDLE FORK RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery releases of spring chinook salmon into the Yamhill, Luckiamute, and Marys rivers and Rickreall Creek subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT/ Fin clip
1989	S. Santiam R.	Dexter Pond	smolt	03/05/91	--	10.5	11,045	Rickreall Creek	--
1989	S. 'Santiam R.	Dexter Pond	smolt	03/05/91	--	10.5	5,440	Rickreall Creek	07-55-02[b]

[a] Modified from Oregon Department of Fish and Wildlife's hatchery production database.
[b] Juveniles with this tag group were also released into the Santiam and Calapooia rivers subbasin.

COAST RANGE RIVERS SUBBASIN

Naturally Produced Fall Chinook Salmon

GEOGRAPHIC LOCATION

The rivers of the Coast Range subbasin originate on the eastern side of the Coast Range Mountains, and flow into the Willamette River between RM 55 and RM 108 (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The subbasin drains approximately 1,800 square miles of Yamhill, Polk and Benton counties (State Water Resources Board 1967, cited by Oregon Department of Fish and Wildlife 1990). Major tributaries of the subbasin are the Yamhill River, Luckiamute River, Marys River, and Rickreall Creek (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Wild fall chinook are not indigenous to the subbasin (Oregon Department of Fish and Wildlife 1990). Hatchery fall chinook were released into the subbasin in the mid-1970's (see COAST RANGE RIVERS SUBBASIN, Hatchery Produced Fall Chinook Salmon). Redds were counted during spawning ground surveys conducted in 1976, the first return year from the 1974 release, (Hansen 1977, cited by Oregon Department of Fish and Wildlife 1990) but no natural production has been documented in subsequent years (Hansen and Williams 1979, cited by Oregon Department of Fish and Wildlife 1990). Currently, there are no fall chinook in the Coast Range rivers subbasin (Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Spawning Area

Numbers: Spawning areas in the Coast Range rivers subbasin were surveyed in the late 1970's. The only evidence of natural production was a count of 24 redds in the Luckiamute River in 1976 (Hansen 1977, cited by Oregon Department of Fish and Wildlife 1990; and Hansen and Williams 1979, cited by Oregon Department of Fish and Wildlife 1990).

REFERENCES

Hansen, H.L. 1977. Stock assessment and enhancement of fall salmon species in the Willamette River system. Federal Aid Progress Reports, Fisheries. Oregon Department of Fish and Wildlife. (As reported in Oregon Department of Fish and Wildlife 1990.)

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State Water Resources Board. 1967. Willamette River basin. Salem, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990).

COAST RANGE RIVERS SUBBASIN

Hatchery Produced Fall Chinook Salmon

ORIGIN

Hatchery fall chinook were released in the Coast Range rivers subbasin in 1974 and 1976, in an unsuccessful attempt to establish a self-sustaining population in the subbasin (Hansen 1977, cited by Oregon Department of Fish and Wildlife 1990). The only hatchery stock used for subbasin hatchery production is the Cowlitz substock of the Lower River Hatchery (LRH) stock (Table 1, see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, ORIGIN).

DISTRIBUTION

Subbasin

Hatchery fall chinook have only been released into the Luckiamute and Little Luckiamute rivers (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

There are no records of releases in the subbasin.

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin are unknown (Table 1). Annual numbers released ranged from 209,250 to 2,302,668 fish (Table 1). Size at release was 128 fish per pound (Table 1).

Smolt

There are no records of releases in the subbasin.

Jack and Adult

There are no records of releases in the subbasin.

Table 1 (TR). Hatchery fall chinook releases into the Coast Range rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1973	LRH	(Cowlitz)	Unknown	fing.	01/01/74	12/31/74[c]	128	78,000	Luckiamute River	--
1973	LRH	(Coulitz)	Unknown	fing.	01/01/74	12/31/74[c]	128	131,250	Little Luckiamute River	--
1975	LRH	(Coulitz)	Unknown	fing.	01/01/76	12/31/76[c]	128	2,040,328	Luckiamute River	--
1975	LRH	(Cowlitz)	Unknown	fing.	01/01/76	12/31/76[c]	128	262,340	Little Luckiamute River	--

a Modified from Hansen (1977, cited by Oregon Department of Fish and Wildlife 1990).

b LRH refers to Louer Columbia River Hatchery Stock, which are informally called tules (along with Bonneville Pool Hatchery Stock). Coulitz is a subsfock of LRH.

c Release dates unknown (only year of release known). Standardized to the first and last day of the year.

REFERENCES

Hansen, H.L. 1977. Stock assessment and enhancement of fall salmon species in the Willamette River system. Federal Aid Progress Reports, Fisheries. Oregon Department of Fish and Wildlife. (As reported in Oregon Department of Fish and Wildlife 1990.)

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Coast Range). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

COAST RANGE 8

COAST RANGE RIVERS SUBBASIN

Naturally Produced Coho Salmon

GEOGRAPHIC LOCATION

The rivers of the Coast Range subbasin originate on the eastern side of the Coast Range Mountains, and flow into the Willamette River between RM 55 and RM 108 (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The subbasin drains approximately 1,800 square miles of Yamhill, Polk and Benton counties (State Water Resources Board 1967, cited by Oregon Department of Fish and Wildlife 1990). Major tributaries of the subbasin are the Yamhill River, Luckiamute River, Marys River, and Rickreall Creek (Oregon Department of Fish and Wildlife 1990).

ORIGIN

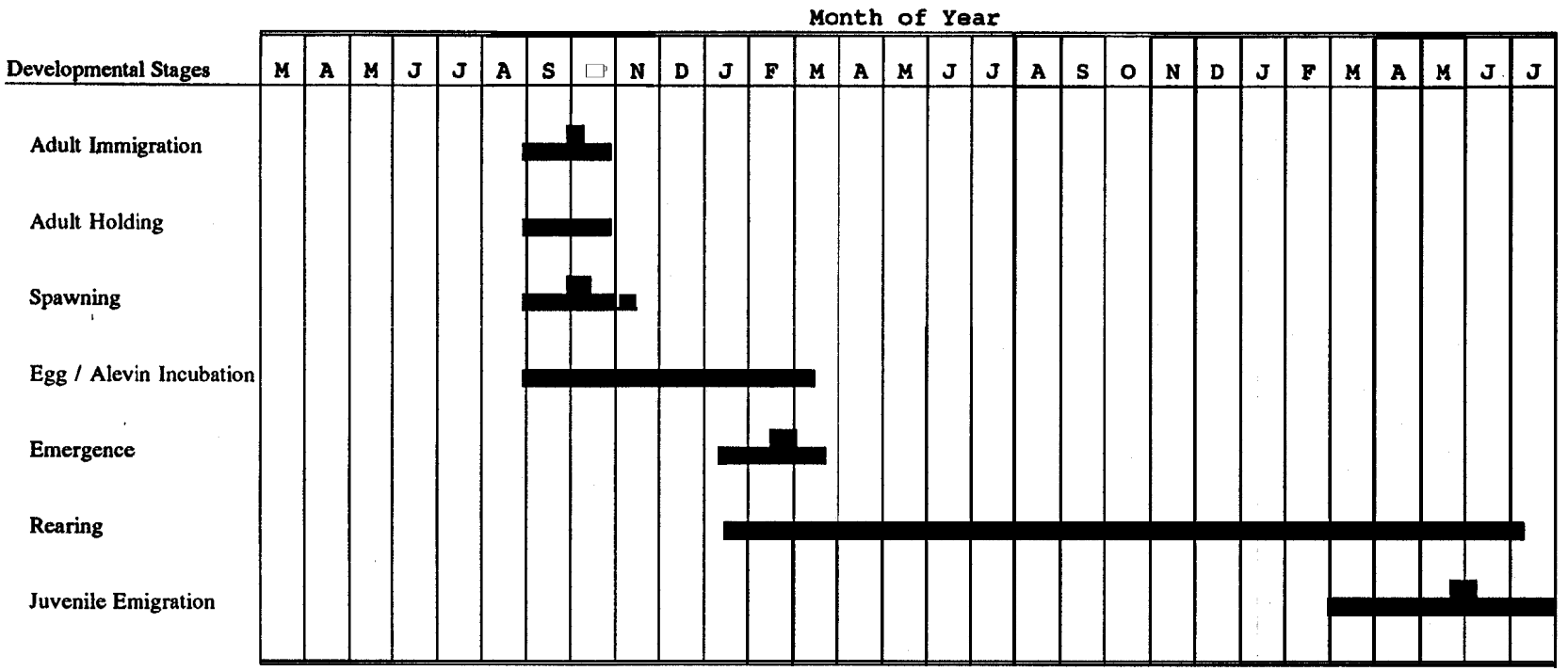
Coho are not indigenous to the Coast Range subbasin (Oregon Department of Fish and Wildlife 1990). Hatchery coho were released into areas of the Willamette River basin upstream of Willamette Falls, beginning in the 1920's, and in the Coast Range rivers subbasin, beginning in 1954 (see COAST RANGE RIVERS SUBBASIN, Hatchery Produced Coho Salmon). Hatchery coho are no longer released into the Coast Range rivers subbasin and any production is believed to be the result of natural production in the subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Spawning and rearing distribution in the subbasin is unknown although it is likely that natural production occurs in areas where hatchery fish were released (Oregon Department of Fish and Wildlife 1990). The Northwest Power Planning Council estimates that approximately 242.7 miles of spawning and rearing habitat is available in the subbasin (Tables 1-8). The quality of habitat considered suitable for spawning and rearing varies throughout the Coast Range rivers subbasin (Tables 1-8).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Wide bars indicate periods of peak activity.

Figure 1 (TT). Coho salmon freshwater life history in the Coast Range subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Yamhill River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	33.0	38.5	27.9	0.6	--	102.8	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Yamhill River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	a-	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 3 (HB-3). Estimated amount of spawning and rearing habitat by quality of Rickreall River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	3.7	38.5	43.0	14.8	--	27.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 4 (HB-4). Estimated amount of rearing only habitat by quality of Rickreall River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (0)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 5 (HB-5). Estimated amount of spawning and rearing habitat by quality of Marys River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	27.2	72.8	0.0	--	46.7	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 6 (HB-6). Estimated amount of rearing only habitat by quality of Marys River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 7 (HB-7). Estimated amount of spawning and rearing habitat by quality of Luckiamute River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	27.7	30.3	42.0	0.0	--	66.2	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 8 (HB-8). Estimated amount of rearing only habitat by quality of Luckiamute River subbaain coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Coast Range). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

State Water Resources Board. 1967. Willamette River basin. Salem, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

COAST RANGE RIVERS SUBBASIN

Hatchery Produced Coho Salmon

ORIGIN

Hatchery coho were released in the 1960's and 1970's to establish a self-sustaining population in the subbasin. This program was discontinued due to low numbers of returning adults (Williams 1983a, cited by Oregon Department of Fish and Wildlife 1990). In the 1980's, hatchery coho were released in the subbasin to supplement ocean and Columbia River fisheries. This program was discontinued due to concerns that coho were competing with other fish species, and were not contributing to targeted fisheries (Oregon Department of Fish and Wildlife 1990). The subbasin was supplemented with LCER (Lower Columbia Early Run; see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, ORIGIN), late run (also known as Cowlitz), and coastal stocks. Hatchery fish are no longer released into the subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

From 1952-87 coho fry, fingerlings, smolts, and adults were stocked mainly in the Yamhill River drainage and to a lesser degree in the Luckiamute River, Marys River, and Rickreall Creek drainages (Oregon Department of Fish and Wildlife 1990). The most recent releases of hatchery coho, from 1983-87, were more restricted than previous releases (Williams 1983b, cited by Oregon Department of Fish and Wildlife 1990), in order to protect steelhead production areas (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Sandy, Cascade, Bonneville, Klaskanine, Big Creek, McKenzie, Gnat Creek, Oxbow, Trask, Nehalem, Siletz, and Alsea hatcheries (Table 1). Annual numbers released ranged from 158,517 to 3,703,246 fish (Table 1). Size at release ranged from 1,975 to 262 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Sandy, Cascade, Bonneville, Oxbow, and Elk River hatcheries (Table 1). Annual numbers released ranged from 29,300 to 1,288,807 fish (Table 1). Size at release ranged from 225 to 149 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Sandy, Cascade, Bonneville, Klaskanine, and Alsea hatcheries (Table 1). Annual numbers released ranged from 10,000 to 525,351 fish (Table 1).

Jack and Adult

Hatchery facilities in which adults were held prior to release in the subbasin include Sandy, Cascade, Bonneville, Klaskanine, Big Creek, Siletz, and Alsea hatcheries (Table 1). Annual numbers released ranged from 150 to 3,406 fish (Table 1).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES and see SANDY RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES.

Table 1 (TR). Hatchery coho releases into the Coast Range rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT code/ Fin Clip
1952	LCER	Bonnevi lle	smolt	01/01/54	12/31/54[c]	--	10,000	South Yamhill River	--
1953	LCER	Sandy	fins.	01/01/54	12/31/54[c]	--	100,000	South Yamhill River	--
1954	LCER	Sandy	fing.	01/01/55	12/31/55[c]	--	50,000	South Yamhill River	--
1954	LCER	Sandy	smolt	01/01/55	12/31/55[c]	--	45,486	South Yamhill River	--
1955	LCER	Sandy	smolt	01/01/57	12/31/57[c]	--	79,877	South Yamhill River	--
1956	LCER	Sandy	fing.	01/01/57	12/31/57[c]	--	239,556	South Yamhill River	--
1956	LCER	Sandy	fing.	01/01/57	12/31/57[c]	--	119,862	Luckiamute River	--
1957	LCER	Sandy	fing.	01/01/58	12/31/58[c]	--	128,000	South Yamhill River	--
1957	LCER	Sandy	fing.	01/01/58	12/31/58[c]	--	70,000	Lwkiamute	--
1958	LCER	Sandy	fing.	01/01/59	12/31/59[c]	--	88,476	South Yamhill River	--
1958	LCER	Sandy	fing.	01/01/59	12/31/59[c]	--	80,000	Luckiamute River	--
1958	LCER	Sandy	fing.	01/01/59	12/31/59[c]	--	80,000	Marys River tributaries	--
1959	LCER	Sandy	fing.	01/01/60	12/31/60[c]	--	90,646	Luckiamute River	--
1959	LCER	Sandy	fing.	01/01/60	12/31/60[c]	--	108,794	Marys River tributaries	--
1959	LCER	Bonneville	smolt	01/01/61	12/31/61[c]	--	97,784	South Yamhill River	--
1960	LCER	Sandy	smolt	01/01/62	12/31/62[c]	--	63,158	South Yamhill River tribs	--
1961	LCER	Bonneville	fry	01/01/62	12/31/62[c]	--	300,000	North Yamhill River tribs	--
1961	LCER	Bonneville	fry	01/01/62	12/31/62[c]	--	402,052	South Yamhill River tribs	--
1961	LCER	Bonneville	fry	01/01/62	12/31/62[c]	--	104,580	Luckiamute River	--
1961	LCER	Sandy	smolt	01/01/63	12/31/63[c]	--	44,979	South Yamhill River tribs	--
1962	LCER	Bonneville	fry	01/01/63	12/31/63[c]	--	400,000	Luckiamute River	--
1962	LCER	Bonn. and Klask.	fry	01/01/63	12/31/63[c]	--	462,907	South Yamhill River tribs	--
1962	LCER	Klaskanine	fry	01/01/63	12/31/63[c]	--	350,000	Marys River	--
1962	LCER	Sandy	fry	01/01/63	12/31/63[c]	--	291,886	North Yamhill River tribs	--
1962	LCER	Sandy	smolt	01/01/64	12/31/64[c]	--	61,814	South Yamhill River tribs	--
1963	LCER	Sandy	smolt	01/01/65	12/31/65[c]	--	10,060	North Yamhill River tribs	--
1963	LCER	Sandy	smolt	01/01/65	12/31/65[c]	--	69,793	South Yamhill River tribs	--
1964	LCER	Klaskanine	fry	01/01/65	12/31/65[c]	--	1,827,209	South Yamhill River tribs	--
1964	LCER	Klaskanine	fry	01/01/65	12/31/65[c]	--	304,872	Rickreall Creek	--
1964	LCER	Klaskanine	fry	01/01/65	12/31/65[c]	--	392,587	Luckiamute River	--
1964	LCER	Big Cr. and Klask.	fry	01/01/65	12/31/65[c]	--	1,178,578	Marys River tributaries	--
1964	LCER	Cascade	fing.	01/01/65	12/31/65[c]	--	100,031	North Yamhill River tribs	--
1964	LCER	oxbow	fing.	01/01/65	12/31/65[c]	--	64,152	South Yamhill River tribs	--
1964	LCER	Sandy	smolt	01/01/66	12/31/66[c]	--	29,321	North Yamhill River	--
1964	LCER	Sandy	smolt	01/01/66	12/31/66[c]	--	14,329	South Yamhill River trib.	--
1964	LCER	Sandy	smolt	01/01/66	12/31/66[c]	--	29,970	Marys River tributaries	--
1964	LCER	Cascade	adult	01/01/64	12/31/64[c]	--	300	North Yamhill River	--
1964	LCER	Cascade	adult	01/01/64	12/31/64[c]	--	600	South Yamhill River tribs	--
1964	LCER	Cascade	adult	01/01/64	12/31/64[c]	--	250	Marys River tributary	--

Table 1 (TR). (cont.) Hatchery coho releases into the Coast Range rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip
1965	LCER	Klaskanine	fry	01/01/66	12/31/66[c]	--	250,596	Rickreall Creek	--
1965	LCER	Sandy	fry	01/01/66	12/31/66[c]	--	308,628	North Yamhill River tribs	--
1965	LCER	Bonn. and Cascade	fry	01/01/66	12/31/66[c]	--	402,600	Luckiamute River tribs	--
1965	LCER	Bonn. and Big Cr.	fry	01/01/66	12/31/66[c]	--	799,153	South Yamhill River	--
1965	LCER	Bonn. and Big Cr.	fry	01/01/66	12/31/66[c]	--	608,748	Marys River tributaries	--
1965	LCER	Sandy	adult	01/01/65	12/31/65[c]	--	700	North Yamhill River	--
1965	LCER	Sandy	adult	01/01/65	12/31/65[c]	--	220	South Yamhill River	--
1965	Unknown	Alsea	adult	01/01/65	12/31/65[c]	--	117	North Yamhill River	--
1965	Unknown	Alsea	adult	01/01/65	12/31/65[c]	--	200	Luckiamute River trib.	--
1965	Unknown	Siletz	adult	01/01/65	12/31/65[c]	--	246	Marys River	--
1966	Trask	Trask	fry	01/01/67	12/31/67[c]	--	'193,502	North Yamhill River	--
1966	Trask	Trask	fry	01/01/67	12/31/67[c]	--	104,250	South Yamhill R. and trib.	--
1966	Unknown	Nehalem	fry	01/01/67	12/31/67[c]	--	208,679	Luckiamute River trib.	--
1966	Unknown	Nehalem and Siletz	fry	01/01/67	12/31/67[c]	--	709,276	Harys River tributaries	--
1966	LCER	Sandy	fing.	01/01/67	12/31/67[c]	--	140,196	North Yamhill River	--
1966	LCER'	Sandy	fing.	01/01/67	12/31/67[c]	--	127,314	Marys River	--
1966	LCER	Bonneville	adult	01/01/66	12/31/66[c]	--	150	South Yamhill River trib.	--
1966	LCER	Bonneville	adult	01/01/66	12/31/66[c]	--	300	Rfckreall Creek and trib	--
1966	Unknown	Siletz	adult	01/01/66	12/31/66[c]	--	190	Luckiamute River	--
1966	Unknown	Siletz	adult	01/01/66	12/31/66[c]	--	190	Marys River	--
1967	LCER	Klaskanine	fry	01/01/68	12/31/68[c]	--	306,000	South Yamhill River tribs	--
1967	Unknown	Siletz	fry	01/01/68	12/31/68[c]	--	152,667	Rickreall Creek and trib.	--
1967	Unknown	Si letz	fry	01/01/68	12/31/68[c]	--	224,729	Luckiamute River tributary	--
1967	Unknown	Siletz	fry	01/01/68	12/31/68[c]	--	79,997	Harys River tributary	--
1967	LCER	Bonn. and Cascade	adult	01/01/67	12/31/67[c]	--	659	Luckiarmte River and trib	--
1967	LCER	Bonn. and Cascade	adult	01/01/67	12/31/67[c]	--	776	Marys River	--
1967	LCER	Klaskanine	adult	01/01/67	12/31/67[c]	--	159	Yamhill River	--
1967	LCER	Klaskanine	adult	01/01/67	12/31/67[c]	--	406	North Yamhill R. and trib.	--
1967	LCER	Klaskanine	adult	01/01/67	12/31/67[c]	--	806	South Yamhill R. tribs.	--
1967	Unknown	Si letz	adult	01/01/67	12/31/67[c]	--	300	North Yamhill River trib.	--
1967	Unknown	Siletz	adult	01/01/67	12/31/67[c]	--	100	South Yamhill River trib	--
1967	Unknown	Siletz	adult	01/01/67	12/31/67[c]	--	200	Harys River tributary	--
1968	LCER	Sandy	fry	01/01/69	12/31/69[c]	--	357,061	Marys River and trib.	--
1968	LCER	Cascade	fry	01/01/69	12/31/69[c]	--	501,997	Luckiamute River and trib.	--
1968	LCER	Cascade	smolt	01/01/70	12/31/70[c]	--	185,845	Luckiamute River tributary	--
1968	LCER	Klaskanine	smolt	01/01/70	12/31/70[c]	--	86,115	North Yamhill R. and trib.	--
1968	Unknown	Alsea	smolt	01/01/70	12/31/70[c]	--	152,992	Harys River tributaries	--
1968	LCER	Bonneville	adult	01/01/68	12/31/68[c]	--	226	North Yamhill River	--
1968	LCER	Bonneville	adult	01/01/68	12/31/68[c]	--	140	South Yamhill River trib	--

Table 1 (TR). (cont.) Hatchery coho releases into the Coast Range rivers subbasin by brood year and, if marked, coded uire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1968	LCER	Big Creek	adult	01/01/68	12/31/68[c]	--	150	Rickreall Creek	--
1968	LCER	Big Creek	adult	01/01/68	12/31/68[c]	--	1,716	Luckiamute River and trib	--
1969	LCER	Sandy	fry	01/01/70	12/31/70[c]	--	98,080	North Yamhill River trib.	--
1969	LCER	Cascade	fry	01/01/70	12/31/70[c]	--	280,000	Luckiamute River trib.	--
1969	LCER	Cascade	fry	01/01/70	12/31/70[c]	--	224,000	Warys River tributaries	--
1969	LCER	Big Cr. and Sandy	fry	01/01/70	12/31/70[c]	--	1,226,997	South Yamhill River tribs	--
1969	Unknom	Alsea	fry	01/01/70	12/31/70[c]	--	296,547	Luckiamute River	--
1969	Unknown	Alsea	fry	01/01/70	12/31/70[c]	--	213,382	Marys River tributaries	--
1969	LCER	Sandy	smolt	01/01/71	12/31/71[c]	--	181,739	Luckiamute River and tribs	--
1969	LCER	Cascade	smolt	01/01/71	12/31/71[c]	--	85,288	North Yamhill R. and trib.	--
1969	Unknown	Alsea	smolt	01/01/71	12/31/71[c]	--	70,931	Luckiamute River	--
1969	Unknown	Alsea	smolt	01/01/71	12/31/71[c]	--	160,374	Marys River tribs	--
1969	LCER	Big Creek	adult	01/01/69	12/31/69[c]	--	429	North Yamhill River	--
1969	LCER	Big Creek	adult	01/01/69	12/31/69[c]	--	300	South Yamhill River tribs	--
1969	LCER	Big Creek	adult	01/01/69	12/31/69[c]	--	610	Rickreall Creek	--
1969	LCER	Big Cr. and Sandy	adult	01/01/69	12/31/69[c]	--	600	Luckiamute River	--
1969	Unknown	Alsea	adult	01/01/69	12/31/69[c]	--	200	South Yamhill River trib.	--
1970	LCER	McKenzie	fry	01/01/71	12/31/71[c]	--	222,957	Luckiamute River tributary	--
1970	LCER	Cascade	sllwlt	01/01/72	12/31/72[c]	--	86,258	North Yamhill R. trib.	--
1970	LCER	Cascade	smolt	01/01/72	12/31/72[c]	--	123,700	Luckiamute River	--
1970	Unknown	Alsea	smolt	01/01/72	12/31/72[c]	--	41,589	Luckiamute River	--
1970	Unknown	Alsea	smolt	01/01/72	12/31/72[c]	--	179,733	Harys River tributaries	--
1970	'LCER	Sandy	adult	01/01/70	12/31/70[c]	--	150	Rickreall Creek	--
1971	LCER	Big Creek	fry	01/01/72	12/31/72[c]	--	397,240	South Yamhill River trib.	--
1971	LCER	Bonnevi lle	sntolt	01/01/73	12/31/73[c]	--	435,226	South Yamhill River trib	--
1971	LCER	Bonneville	smolt	01/01/73	12/31/73[c]	--	19,802	Marys River tributary	--
1971	LCER	Bonneville	adult	01/01/71	12/31/71[c]	--	150	Luckiamute River tributary	--
1971	LCER	Big Creek	adult	01/01/71	12/31/71[c]	--	150	Rickreall Creek	--
1972	LCER	Sandy	fry	01/01/73	12/31/73[c]	--	327,117	Luckiamute River and trib.	--
1972	LCER	Elk River	fing.	01/01/73	12/31/73[c]	--	196,100	South Yamhill River tribs	--
1972	LCER	Sandy	smolt	01/01/74	12/31/74[c]	--	20,291	Luckiamute River	--
1972	LCER	Sandy	smolt	01/01/74	12/31/74[c]	--	20,291	Marys River tributary	--
1972	LCER	Bonn. and Sandy	smolt	01/01/74	12/31/74[c]	--	484,769	South Yamhill River tribs	--
1972	LCER	Bonneville	adult	01/01/72	12/31/72[c]	--	208	South Yamhill River trib	--
1972	LCER	Bonneville	adult	01/01/72	12/31/72[c]	--	160	Luckiamute River	--
1972	LCER	Sandy	adult	01/01/72	12/31/72[c]	--	164	Rickreall Creek	--
1913	LCER	Bonnevi lle	adult	01/01/73	12/31/73[c]	--	239	South Yamhill River trib	--
1973	LCER	Bonneville	adult	01/01/73	12/31/73[c]	--	152	Rickreall Creek	--
1973	LCER	Eagle Creek NFH	adult	01/01/73	12/31/73[c]	--	214	Luckiamute River tributary	--

Table 1 (TR). (cont.) Hatchery coho releases into the Coast Range rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1974	LCER	Sandy	fry	01/01/75	12/31/75[c]	--	158,517	Luckiamute River tributary	--
1974	LCER	Elk River	fins.	01/01/75	12/31/75[c]	--	29,300	Mercer Reservoir	--
1974	LCER	Cascade	smolt	01/01/76	12/31/76[c]	--	55,010	North Yamhill R. and trib.	--
1974	Coulitz	Cascade	smolt	01/01/76	12/31/76[c]	--	124,869	South Yamhill R. and trib.	--
1974	Coulitz	Cascade	smolt	01/01/76	12/31/76[c]	--	73,009	Luckiamute River and trib.	--
1974	Cowlitz	Cascade	smolt	01/01/76	12/31/76[c]	--	43,954	Warys River tributaries	--
1974	LCER	Eagle Creek NFH	adult	01/01/74	12/31/74[c]	--	204	Luckiamute River	--
1976	Cowlitz	Cascade	fry	01/01/77	12/31/77[c]	--	161,250	Rickreall Creek	--
1982	LCER	Sandy	fry	01/01/83	12/31/83[c]	--	20,000	Teal Creek	--
1982	Sandy R.[d]	Gnat Creek	fry	02/17/83	--	1,175	84,600	Baker Creek	--
2982	Sandy R.[d]	Gnat Creek	fry	02/17/83	--	1,175	56,400	Gooseneck Creek	--
1982	Sandy R.[d]	Gnat Creek	fry	02/17/83	--	1,175	112,800	Mill Creek	--
1982	Sandy R.[d]	Gnat Creek	fry	02/17/83	--	1,175	56,400	NFk Yamhill River	--
1982	Sandy R.[d]	Gnat Creek	fry	02/17/83	--	1,175	84,600	Turner Creek	--
1982	Sandy, R.[d]	Sandy	fry	02/18/83	--	1,121	188,328	Deer Creek	--
1982	Sandy R.[d]	Sandy	fry	02/22/83	--	1,177	97,691	Luckiamute River	--
1982	Sandy R.[d]	Sandy	fry	02/22/83	--	1,182	35,460	Luckiamute River	--
1982	Sandy R.[d]	Sandy	fry	02/22/83	--	1,182	59,100	Haxfield Creek	--
1982	Sandy R.[d]	Sandy	fry	02/22/83	--	1,182	59,100	Pedee Creek	--
1982	Sandy R.[d]	Sandy	fry	02/22/83	--	1,182	23,640	Price Creek	--
1982	Sandy R.[d]	Sandy	fry	02/22/83	--	1,182	59,100	Ritner Creek	--
1982	Sandy R.[d]	Sandy	fry	02/18/83	--	1,121	31,388	Rock Creek	--
1982	Sandy R.[d]	Sandy	fry	02/18/83	--	1,121	31,388	Rogue River	--
1982	Sandy R.[d]	Sandv	fry	02/22/83	--	1,182	23,640	SFk Pedee Creek	--
1982	Sandy R.[d]	Sandy	fry	02/18/83	--	1,121	251,104	Yamhil1River	--
1982	Sandy R.[d]	STEP	fry	02/15/83	--	1,000	28,000	Rickreall Creek	--
1982	Sandy R.[d]	STEP	fry	02/26/83	--	1,190	29,750	Rickreall Creek	--
1982	Sandy R.[d]	STEP	fry	02/26/83	--	1,975	19,750	Rickreall Creek	--
1982	Tanner Cr	Cascade	fry	02/24/83	--	1,150	110,400	Greasy Creek	--
1982	Tanner Cr	Cascade	fry	02/24/83	--	1,150	98,900	Rock Creek	--
1982	Tanner Cr	Cascade	fry	02/24/83	--	1,150	62,100	Shot Pouch Creek	--
1982	Tanner Cr	Cascade	fry	02/24/83	--	1,150	73,600	Woods Creek	--
1983	Cowlitz River	oxbow (Herman)	fry	06/28/84	--	369.4	157,314	Greasy Creek	--
1983	Cowlitz River	oxbow (Herman)	fry	06/29/84	--	370.5	59,230	Luckiamute R (lower)	--
1983	Cowlitz River	oxbow (Herman)	fry	06/29/84	--	370.5	111,100	Luckiamute River	--
1883	Cowlitz River	oxbow (Herman)	fry	06/29/84	--	370.5	55,525	Maxfield Creek	--
1983	Cowlitz River	oxbow (Herman)	fry	06/29/84	--	370.5	55,525	Pedee Creek	--
1983	Coulitz River	oxbow (Herman)	fry	06/29/84	--	370.5	44,410	Ritner Creek	--
1983	Cowlitz River	oxbow (Herman)	fry	06/28/84	--	369.4	90,822	Shot Pouch Creek	--

Table 1 (TR). (cont.) Hatchery coho releases into the Coast Range rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1983	Coulitt River	Oxbow (Herman)	fry	06/28/84	--	369.4	73,830	Woods Creek	--
1984	Tanner Cr	Bomeville	fry	05/09/85	--	262.0	125,460	Ritner Creek	--
1984	Tanner Cr	Oxbow (Herman)	fry	05/29/85	--	326.0	84,660	Baker Creek	--
1984	Tanner Cr	Oxbow (Herman)	fry	05/28/85	--	319.0	133,940	Luckiamute R (lower)	--
1984	Tanner Cr	Oxbow (Herman)	fry	05/29/85	--	326.0	275,070	Luckiamute River	--
1984	Tanner Cr	Oxbow (Herman)	fry	05/28/85	--	319.0	118,010	Mill Creek	--
1984	Tanner Cr	Oxbow (Herman)	fry	05/29/85	--	326.0	149,885	Mill Creek	--
1984	Tanner Cr	Oxbow (Herman)	fry	05/28/85	--	303.0	152,915	NFk Yamhill River	--
1984	Tanner Cr[d]	Oxbow (Herman)	fry	05/29/85	--	326.0	140,080	Panther Creek	--
1984	Sandy R.[d]	Bonneville	fing.	05/08/85	--	178.6	180,207	Deer Creek	--
1984	Sandy R.[d]	Bonneville	fing.	05/08/85	--	194.0	88,270	Luckiamute R (lower)	--
1984	Sandy R.[d]	Bonneville	fing.	05/08/85	--	217.0	60,760	Luckiamute R flower)	--
1984	Sandy R.[d]	Bonneville	fing.	05/08/85	--	187.0	84,120	NFk Yamhill River	--
1984	Sandy R.[d]	Bonneville	fing.	05/08/85	--	194.0	116,350	NFk Yamhill River	--
1984	Sandy R.[d]	Bonneville	fing.	05/08/85	--	217.0	139,765	Pedee Creek	--
1984	Sandy R.[d]	Oxbow (Herman)	fing.	05/28/85	--	149.0	120,640	Luckiamute R (lower)	--
1984	Sandy R.[d]	Oxbow (Herman)	fing.	05/09/85	--	212.5	150,000	Luckiamute River	--
1984	Sandy R.[d]	Oxbou (Herman)	fing.	05/09/85	--	212.5	150,775	Mill Creek	--
1984	Sandy R.[d]	Oxbow (Herman)	fing.	05/28/85	--	149.0	197,920	NFk Yamhill River	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	214.0	104,402	Greasy Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	213.0	163,960	Luckiamute R (lower)	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	216.0	44,034	Pedee Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	216.0	53,116	Ritner Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	214.0	41,078	Rock Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	225.0	53,960	Shot Pouch Creek	--
1986	Tanner Cr	Bonneville	fing.	05/28/87	--	225.0	40,440	Uoods Creek	--

a Modified from Williams (1983, cited by Oregon Department of Fish and Wildlife 1990); Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990); and Oregon Department of Fish and Wildlife's hatchery production database.

b LCER refers to Lower Columbia Early Run stock, a "catchall" name for early run hatchery stocks, including Eagle Creek, Clackamas River, Sandy River, Big Creek, and Tanner Creek stocks. These stocks have been previously grouped as early run Toutle stock, or just early run coho.

c Cowlitz stock is part of a late run stock group.

d Month(s) and day(s) of release unknown; standardized to the first and last day of the year.

Sandy Fish Hatchery stock.

REFERENCES

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COAST RANGE RIVERS SUBBASIN

Naturally Produced Winter Steelhead

GEOGRAPHIC LOCATION

The rivers of the Coast Range subbasin originate on the eastern side of the Coast Range Mountains, and flow into the Willamette River between RM 55 and RM 108 (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The subbasin drains approximately 1,800 square miles of Yamhill, Polk and Benton counties (State Water Resources Board 1967, cited by Oregon Department of Fish and Wildlife 1990). Major tributaries of the subbasin are the Yamhill River, Luckiamute River, Marys River, and Rickreall Creek (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Winter steelhead are not indigenous to the Coast Range rivers subbasin (Oregon Department of Fish and Wildlife 1990). Steelhead were observed in the subbasin prior to hatchery supplementation (Willis et al. 1960, cited by Oregon Department of Fish and Wildlife 1990) but these fish may have been strays from other subbasins (Oregon Department of Fish and Wildlife 1990). Hatchery winter steelhead have been released in the subbasin since 1964 (see COAST RANGE RIVERS SUBBASIN, Hatchery Produced Winter Steelhead). A self-sustaining population developed in the subbasin as a result of hatchery releases (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Spawning ground counts have shown that winter steelhead primarily utilize the upper reaches of the Yamhill and Luckiamute river drainages (Oregon Department of Fish and Wildlife 1990). Habitat considered suitable for spawning and rearing is located throughout the Coast Range rivers subbasin including the North and South Yamhill river drainages; the Agency, Willamina, Pedee, and Rickreall creek drainages; the Luckiamute and Little Luckiamute river drainages; and the Marys River drainage. The Northwest Power Planning Council estimates that there is a total of 213.6 miles of spawning and rearing habitat available in the subbasin (Tables 1-8). The quality of the spawning and rearing habitat varies throughout the Coast Range rivers subbasin (Tables 1-8). Although suitable habitat may exist for winter steelhead, the distribution of the fish may be limited by low flows and warm temperatures (Oregon Department of Fish and Wildlife 1990).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced winter steelhead are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

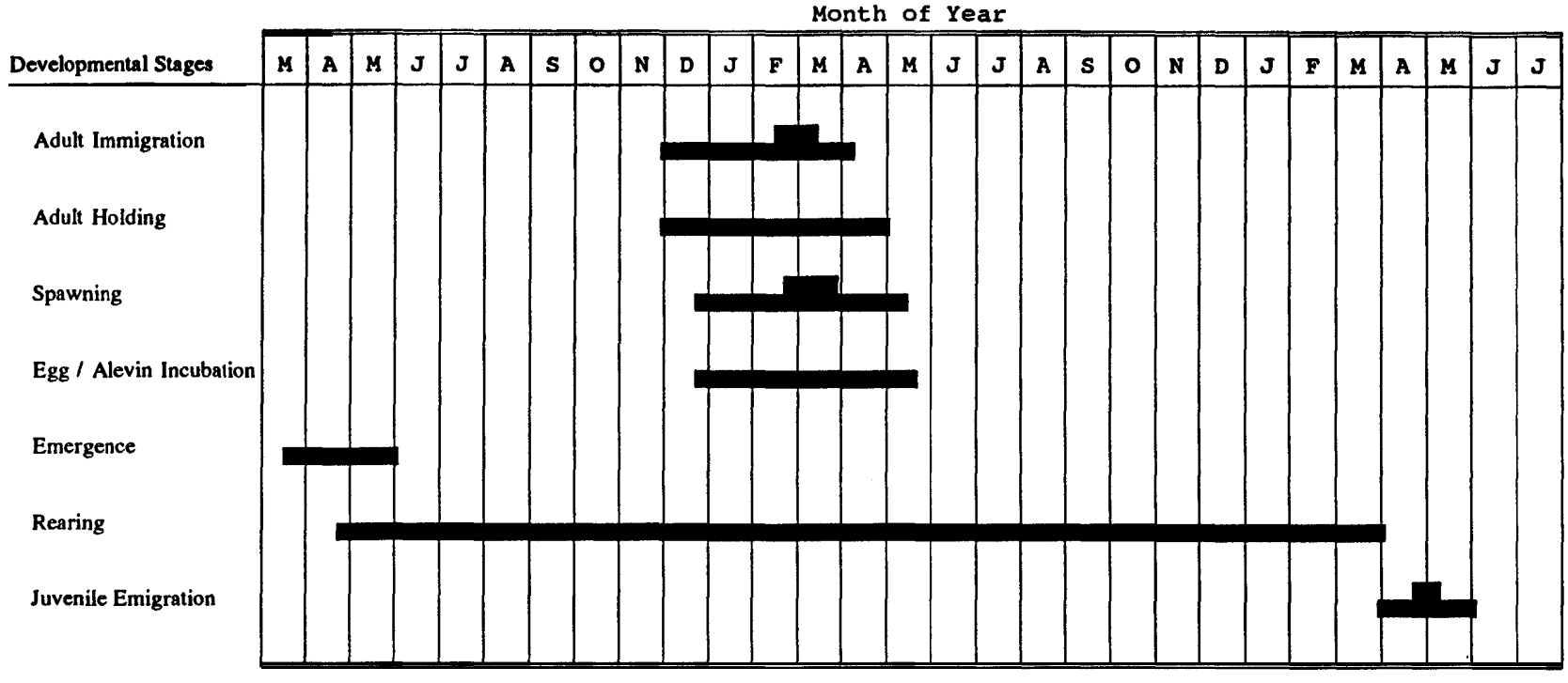
Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for naturally produced winter steelhead are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Numbers: Although brood year specific estimates of spawner escapement for naturally produced winter steelhead are not available, estimates by run year for the combined spawner escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Wide bars indicate periods of peak activity.

Figure 1 (TT). Winter steelhead freshwater life history in the Coast Range subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Yamhill River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	46.2	27.6	25.8	0.4	--	130.2	--
Acres (%)	--	--	--	a-	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Yamhill River subbaain winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 3 (HB-3). Estimated amount of spawning and rearing habitat by quality of Rickreall River subbasin winter steelhead production area".

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	47.3	52.7	0.0	--	22.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 4 (HB-4). Estimated amount of rearing only habitat by quality of Rickreall River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 5 (HB-5). Estimated amount of spawning and rearing habitat by quality of Marys River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	39.3	0.0	60.7	0.0	--	14.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 6 (HB-6). Estimated amount of rearing only habitat by quality of Marys River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 7 (HB-7). Estimated amount of spawning and rearing habitat by quality of Luckiamute River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	40.0	18.8	41.2	0.0	--	46.9	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 8 (HB-8). Estimated amount of rearing only habitat by quality of Luckiamute River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

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COAST RANGE RIVERS SUBBASIN

Hatchery Produced Winter Steelhead

ORIGIN

Hatchery winter steelhead were first released into the Coast Range rivers subbasin, beginning in 1964, to establish a self-sustaining population and to create a sport fishery (Oregon Department of Fish and Wildlife 1990). There has been no hatchery program in the subbasin since 1983, although STEP may continue to release fry from hatchboxes (Oregon Department of Fish and Wildlife 1990). The Big Creek, Alsea, and Floras stocks have been released in the subbasin. The coastal stocks are believed to have experienced low survival rates due to susceptibility to *Ceratomyxa shasta* (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

From 1964-73, adult winter steelhead were released into the subbasin (Table 1). Hatchery fish were primarily released into the Yamhill, Luckiamute, and Marys river drainages and the Rickreall Creek drainage (Oregon Department of Fish and Wildlife 1990). Smolts were released in the Yamhill River drainage from 1964-68 and 1978-83 (Table 1). From 1982-87, STEP released fry from hatchboxes into the Yamhill and Marys river drainages and the Rickreall Creek drainage (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin are unknown (Table 1). Annual numbers released ranged from 24,800 to 109,065 fish (Table 1). Size at release ranged from 2,000 to 1,953 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Roaring River and Klaskanine hatcheries (Table 1). Annual numbers released ranged from 6,339 to 89,574 fish (Table 1). Size at release ranged from 47.9 to 19.2 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Sandy, Big Creek, Roaring River, Gnat Creek, and Klaskanine hatcheries (Table 1). Annual numbers released ranged from 19,982 to 129,268 fish (Table 1). Size at

release ranged from 7.6 to 5.0 fish per pound (Table 1).

Adult

Hatchery facilities in which adults were held prior to release in the subbasin include Klaskanine, Big Creek, and Alsea hatcheries (Table 1). Annual numbers released ranged from 230 to 2,330 fish (Table 1).

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery winter steelhead are not available, estimatesby run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Number: Although brood year specific estimates of run size for naturally produced winter steelhead are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES.

Table 1(TR). Hatchery winter steelhead releases into the Coast Range rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1964	Unknown	Unknown	fry	01/01/64	12/31/64[c]	--	109,065	South Yamhill River	--
1964	Unknom	Sandy	smolt	01/01/65	12/31/65[c]	--	7,392	Agency Creek	--
1964	Big Creek	Big Creek	smolt	01/01/65	12/31/65[c]	--	17,658	South Yamhill River	--
1964	Big Creek	Big Creek	smolt	01/01/65	12/31/65[c]	--	18,900	Willamina Creek	--
1964	Alsea	Unknown	adult	01/01/64	12/31/64[c]	--	230	Mill Creek	--
1965	Big Creek	Big Creek	slnolt	01/01/66	12/31/66[c]	--	13,583	North Yamhill River	--
1965	Big Creek	Big Creek	slllolt	01/01/66	12/31/66[c]	--	10,440	South Yamhill River	--
1965	Big Creek	Big Creek	smolt	01/01/66	12/31/66[c]	--	12,784	Hill Creek	--
1965	Big Creek	Big Creek	slllolt	01/01/66	12/31/66[c]	--	9,935	Willamina Creek	--
1965	Big Creek	Big Creek	smolt	01/01/66	12/31/66[c]	--	8,175	Agency Creek	--
1966	Big Creek	Big Creek	smolt	01/01/67	12/31/67[c]	--	10,875	North Yamhill River	--
1966	Big Creek	Big Creek	smolt	01/01/67	12/31/67[c]	--	10,141	Mill Creek	--
1966	Big Creek	Big Creek	slnolt	01/01/67	12/31/67[c]	--	10,141	Agency Creek	--
1966	Big Creek	Big Creek	adult	01/01/66	12/31/66[c]	--	232	North Yamhill River	--
1967	Big Creek	Big Creek	smolt	01/01/68	12/31/68[c]	--	10,577	North Yamhill River	--
1967	Big Creek	Klaskanine	slllolt	01/01/68	12/31/68[c]	--	5,578	Mill Creek	--
1967	Big Creek	Klaskanine	smolt	01/01/68	12/31/68[c]	--	5,320	Willamina Creek	--
1967	Big Creek	Klaskanine	smolt	01/01/68	12/31/68[c]	--	5,320	Agency Creek	--
1967	Big Creek	Big Creek	adult	01/01/67	12/31/67[c]	--	300	Mill Creek	--
1967	Big Creek	Big Creek	adult	01/01/67	12/31/67[c]	--	300	Uillamina Creek	--
1967	Big Creek	Klaskanine	adult	01/01/67	12/31/67[c]	--	402	North Yamhill River	--
1967	Big Creek	Klaskanine	adult	01/01/67	12/31/67[c]	--	202	South Yamhill River	--
1967	Big Creek	Klaskanine	adult	01/01/67	12/31/67[c]	--	236	Uillamina Creek	--
1967	Big Creek	Klaskanine	adult	01/01/67	12/31/67[c]	--	212	Cosper Creek	--
1967	Big Creek	Klaskanine	adult	01/01/67	12/31/67[c]	--	446	Agency Creek	--
1967	Big Creek	Klaskanine	adult	01/01/67	12/31/67[c]	--	232	Luckiamute River	--
1968	Alsea	Alsea	adult	01/01/68	12/31/68[c]	--	130	Little Luckiamute River	--
1968	Big Creek	Big Creek	adult	01/01/68	12/31/68[c]	--	180	Uillamina Creek	--
1968	Big Creek	Big Creek	adult	01/01/68	12/31/68[c]	--	160	Agency Creek	--
1968	Big Creek	Klaskanine	adult	01/01/68	12/31/68[c]	--	200	North Yamhill River	--
1968	Big Creek	Klaskanine	adult	01/01/68	12/31/68[c]	--	175	Mill Creek	--
1968	Big Creek	Klaskanine	adult	01/01/68	12/31/68[c]	--	168	Willamina Creek	--
1968	Big Creek	Klaskanine	adult	01/01/68	12/31/68[c]	--	200	Luckiamute River	--
1968	Big Creek	Klaskanine	adult	01/01/68	12/31/68[c]	--	200	Little Luckiamute River	--
1968	Big Creek	Klaskanine	adult	01/01/68	12/31/68[c]	--	200	Greasy Creek	--
1968	Big Creek	Klaskanine	adult	01/01/68	12/31/68[c]	--	201	Shotpouch Creek	--
1969	Big Creek	Big Creek	adult	01/01/69	12/31/69[c]	--	200	Hill Creek	--
1969	Big Creek	Big Creek	adult	01/01/69	12/31/69[c]	--	238	Willamina Creek	--
1969	Big Creek	Big Creek	adult	01/01/69	12/31/69[c]	--	208	Rickreall Creek	--

Table 1 (TR). (cont.) Hatchery winter steelhead releases into the Coast Range rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1969	Big Creek	Big Creek	adult	01/01/69	12/31/69[c]	--	200	Pedee Creek	--
1969	Creek	Big Creek	adult	01/01/69	12/31/69[c]	--	200	Shotpouch Creek	--
1969	Big Big Creek	Klaskanine	adult	01/01/69	12/31/69[c]	--	206	Agency Creek	--
1969	Big Creek	Klaskanine	adult	01/01/69	12/31/69[c]	--	204	Luckiamute River	--
1969	Big Creek	Kleskanine	adult	01/01/69	12/31/69[c]	--	209	Little Luckiamute River	--
1970	Big Creek	Klaskanine	adult	01/01/70	12/31/70[c]	--	154	Uillamina Creek	--
1970	Big Creek	Klaskanine	adult	01/01/70	12/31/70[c]	--	248	Luckiamute River	--
1971	Big Creek	Big Creek	adult	01/01/71	12/31/71[c]	--	200	Mill Creek	--
1971	gig Creek	Big Creek	adult	01/01/71	12/31/71[c]	--	200	Rowe11 Creek	--
1971	Big Creek	Big Creek	adult	01/01/71	12/31/71[c]	--	200	Agency Creek	--
1971	Big Creek	gig Creek	adult	01/01/71	12/31/71[c]	--	200	Greasy Creek	--
1971	gig Creek	Big Creek	adult	01/01/71	12/31/71[c]	--	200	Shotpouch Creek	--
1971	Big Creek	Klaskanine	adult	01/01/71	12/31/71[c]	--	200	North Yamhill River	--
1971	Big Creek	Klaskanine	adult	01/01/71	12/31/71[c]	--	200	Uillamina Creek	--
1971	Big Creek	Klaskanine	adult	01/01/71	12/31/71[c]	--	200	Rickreall Creek	--
1971	Big Creek	Klaskanine	adult	01/01/71	12/31/71[c]	--	200	Little Luckiamute River	--
1971	Big Creek	Kleskanine	adult	01/01/71	12/31/71[c]	--	177	Luckiamute River	--
1972	Big Creek	Big Creek	adult	01/01/72	12/31/72[c]	--	330	Agency Creek	--
1972	Big Creek	Klaskanine	adult	01/01/72	12/31/72[c]	--	200	North Yamhill River	--
1972	Big Creek	Klaskanine	adult	01/01/72	12/31/72[c]	--	402	South Yamhill River	--
1972	Big Creek	Klaskanine	adult	01/01/72	12/31/72[c]	--	200	Rowe11 Creek	--
1972	Big Creek	Klaskanine	adult	01/01/72	12/31/72[c]	--	200	Luckiamute River	--
1972	Big Creek	Klaskanine	adult	01/01/72	12/31/72[c]	--	256	Little Luckiamute River	--
1972	Big Creek	Klaskanine	adult	01/01/72	12/31/72[c]	--	200	Rock Creek	--
1973	gig Creek	Klaskanine	adult	01/01/73	12/31/73[c]	--	200	North Yamhill River	--
1973	Big Creek	Klaskanine	adult	01/01/73	12/31/73[c]	--	200	Rock Creek	--
1974	Big Creek	Klaskanine	smolt	01/01/75	12/31/75[c]	--	24,946	Mill Creek	--
1974	gig Creek	Klaskanine	smolt	01/01/75	12/31/75[c]	--	25,007	Uillamina Creek	--
1975	Big Creek	Klaskanine	smolt	01/01/76	12/31/76[c]	--	24,986	Mill Creek	--
1975	Big Creek	Klaskanine	smolt	01/01/76	12/31/76[c]	--	24,904	Uillamina Creek	--
1976	Big Creek	Klaskanine	smolt	01/01/77	12/31/77[c]	--	24,997	Mill Creek	--
1976	Big Creek	Klaskanine	smolt	01/01/77	12/31/77[c]	--	24,995	Willamina Creek	--
1977	Big Creek	Klaskanine	smolt	01/01/78	12/31/78[c]	--	22,034	Mill Creek	--
1977	Big Creek	Klaskanine	smolt	01/01/78	12/31/78[c]	--	20,601	Uillamina Creek	--
1978	Big Creek	Klaskanine	smolt	01/01/79	12/31/79[c]	--	19,166	Mill Creek	--
1978	Big Creek	Klaskanine	smolt	01/01/79	12/31/79[c]	--	29,802	Willamina Creek	--
1979	Big Creek	Klaskanine	smolt	01/01/80	12/31/80[c]	--	16,000	North Yamhill River	--
1979	Big Creek	Klaskanine	smolt	01/01/80	12/31/80[c]	--	25,074	Mill Creek	--
1979	Big Creek	Klaskanine	smolt	01/01/80	12/31/80[c]	--	24.970	Willamina Creek	--

Table 1 (TR). (cont.) Hatchery uinter steelhead releases into the Coast Range rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1979	Big Cr[d]	Roaring River	smolt	04/16/80	--	6.5	22,090	Mill Creek	--
1979	Big Cr[d]	Roaring River	smolt	04/18/80	--	6.5	9,097	NFk Yamhill River	--
1979	Big Cr[d]	Roaring River	smolt	04/17/80	--	6.5	20,989	Uillamina Creek	--
1979	Big Cr[d]	Roaring River	smolt	04/18/80	--	6.5	11,048	Yamhill River	--
1980	Big Creek	Klaskanine	smolt	01/01/81	12/31/81[c]	--	20,145	North Yamhill River	--
1980	Big Creek	Klaskanine	smolt	01/01/81	12/31/81[c]	--	22,090	Mill Creek	--
1980	Big Creek	Klaskanine	smolt	01/01/81	12/31/81[c]	--	20,989	Uillamina Creek	--
1980	Big Cr[d]	Roaring River	fing.	03/12/81	--	19.2	6,339	Yamhill River	--
1980	Big Cr[d]	Roaring River	smolt	04/07/81	--	7.2	10,010	Mill Creek	--
1980	Big Cr[d]	Roaring River	smolt	04/07/81	--	7.6	10,070	Mill Creek	--
1980	Big Cr[d]	Roaring River	smolt	04/06/81	--	5.6	10,920	NFk Yamhill River	--
1980	Big Cr[d]	Roaring River	smolt	04/06/81	--	5.7	9,115	NFk Yamhill River	--
1980	Big Cr[d]	Roaring River	smolt	04/07/81	--	5.0	6,974	Uillamina Creek	--
1980	Big Cr[d]	Roaring River	smolt	04/07/81	--	5.5	7,756	Uillamina Creek	--
1980	Big Cr[d]	Roaring River	smolt	04/07/81	--	5.8	8,236	Uillamina Creek	--
1981	Big Creek	Klaskanine	smolt	01/01/82	12/31/82[c]	--	20,035	North Yamhill River	--
1981	Big Creek	Klaskanine	smolt	01/01/82	12/31/82[c]	--	20,080	Mill Creek	--
1981	Big Creek	Klaskanine	smolt	01/01/82	12/31/82[c]	--	22,966	Uillamina Creek	--
1981	Big Cr[d]	Gnat Creek	smolt	04/08/82	--	5.7	10,049	NFk Yamhill River	LP
1981	Big Cr[d]	Gnat Creek	smolt	04/07/82	--	5.6	9,964	Uillamina Creek	LP
1982	Floras Creek[e]	STEP	fry	05/19/82	--	1,653	16,530	Rickreall Creek	--
1982	Floras Creek[e]	STEP	fry	05/19/82	--	1,654	8,270	Rickreall Creek	--
1982	Big Cr[d]	Roaring River	fing.	09/27/82	--	47.9	44,787	Yamhill River	--
1982	Big Creek	Klaskanine	fing.	01/01/82	12/31/82[c]	--	44,787	South Yamhill River	--
1982	Big Creek	Klaskanine	smolt	01/01/83	12/31/83[c]	--	10,018	North Yamhill River	--
1982	Big Creek	Klaskanine	smolt	01/01/83	12/31/83[c]	--	9,964	Uillamina Creek	--
1983	Big Cr[d]	STEP	fry	04/09/83	--	2,000	40,000	Mill Creek	--
1983	Big Cr[d]	STEP	fry	04/09/83	--	2,000	40,000	Rickreall Creek	--

[a] Modified from Oregon Department of Fish and Uildlife (unpublished data, cited by Oregon Department of Fish and Uildlife 1990); and Oregon Department of Fish and Wildlife's hatchery production database.

[b] D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

[c] Month(s) and day(s) of release unknown; standardized to the first and last day of the year.

[d] Big Creek Hatchery stock.

[e] Floras Creek stock, including broodstock from New River.

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SANTIAM RIVER SUBBASIN

Naturally Produced Spring Chinook Salmon

GEOGRAPHIC LOCATION

The Santiam and Calapooia rivers are regarded as one subbasin, and termed the Santiam and Calapooia rivers subbasin. For management purposes, Mill Creek is included as part of the Santiam and Calapooia rivers subbasin (Oregon Department of Fish and Wildlife 1990).

The Santiam River flows into the Willamette River at River Mile (RM) 108. At Santiam River RM 11.7, the river forks into the North Santiam and the South Santiam rivers. The Santiam River system drains an area of 1,827 square miles (Oregon Department of Fish and Wildlife 1990; Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1).

The Calapooia River flows into the Willamette River at RM 119.5. The Calapooia River system drains an area of 374 square miles (Oregon Department of Fish and Wildlife 1990).

Mill Creek enters the Willamette River at RM 83.

ORIGIN

Willamette spring chinook are native to the Santiam and Calapooia rivers subbasin, although hatchery spring chinook currently represent the larger percentage of subbasin returns (Oregon Department of Fish and Wildlife 1990). Natural production occurs from hatchery Willamette spring chinook spawning in the subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Historically, spring chinook were the only race of salmon in the Santiam and Calapooia rivers subbasin (Oregon Department of Fish and Wildlife 1990). Primary production areas were located in the mainstem Santiam River, the North Santiam, the Little North Santiam and Breitenbush rivers, and Marion and Blowout creeks (Mattson 1948, cited by Oregon Department of Fish and Wildlife 1990). In the South Santiam drainage, the primary spring chinook production areas were located in the Middle Santiam River, Quartzville Creek, and a 5-mile reach upstream of Cascadia on the South Santiam River (Oregon Department of Fish and Wildlife 1990). Currently, hydroelectric developments impede or block passage to important adult holding, spawning, and rearing areas (Oregon Department of Fish and Wildlife 1990). Construction of dams has also resulted in changes in streamflow and temperature (U.S. Army Corps of Engineers 1988, cited by Oregon Department of Fish and Wildlife 1990), which have been detrimental to wild production (Oregon Department of Fish and Wildlife 1990). On the North Santiam, reaches above Detroit Dam (RM 49) are inaccessible. On the South Santiam, adults are not allowed to pass above Foster Dam (RM 38). This policy is intended to keep the water supply used by South Santiam Hatchery free of diseases that infect returning adults. Stayton diversion area (RM 18 on the North

Santiam River) and Lebanon Dam (on the South Santiam) restricts upstream passage of adults and downstream passage of juveniles. Downstream passage of juveniles is also impeded at the Lebanon-Albany canal on the South Santiam. These problems, combined with habitat degradation and overharvesting of wild stocks, have led to a serious reduction in the wild spring chinook population (Oregon Department of Fish and Wildlife 1990).

Spring chinook currently spawn and rear in the North Santiam River between Stayton and Minto Dam, the Little North Santiam up to Henline Creek, the mainstem South Santiam from Ames Creek to Foster Dam, Thomas Creek from Jordan Creek to Hall Creek, Crabtree Creek from RM 14 to White Rock Creek, and in Wiley Creek (Oregon Department of Fish and Wildlife 1990). Available spawning and rearing habitat in the Santiam River system is rated as primarily of "fair" quality (Tables 1 and 2).

The construction of Thompson's Mill Dam and Sodom Dam in the Calapooia River have created barriers to potential spawning areas and spawning habitat has been degraded by erosion resulting from timber harvesting in the watershed. Lost and degraded spawning and rearing habitat associated with these factors have contributed to a decline in the spring chinook run to the Calapooia River. Since the 1970's, natural production of spring chinook in the Calapooia has been considered minimal or non-existent (Oregon Department of Fish and Wildlife 1990). The Calapooia River from Holley to Treadwell Creek is considered to have habitat suitable for spawning and rearing of spring chinook (Oregon Department of Fish and Wildlife 1990). Available spawning and rearing habitat in the Calapooia River is rated as primarily of "fair" quality (Tables 3 and 4).

Spring chinook spawn and rear in Mill Creek. Available spawning and rearing habitat in Mill Creek is rated as "fair" quality (Tables 5 and 6).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 2. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of harvest for naturally produced spring chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Bennett (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size to the Santiam River for naturally produced spring chinook are not available, estimates by run year for the combined

escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

No information is available on escapements of spring chinook to the Calapooia River or Mill Creek.

Spawning Area

Numbers: Data from spawning surveys conducted in 1976 indicate a spawning population of 100 spring chinook in the mainstem Calapooia River (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990). The method used to arrive at this number is unknown.

Strays

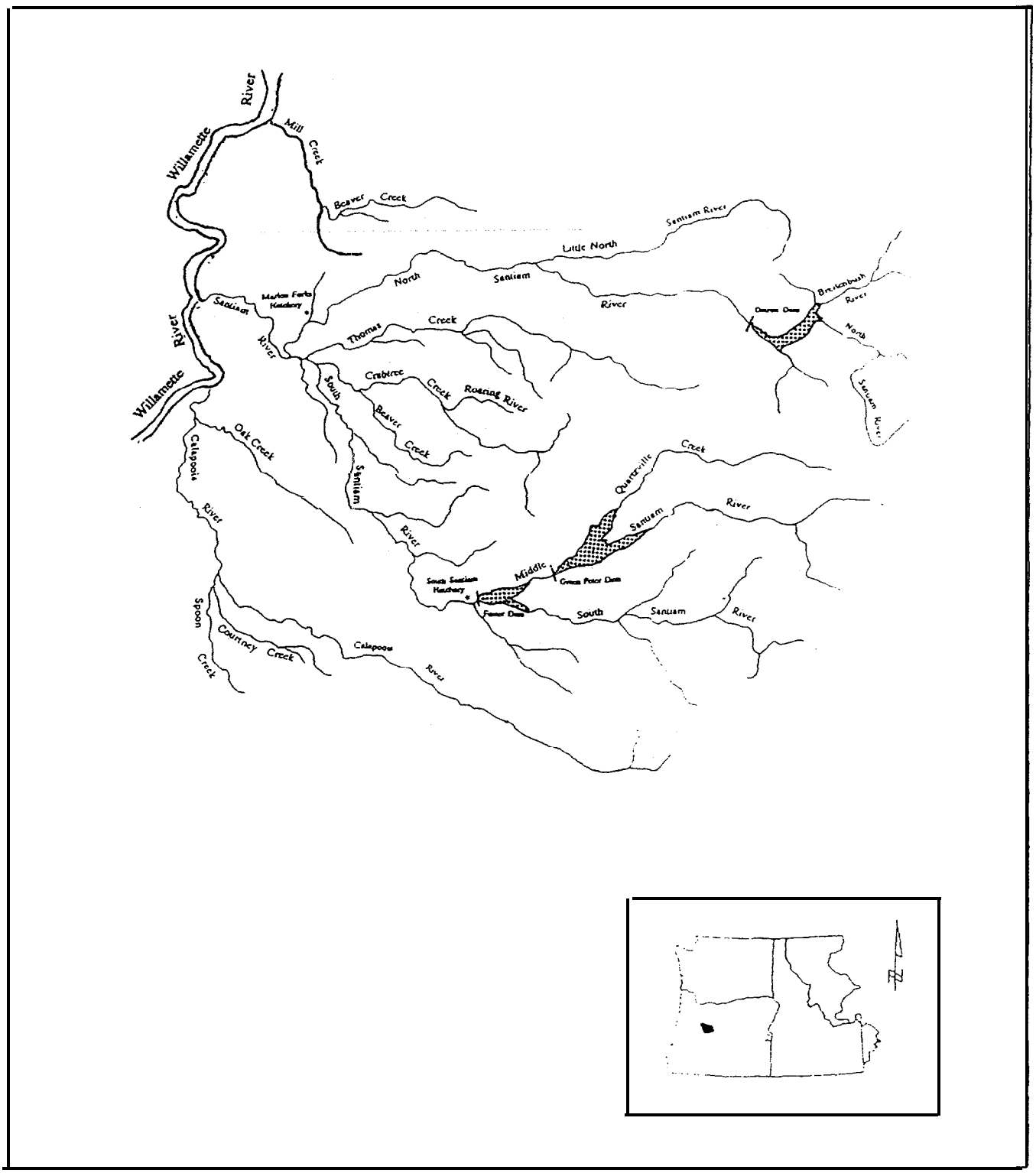
Coded wire tagged hatchery spring chinook, released as juveniles in the McKenzie, Middle Fork, and Willamette rivers, were recovered in the Santiam and Calapooia rivers subbasin (Table 7).

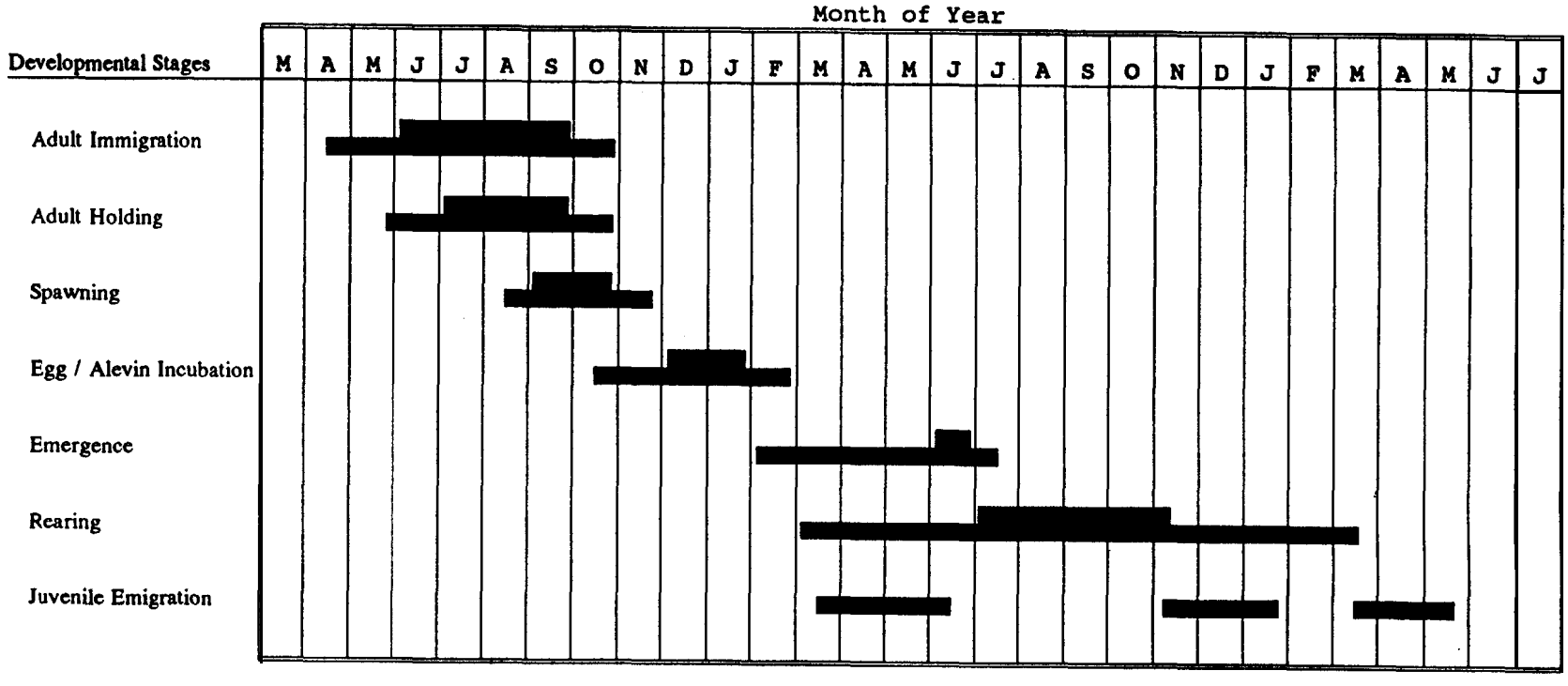
BIOCHEMICAL-GENETIC CHARACTERISTICS

In 1983, juvenile spring chinook were collected from Thomas Creek, which is located on the South Santiam, and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele mobilities and allele frequencies were determined for 17 enzyme systems (Appendix Table 3). No rare alleles were detected.

Schreck et al. (1986) classified Columbia River Basin chinook into several clusters of similar stocks, based on biochemical, morphological, and life history characters. Columbia River Basin chinook stocks segregated into two primary groups. The first group consisted of spring chinook from east of the Cascade Mountains and summer chinook from Idaho. The second group consisted of spring chinook from west of the Cascades, summer chinook from the upper Columbia, and all fall chinook stocks. The second primary group was composed of 3 subgroups. At the subgroup level, wild spring chinook collected from Thomas Creek were found to be most similar to other chinook stocks (wild and hatchery, fall and spring) found in the Willamette River subbasin. This subgroup was characterized by the highest average values for head length, gill rakers and pelvic fin rays, and the lowest average values for anal fin rays and pectoral fin rays. This group also had the lowest average frequencies of the common aconitate hydratase, malate dehydrogenase and mannose phosphate isomerase alleles. All stocks placed in this group are native to the Willamette River subbasin, with the possible exception of Clackamas River fall chinook.

Figure 1. The **Santiam** River subbasin.





Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.

Figure 2 (TT). Spring chinook freshwater life history in the Santiam River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Santiam River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	26.5	73.5	0.0	--	109.1	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Santiam River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (HB-3). Estimated amount of spawning and rearing habitat by quality of Calapooia River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	POOP	Unknown	Total	Confidence
Miles (%)	0.0	0.0	70.8	29.2	--	48.6	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 4 (HB-4). Estimated amount of rearing only habitat by quality of Calapooia River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 5 (HB-5). Estimated amount of spawning and rearing habitat by quality of Mill Creek subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	100.0	0.0	--	18.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 6 (HB-6). Estimated amount of rearing only habitat by quality of Mill Creek subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 7 (AI). Non-harvest recoveries of coded wire tagged hatchery spring chinook salmon in the Santiam and Calapooia rivers subbasin[1,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Sant iam[c]	Santiam[c]	Hatchery Returns		
	1982	--	304	304
	1983		107	122
	1984	--	386	436
	1985	--	278	281
	1986	--	21	56
	1987	--	10	10
	1988	--	145	145
Santiam[c]	Santiam[c]	Trap Returns		
	1987	--	130	132
Willamette River	Santiam[c]	Hatchery Returns		
	1982	--	12	12
	1983	--	1	1
McKenzie River	Santiam[c]	Hatchery Returns		
	1983	--	2	2
Middle Fork River	Santiam[c]	Hatchery Returns		
	1982	--	1	1
	1983	--	--	--
	1984	--	1	1

a Based on the following tag codes: 07-17-25, 07-17-26, 07-17-27, 07-17-28, 07-17-29, 07-17-30, 07-17-31, 07-17-32, 07-17-43, 07-19-19, 07-19-20, 07-19-21, 07-19-22, 07-19-24, 07-19-26, 07-19-27, 07-19-28, 07-19-29, 07-19-30, 07-19-43, 07-19-44, 07-19-45, 07-19-46, 07-19-47, 07-19-48, 07-20-18, 07-20-20, 07-20-21, 07-20-22, 07-22-47, 07-22-48, 07-22-49, 07-22-50, 07-22-51, 07-22-52, 07-22-53, 07-22-54, 07-23-03, 07-25-23, 07-25-24, 07-25-25, 07-25-26, 07-25-27, 07-25-28, 07-25-29, 07-25-30, 07-27-18,

(cont.)

Table 7 (AI). (cont.) Non-harvest recoveries of coded wire tagged hatchery spring chinook salmon in the Santiam and Calapooia rivers subbasin[a,b].

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[a] (cont.) 07-28-63, 07-29-02, 07-29-05, 07-29-30, 07-30-23, 07-30-24, 07-36-51, 07-36-52, 07-36-53, 07-36-54, 07-36-58, 07-36-59, 07-36-60, 07-36-61, 07-36-62, 07-36-63, 07-37-01, 07-37-02, 07-39-46, 07-39-47, 07-39-52, 07-39-53, 07-50-01, 09-17-01.

[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

[c] Santiam and Calapooia rivers subbasin.

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SANTIAM RIVER SUBBASIN

Hatchery Produced Spring Chinook Salmon

ORIGIN

The Santiam and Calapooia rivers subbasin has been supplemented with hatchery spring chinook since the early 1900's (Howell et al. 1985). Hatchery spring chinook releases have been mainly of Willamette stock (Oregon Department of Fish and Wildlife 1990), although Carson stock spring chinook have been released on an experimental basis (Smith and Zakel 1981, cited by Howell et al. 1985).

Hatchery Willamette spring chinook were derived primarily from the native Willamette stock (Howell et al. 1985). Historically, spring chinook were trapped and spawned from most of the major tributaries on the east side of the Willamette. Prior to the 1970's, Willamette River spring chinook eggs and fish were widely exchanged among rearing facilities located within the Willamette Subbasin (Howell et al. 1985). Beginning in the mid-1970's and early 1980's the McKenzie, Clackamas, and South Santiam hatcheries, and Dexter Pond have primarily collected broodstock from returning fish (personal communication, M. Smith, Oregon Department of Fish and Wildlife, cited by Howell et al. 1985). Currently, Marion Forks Hatchery produces a North Santiam substock, using wild and hatchery fish for broodstock, and South Santiam Hatchery produces a South Santiam substock, using only hatchery fish for broodstock (Oregon Department of Fish and Wildlife 1990).

Hatchery spring chinook are released into the subbasin to mitigate for lost natural production resulting from dam construction and to increase recreational fishing opportunities (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Recent releases of hatchery fish into the Santiam and Calapooia rivers subbasin have been primarily of Willamette stock (Table 1). In the past ten years, hatchery fish were released into the North Santiam, Little North Santiam, South Santiam, Middle Santiam, and Calapooia rivers; Foster and Green Peter reservoirs; and Thomas, Horn, and Crabtree creeks (Table 1).

Carson stock smolts, from the 1976-80 brood years, were released from Marion Forks Hatchery on an experimental basis (Smith and Zakel 1981, cited by Howell et al. 1985). Returns of Carson stock to the fisheries were low, so releases were discontinued (Howell et al. 1985).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which frywere reared or acclimated prior to release in the subbasin include Marion Forks, South Santiam, Willamette, Oakridge, and McKenzie hatcheries (Table 1). Annual numbers released ranged from 2,208 to 4,847,432 fish (Table 1). Size at release ranged from 900 to 134 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Marion Forks, South Santiam, Oakridge, and Willamette hatcheries, and Stayton Pond (Table 1). Annual numbers released ranged from 3,420 to 2,556,015 fish (Table 1). Size at release ranged from 125.0 to 16.1 fih per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include South Santiam, Marion Forks, Willamette, and Oakridge hatcheries, and Dexter and Stayton ponds (Table 1). Annual numbers released ranged from 106,82 1 to 1,686,138 fish (Table 1). Size at release ranged from 16.0 to 5.0fish per pound (Table 1).

Jack and Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery spring chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Bennett (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size to the Santiam River system for naturally produced spring chinook are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

No information is available on the run size of spring chinook in the Calapooia River system or Mill Creek.

Hatchery Facilities

Timing: Returns to hatchery collection facilities located at Minto and Foster dams, run by Marion Forks and South Santiam hatcheries, respectively, provide the only estimate of timing to the hatcheries (Oregon Department of Fish and Wildlife 1990). The collection facility at Minto Dam is operated from 15 September through 15 October (Oregon

Department of Fish and Wildlife 1990). Run year specific information on the timing of returns to the hatcheries is available in Howell et al. (1985).

Run year specific information on the timing of spawning at Marion Forks and South Santiam hatcheries is available in Howell et al. (1985).

There are no hatcheries or collection facilities on the Calapooia River or Mill Creek.

Numbers: Spring chinook returns to Marion Forks Hatchery from the 1967 brood year numbered 1,696 fish (Table 2). Run year specific estimates of returns to Marion Forks Hatchery are available in Bennett (1990).

Spring chinook returns to South Santiam Hatchery from the 1967 brood year numbered 1,538 fish (Table 3). Run year specific estimates of returns to South Santiam Hatchery are available in Bennett (1990).

Run year specific information on the number of females spawned at Marion Forks Hatchery is available in Howell et al. (1985). The number of males spawned is unknown.

Fork Length

Although brood year specific information on fork length for hatchery spring chinook is not available, information by run year, from returns of naturally and hatchery produced fish combined, to Marion Forks Hatchery are available in Wallis and Burck (1961, cited by Oregon Department of Fish and Wildlife 1990), Wallis and Burck (1962, cited by Oregon Department of Fish and Wildlife 1990), Wallis and Burke (1963, cited by Oregon Department of Fish and Wildlife 1990), Wallis (1964, cited by Oregon Department of Fish and Wildlife 1990), Swartz and Wallis (1966, cited by Oregon Department of Fish and Wildlife 1990), Swartz (1967, cited by Oregon Department of Fish and Wildlife 1990), Swartz (1968a, cited by Oregon Department of Fish and Wildlife 1990), and in Swartz (1968b, cited by Oregon Department of Fish and Wildlife 1990).

Age Structure

Estimates of age structure are available for spring chinook returning to Foster Dam (Table 4). Data was available by ocean age only. Total age was determined based on the assumption that all returning adults had migrated as age 1+ smolts (i.e. freshwater age 2). This assumption was based on data that indicates subyearling releases have a fairly low smolt to returning adult survival rate (see JUVENILE LIFE HISTORY, Survival Rate) and that the majority of hatchery juvenile fish released as age 1+ smolts migrate in the year of release (see JUVENILE LIFE HISTORY, Age Structure).

Annual estimates of age structure, by brood year, ranged from 1.5% to 21.1% 1 salt fish, 72.8% to 94.2% 2 salt fish, and 2.1% to 17.1% 3 salt fish (Table 3).

The average annual age structure of adults returning to Foster Dam, for the 1964-69 brood years, calculated from brood year specific data (Table 4), was 4.0%, 53.6%, and 42.3%, for 3-, 4- and 5-year olds, respectively. These numbers are based on the assumption that all juveniles rear for 2 years in freshwater, and that the freshwater and ocean ages sum to the total age of the fish. It is unknown what proportion of the fish sampled, if any, were naturally produced.

Sex Ratio

Although brood year specific information on the proportion of female spring chinook in the hatchery run are not available, estimates by run year from returns of naturally and hatchery produced fish combined are available in Howell et al. (1985).

Fecundity

Run year specific estimates of average fecundity for returns of naturally and hatchery produced female fish combined to Marion Forks and South Santiam hatcheries are available in Howell et al. (1985).

Mark Recoveries

Coded wire tagged hatchery spring chinook, released as juveniles in the Santiam and Calapooia rivers subbasin, were recovered in the McKenzie and Middle Fork rivers and in coastal tributaries which include the Elk, Rogue, and Salmon rivers (Table 5). Recoveries were also made in the Willamette River (Table 5); which is a necessary migration corridor to the Santiam and Calapooia rivers subbasin.

JUVENILE LIFE HISTORY

Age Structure

Hatchery fish are released as age 1 fingerlings (pre-smolts) in November and age 1+ smolts (i.e. freshwater age 2) in March. It is assumed that the majority of age 1+ smolts released into the subbasin migrate in the year of release (Oregon Department of Fish and Wildlife 1990).

Survival Rate

Smolt-to-adult survival rate for the 1976-80 brood year releases from Marion Forks Hatchery averaged 0.68%. Smolt-to-adult survival rate of 1975-78 brood year spring releases from South Santiam Hatchery averaged 0.51%, and fall releases from South Santiam Hatchery averaged 0.49% (E. Smith, Oregon Department of Fish and Wildlife, personal communication, cited by Oregon Department of Fish and Wildlife 1990). Data indicates that the March releases have a higher survival rate than the November releases (Oregon Department of Fish and Wildlife 1990).

BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile hatchery spring chinook were sampled from Marion Forks Hatchery in 1985, and South Santiam Hatchery in 1983, and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele mobilities and allele frequencies were determined for 18 enzyme systems from both the Marion Forks and the South Santiam samples (Appendix Table 3). No rare alleles were detected.

Schreck et al. (1986) classified Columbia River Basin chinook into several clusters of similar stocks, based on biochemical, morphological, and life history characters. Columbia River Basin chinook stocks segregated into two primary groups. The first group consisted of spring chinook from east of the Cascade Mountains and summer chinook from Idaho. The second group consisted of spring chinook from west of the Cascades, summer chinook

from the upper Columbia, and all fall chinook stocks. The second primary group was composed of 3 subgroups. Hatchery Willamette spring chinook collected from South Santiam and Marion Forks hatcheries were found to be most similar to other chinook stocks (wild and hatchery, fall and spring) found in the Willamette River subbasin. This subgroup was characterized by the highest average values for head length, gill rakers and pelvic fin rays, and the lowest average values for anal fin rays and pectoral fin rays. This group also had the lowest average frequencies of the common aconitate hydratase, malate dehydrogenase and mannose phosphate isomerase alleles. All stocks placed in this group are native to the Willamette River subbasin, with the possible exception of Clackamas River fall chinook.

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile spring chinookfor subbasin hatchery production (Table 6). In particular, juveniles rearing at South Santiam Hatchery are affected by furunculosis and enteric redmouth, adults at Minto collection facility are sometimes infected with IHN (infectious hematopoietic necrosis), and broodstock being held at South Santiam Hatchery are subject to *Ceratomyxa* (Oregon Department of Fish and Wildlife 1990). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see MCKENZIE RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES and see MIDDLE FORK RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
--	Willamette	McKenzie	fing.	01/01/58	12/31/58[d]	..	51,815	Little North Santiam	--
--	Willamette	McKenzie	fins.	01/01/58	12/31/58[d]	--	134,895	North Santiam	--
--	Willamette	South Santiam	fing.	01/01/58	12/31/58[d]	--	182,657	South Santiam	--
--	Willamette	South Santiam	fins.	01/01/58	12/31/58[d]	--	19,992	Wiley Creek	--
--	Willamette	South Santiam	fing.	01/01/58	12/31/58[d]	--	33,705	Quartzville Creek	--
--	Willamette	McKenzie	fing.	01/01/59	12/31/59[d]	--	1,615,632	Little North Santiam	--
--	Willamette	South Santiam	fing.	01/01/59	12/31/59[d]	--	62,967	South Santiam	--
--	Willamette	Marion Forks	fry	01/01/59	12/31/59[d]	..	512,080	North Santiam	--
--	Willamette	Marion Forks	fry	01/01/59	12/31/59[d]	__	200,000	North Santiam	--
--	Willamette	McKenzie	finn.	01/01/60	12/31/60[d]	__	1,092,163	North Santiam	--
--	Willamette	South Santiam	fing.	01/01/60	12/31/60[d]	--	81,925	South Santiam	--
--	Willamette	McKenzie	fing.	01/01/61	12/31/61[d]	..	1,810,841	North Santiam	--
--	Willamette	South Santiam	fing.	01/01/61	12/31/61[d]	..	273,140	South Santiam	--
--	Willamette	McKenzie	fing.	01/01/62	12/31/62[d]	--	1,415,536	North Santiam	--
--	Willamette	South Santiam	smolt	01/01/62	12/31/62[d]	..	154,118	Middle Santiam	--
--	Willamette	McKenzie	fing.	01/01/63	12/31/63[d]	--	1,503,305	North Santiam	--
--	Willamette	South Santiam	fins.	01/01/63	12/31/63[d]	--	157,893	South Santism	--
--	Willamette	McKenzie	fing.	01/01/64	12/31/64[d]	--	1,225,857	North Santiam	--
--	Willamette	South Santiam	fing.	01/01/64	12/31/64[d]	..	147,751	Middle Santiam	--
--	Willamette	Marion Forks	fry	01/01/64	12/31/64[d]	--	747,790	Big Cliff Reservoir	--
--	Willamette	Marion Forks	fry	01/01/64	12/31/64[d]	__	1,677,427	Horn Creek	--
--	Willamette	McKenzie	fing.	01/01/65	12/31/65[d]	..	1,934,146	North Santiam	--
--	Uillamette	McKenzie	fing.	01/01/65	12/31/65[d]	__	8,644	Horn Creek	--
--	Willamette	McKenzie	fing.	01/01/66	12/31/66[d]	..	161,884	North Santiam	--
--	Willamette	McKenzie	fing.	01/01/66	12/31/66[d]	..	32,125	Dry Creek	--
--	Willamette	McKenzie	fing.	01/01/66	12/31/66[d]	--	36,066	Big Cliff Reservoir	--
--	Willamette	South Santiam	fing.	01/01/66	12/31/66[d]	..	147,026	Middle Santiam	--
--	Willamette	Marion Forks	fry	01/01/66	12/31/66[d]	--	1,212,927	North Santiam	--
--	Willamette	McKenzie	fing.	01/01/67	12/31/67[d]	--	2,108,793	North Santiam	--
--	Willamette	South Santiam	fing.	01/01/67	12/31/67[d]	..	146,607	Middle Santiam	--
--	Willamette	Willamette	fing.	01/01/67	12/31/67[d]	..	267,746	South Santiam	--
--	Willamette	McKenzie	fing.	01/01/68	12/31/68[d]	--	2‘408,234	North Santiam	--
--	Willamette	South Santiam	fing.	01/01/68	12/31/68[d]	__	147,781	Middle Santiam	--
--	Willamette	South Santiam	smolt	01/01/68	12/31/68[d]	--	190,148	Green Peter Reservoir	--
--	Willamette	South Santiam	smolt	01/01/68	12/31/68[d]	..	246,450	South Santiam	--
--	Willamette	Marion Forks	smolt	01/01/68	12/31/68[d]	..	141,912	North Santiam	--
--	Willamette	Willamette	smolt	01/01/68	12/31/68[d]	..	31,710	South Santiam	--
--	Willamette	Marion Forks	fry	01/01/68	12/31/68[d]	--	312,908	Canal Fork	--
--	Willamette	Marion Forks	fry	01/01/68	12/31/68	--	596,496	Quartrville Creek	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
--	Willamette	Marion Forks	fry	01/01/68	12/31/68[d]	--	88,128	Packers Gulch Creek	--
--	Willamette	Marion Forks	fry	01/01/68	12/31/68[d]	..	87,423	Yelloustone Creek	--
--	Willamette	Marion Forks	fry	01/01/68	12/31/68[d]	..	602,403	Middle Santiam	--
--	Willamette	McKenzie	fins.	01/01/69	12/31/69[d]	..	649,276	North Santiam	--
--	Willamette	McKenzie	fing.	01/01/69	12/31/69[d]	--	102,521	Quartzville Creek	--
--	Willamette	South Santiam	fins.	01/01/69	12/31/69[d]	..	53,322	South Santiam	--
--	Willamette	South Santiam	smolt	01/01/69	12/31/69[d]	..	70,955	South Santiam	--
--	Willamette	Marion Forks	smolt	01/01/69	12/31/69[d]	..	77,473	North Santiam	--
--	Willamette	Marion Forks	smolt	01/01/69	12/31/69[d]	..	15,310	South Santiam	--
--	Willamette	Marion Forks	fry	01/01/69	12/31/69[d]	..	102,000	South Santiam	--
--	Willamette	South Santiam	fry	01/01/69	12/31/69[d]	..	274,010	Green Peter Reservoir	--
--	Willamette	Willamette	fry	01/01/69	12/31/69[d]	..	148,000	Quartz Creek	--
--	Willamette	Willsmette	fry	01/01/69	12/31/69[d]	..	220,173	Green Peter Reservoir	--
--	Willamette	McKenzie	fing.	01/01/70	12/31/70[d]	..	1,310,299	Minto Dam	--
--	Uillamette	McKenzie	fing.	01/01/70	12/31/70[d]	..	15,443	Green Peter Reservoir	--
--	Willamette	McKenzie	fing.	01/01/70	12/31/70[d]	..	5,338	South Santiam	--
--	Willamette	South Santiam	fing.	01/01/70	12/31/70[d]	--	214,114	South Santiam	--
--	Willamette	South Santiam	smolt	01/01/70	12/31/70[d]	..	335,176	South Santiam	--
--	Willamette	Marion Forks	smolt	01/01/70	12/31/70[d]	..	88,574	Minto Dam	--
--	Willamette	Marion Forks	smolt	01/01/70	12/31/70[d]	..	352,730	North Santiem	--
--	Willamette	Marion Forks	fry	01/01/70	12/31/70[d]	..	791,302	Quartzville Creek	--
--	Willamette	Marion Forks	fry	01/01/70	12/31/70[d]	--	373,877	Packers Gulch Creek	--
--	Willamette	Marion Forks	fry	01/01/70	12/31/70[d]	..	384,203	Canal Creek	--
--	Willsmette	Marion Forks	fry	01/01/70	12/31/70[d]	..	2,647,210	Green Peter Reservoir	--
--	Willamette	South Santiam	fry	01/01/70	12/31/70[d]	..	650,840	Green Peter Reservoir	--
--	Willamette	McKenzie	fing.	01/01/71	12/31/71[d]	..	346,084	North Santiam	--
--	Willamette	South Santiam	smolt	01/01/71	12/31/71[d]	..	19,865	Foster Reservoir	--
--	Willamette	South Santiam	smolt	01/01/71	12/31/71[d]	..	285,451	South Santiam	--
--	Willamette	Marion Forks	smolt	01/01/71	12/31/71[d]	..	248,066	North Santiam	--
--	Willamette	South Santiam	fry	01/01/71	12/31/71[d]	..	1,401,581	Green Peter Reservoir	--
--	Willamette	McKenzie	fins.	01/01/72	12/31/72[d]	..	1,029,832	Minto Dam	--
--	Willamette	South Santiam	smolt	01/01/72	12/31/72[d]	..	141,815	South Santiam	--
--	Uillamette	Marion Forks	smolt	01/01/72	12/31/72[d]	..	73,792	Hinto Dam	--
--	Willamette	South Santiam	fry	01/01/72	12/31/72[d]	..	463,217	Green Peter Reservoir	--
--	Willamette	Uillamette	fry	01/01/72	12/31/72[d]	..	2,074,174	Green Peter Reservoir	--
--	Willamette	McKenzie	fing.	01/01/73	12/31/73[d]	..	668,907	Hinto Dam	--
--	Willamette	South Santiam	smolt	01/01/73	12/31/73[d]	..	38,469	South Santiam	--
--	Willamette	Marion Forks	smolt	01/01/73	12/31/73[d]	..	345,976	Hinto Dam	--
--	Willamette	South Santiam	fry	01/01/73	12/31/73[d]	..	338,955	Green Peter Reservoir	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
--	Willamette	Willamette	fry	01/01/73	12/31/73[d]	--	210,433	Green Peter Reservoir	--
--	Willamette	McKenzie	fing.	01/01/74	12/31/74[d]	--	632,143	Hinto Dam	--
--	Willamette	South Santiam	fing.	01/01/74	12/31/74[d]	--	198,632	South Santiam	--
--	Willamette	Marion Forks	smolt	01/01/74	12/31/74[d]	--	397,777	Minto Dam	--
--	Willamette	Willamette	smolt	01/01/74	12/31/74[d]	--	215,068	Foster Dam	--
--	Willamette	South Santiam	fry	01/01/74	12/31/74[d]	--	411,620	Moose Creek	--
--	Uillamette	South Santiam	fry	01/01/74	12/31/74[d]	--	1,127,996	Green Peter Reservoir	--
--	Uillamette	South Santiam	fry	01/01/74	12/31/74[d]	--	152,687	South Santiam	--
--	Willamette	McKenzie	fing.	01/01/75	12/31/75[d]	--	1,322,053	Minto Dam	--
--	Wiilamette	South Santiam	smolt	01/01/75	12/31/75[d]	--	332,235	South Santiam	--
--	Willamette	Marion Forks	smolt	01/01/75	12/31/75[d]	--	683,293	Minto Dam	--
--	Uillamette	Willamette	fry	01/01/75	12/31/75[d]	--	1,818,961	Green Peter Reservoir	--
--	Willamette	McKenzie	fing.	01/01/76	12/31/76[d]	--	248,050	North Santiam	--
--	Willamette	South Santiam	smolt	01/01/76	12/31/76[d]	--	105,363	South Santiam	--
--	Willamette	Marion Forks	smolt	01/01/76	12/31/76[d]	--	667,117	Minto Dam	--
--	Willamette	Marion Forks	smolt	01/01/76	12/31/76[d]	--	245,181	North Santiam	--
--	Willamette	McKenzie	fing.	01/01/77	12/31/77[d]	--	100,916	North Santiam	--
--	Uillamette	South Santiam	smolt	01/01/77	12/31/77[d]	--	199,816	South Santiam	--
--	Uillamette	Marion Forks	smolt	01/01/77	12/31/77[d]	--	293,760	North Santiam	--
--	Willamette	McKenzie	fing.	01/01/78	12/31/78[d]	--	340,941	North Santiam	--
--	Willamette	Marion Forks	smolt	01/01/78	12/31/78[d]	--	359,182	North Santiam	--
--	Willamette	Marion Forks	fry	01/01/78	12/31/78[d]	--	2,208	Detroit Reservoir	--
--	Willamette	McKenzie	fing.	01/01/79	12/31/79[d]	--	961,273	North Santiam	--
--	Willamette	South Santiam	smolt	01/01/79	12/31/79[d]	--	106,821	South Santiam	--
--	Willamette	Marion Forks	fry	01/01/79	12/31/79[d]	--	676,057	Green Peter Reservoir	--
1978	Carson[e]	Marion Forks	fing.	03/13/80	--	16.1	41,216	Santiam River and NFk-1	LV
1978	Carson[e]	Marion Forks	fing.	03/13/80	--	16.3	35,697	Santiam River and NFk-1	LV
1978	Carson[e]	Marion Forks	fing.	03/13/80	--	16.6	22,161	Santiam River and NFL-1	LV
1978	Carson[e]	Marion Forks	fins.	03/13/80	--	16.7	22,378	Santiam River and NFk-1	LV
1978	Carson[e]	Marion Forks	fing.	03/13/80	--	17.2	23,645	Santiam River and NFk-1	LV
1978	Carson[e]	Marion Forks	fing.	03/13/80	--	17.3	21,625	Santiam River and NFk-1	LV
1978	N. Santiam R.	Marion Forks	fing.	03/13/80	--	16.8	23,515	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	fing.	03/10/80	--	17.3	25,777	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	fing.	03/10/80	--	17.4	51,480	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	fing.	03/10/80	--	17.7	23,895	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	fins.	03/10/80		18.2	23,114	Santiam River and NFL-1	--
1978	N. Santiam R.	Marion Forks	fing.	03/13/80	--	18.4	23,184	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	fing.	03/13/80	--	18.5	24,605	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	fins.	03/13/80	--	18.6	23,250	Santiam River and NFk-1	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Fin Clip[b] Code/
1978	N. Santiam R.	Marion Forks	fing.	03/12/80	--	19.3	35,512	Santiam River and NFL-1	--
1978	N. Santiam R.	Marion Forks	fing.	03/10/80	--	19.5	24,960	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	fing.	03/13/80	--	19.9	25,074	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	fing.	03/10/80		20.0	27,197	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	fing.	03/10/80	--	20.3	17,042	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	fing.	03/13/80	--	20.8	26,208	Santiam River and NFk-1	--
1978	Carson[e]	Marion Forks	smolt	03/13/80	--	15.2	21,270	Santiam River and NFk-1	LV
1978	N. Santiam R.	Marion Forks	smolt	03/13/80		15.9	17,172	Santiam River and NFk-1	--
1978	S. Santiam R.	South Santiam	smolt	03/14/80	--	5.6	17,752	MFk Santiam River	AD-CUT
1978	S. Santiam R.	South Santiam	smolt	03/14/80	--	5.8	9,773	MFk Santiam River	AD-CUT
1978	S. Santiam R.	South Santiam	smolt	03/14/80	--	5.6	24,024	SFk Santiam River	AD-CUT
1978	S. Santiam R.	South Santiam	smolt	03/14/80		5.8	12,470	SFk Santiam River	AD-CUT
1979	S. Santiam R.	Oakridge	smolt	11/07/80	--	5.7	43,694	SFk Santiam River	--
1979	S. Santiam R.	Oakridge	smolt	03/17/81	--	8.6	15,737	SFk Santiam River	--
1979	S. Santiam R.	Oakridge	smolt	03/18/81		11.8	31,848	SFk Santiam River	--
1979	S. Santiam R.	Oakridge	smolt	03/17/81	--	12.0	44,794	SFk Santiam River	--
1979	S. Santiam R.	Oakridge	smolt	03/17/81	--	12.2	75,488	SFk Santiam River	--
1979	S. Santiam R.	Oakridge	smolt	03/17/81	--	12.6	15,182	SFk Santiam River	--
1979	Eagle Cr.	Marion Forks	fing.	10/28/80	--	16.3	17,359	Green Peter Reservoir	--
1979	Eagle Cr.	Marion Forks	fing.	10/27/80	--	16.5	15,510	Green Peter Reservoir	--
1979	Eagle Cr.	Marion Forks	fing.	07/24/80	--	103.0	27,192	Green Peter Reservoir	--
1979	Eagle Cr.	Marion Forks	fing.	07/24/80	--	106.0	27,030	Green Peter Reservoir	--
1979	Eagle Cr.	Marion Forks	fing.	07/23/80	--	109.0	53,846	Green Peter Reservoir	--
1979	Carson[e]	Marion Forks	fing.	11/06/80	--	20.5	67,896	Santiam River and NFk-1	AD-CUT
1979	Carson[e]	Marion Forks	fing.	11/05/80	11/06/80	21.0	33,974	Santiam River and NFL-1	AD-CWT
1979	N. Santiam R.	Marion Forks	fing.	03/17/81	03/18/81	17.0	15,147	Santiam River and NFk-1	--
1979	N. Santiam R.	Marion Forks	fing.	03/17/81	03/18/81	17.0	1,683	Santiam River and NFk-1	AD-CUT
1979	N. Santiam R.	Marion Forks	fing.	03/16/81	03/17/81	18.2	17,200	Santiam River and NFL-1	--
1979	N. Santiam R.	Marion Forks	fing.	03/16/81	03/17/81	18.2	1,910	Santiam River and NFk-1	AD-CUT
1979	Eagle Cr.	Marion Forks	fry	05/16/80		900.0	212,962	Green Peter Reservoir	--
1979	Eagle Cr.	Marion Forks	smolt	10/27/80	--	15.4	14,168	Green Peter Reservoir	--
1979	Eagle Cr.	Marion Forks	smolt	10/29/80	--	15.5	11,935	Green Peter Reservoir	--
1979	Eagle Cr.	Marion Forks	smolt	10/27/80	--	16.0	15,680	Green Peter Reservoir	--
1979	Carson[e]	Marion Forks	smolt	03/20/81	03/23/81	13.3	15,442	Santiam River and NFk-1	--
1979	Carson[e]	Marion Forks	smolt	03/20/81	03/23/81	13.3	1,715	Santiam River and NFk-1	AD-CUT
1979	Carson[e]	Marion Forks	smolt	03/17/81	--	13.7	10,275	Santiam River and NFk-1	--
1979	Carson[e]	Marion Forks	smolt	03/17/81	03/20/81	13.8	32,789	Santiam River and NFk-1	--
1979	Carson[e]	Marion Forks	smolt	03/17/81	03/20/81	13.8	3,643	Santiam River and NFk-1	AD-CUT
1979	Carson[e]	Marion Forks	smolt	03/16/81	03/18/81	14.0	30,240	Santiam River and NFk-1	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1979	Carson[e]	Marion Forks	smolt	03/16/81	03/18/81	14.0	3,360	Santiam River and NFk-1	AD-CUT
1979	Carson[e]	Marion Forks	smolt	03/18/81	··	14.1	14,594	Santiam River and NFk-1	··
1979	Carson[e]	Marion Forks	smolt	03/18/81	--	14.1	1,621	Santiam River and NFL-1	AD-CUT
1979	Carson[e]	Marion Forks	smolt	03/16/81	03/20/81	14.3	31,405	Santiam River and NFL-1	··
1979	Carson[e]	Marion Forks	smolt	03/16/81	03/20/81	14.3	3,487	Santiam River and NFk-1	AD-CUT
1979	Carson[e]	Marion Forks	smolt	03/20/81		15.7	17,946	Santiam River and NFk-1	··
1979	Carson[e]	Marion Forks	smolt	03/20/81	--	15.7	1,993	Santiam River and NFL-I	AD-CUT
1979	N. Santiam R.	Marion Forks	smolt	03/23/81	03/24/81	12.9	11,378	Santiam River and NFL-1	··
1979	N. Santiam R.	Marion Forks	smolt	03/23/81	03/24/81	12.9	1,264	Santiam River and NFk-1	AD-CUT
1979	N. Santiam R.	Marion Forks	smolt	03/24/81	··	13.2	16,395	Santiam River and NFk-1	··
1979	N. Santiam R.	Marion Forks	smolt	03/24/81		13.2	1,821	Santiam River and NFk-1	AD-CUT
1979	N. Santiam R.	Marion Forks	smolt	03/19/81	--	13.7	7,398	Santiam River and NFk-1	··
1979	N. Santiam R.	Marion Forks	smolt	03/18/81	--	14.2	13,803	Santiam River and NFk-1	··
1979	N. Santiam R.	Marion Forks	smolt	03/18/81		14.2	1,533	Santiam River and NFk-1	AD-CUT
1979	N. Santiam R.	Marion Forks	smolt	03/19/81	03/23/81	14.3	32,047	Santiam River and NFk-1	··
1979	N. Santiam R.	Marion Forks	smolt	03/19/81	03/23/81	14.3	3,560	Santiam River and NFk-1	AD-CWT
1979	N. Santiam R.	Marion Forks	smolt	03/16/81		14.5	12,659	Santiam River and NFk-1	··
1979	N. Santiam R.	Marion Forks	smolt	03/16/81	--	14.5	1,406	Santiam River and NFk-1	AD-CUT
1979	N. Santiam R.	Marion Forks	smolt	03/19/81	03/23/81	15.8	32,881	Santiam River and NFk-1	··
1979	N. Santiam R.	Marion Forks	smolt	03/23/81	··	15.8	2,037	Santiam River and NFL-I	AD-CUT
1979	S. Santiam R.	South Santiam	smolt	03/17/81	··	5.5	33,240	SFk Santiam River	··
1979	S. Santiam R.	South Santiam	smolt	11/20/80		6.5	114,390	SFk Santiam River	··
1979	S. Santiam R.	South Santiam	smolt	11/05/80	--	7.0	80,080	SFk Santiam River	··
1980	MFk Will. R.[f]	Oakridge	fing.	12/01/81	12/03/81	17.4	183,357	Green Peter Reservoir	··
1980	MFk Will. R.[f]	Oakridge	fing.	12/03/81	12/04/81	20:o	87,700	Green Peter Reservoir	··
1980	Clackamas R.	Oakridge	fry	06/17/81	··	230.0	274,844	Green Peter Reservoir	··
1980	Clackamas R.	Oakridge	fry	06/17/81	--	317.0	82,413	Green Peter Reservoir	··
1980	MFk Will. R.[f]	Oakridge	fry	05/12/81	--	154.2	175,892	Green Peter Reservoir	··
1980	MFk Will. R.[f]	Oakridge	fry	05/12/81		157.0	173,603	Green Peter Reservoir	··
1980	MFk Will. R.[f]	Oakridge	fry	05/12/81	--	193.4	173,393	Green Peter Reservoir	··
1980	MFk Will. R.[f]	Oakridge	fry	05/13/81	--	199.0	363,175	Green Peter Reservoir	··
1980	MFk Will. R.[f]	Oakridge	fry	05/12/81	--	204.1	314,314	Green Peter Reservoir	··
1980	S. Santiam R.	Oakridge	smolt	11/09/81		7.0	25,367	Calapooia River	··
1980	S. Santiam R.	Oakridge	smolt	11/18/81	11/19/81	5.0	84,547	SFk Santiam River	··
1980	S. Santiam R.	Oakridge	smolt	11/18/81	··	5.2	22,516	SFk Santiam River	··
1980	S. Santiam R.	Oakridge	smolt	11/19/81		5.4	38,690	SFk Santiam River	··
1980	S. Santiam R.	Oakridge	snlolt	11/19/81	--	5.5	23,455	SFk Santiam River	··
1980	S. Santiam R.	Oakridge	smolt	11/20/81	--	5.7	33,114	SFk Santiam River	··
1980	S. Santiam R.	Dakridge	smolt	11/23/81	11/24/81	5.9	49,229	SFk Santiam River	··

Table 1 (TR).[a] (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code.

Brood Year	stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release location	CWT Code/ Fin Clip[b]
1980	S. Santiam R.	Oakridge	smolt	1 I/23/81	11/24/81	6.1	25,679	SFk Santiam River	--
1980	S. Santiam R.	Oakridge	smolt	1 I/23/81	--	6.3	17,955	SFk Santiam River	--
1980	S. Santiam R.	Oakridge	smolt	1 I/23/81	--	6.4	28,219	SFk Santiam River	--
1980	S. Santiam R.	Oakridge	smolt	I/20/81	11/23/81	7.0	59,460	SFk Santiam River	--
1980	S. Santiam R.	Oakridge	smolt	1 I/24/81	--	7.1	30,850	SFk Santiam River	--
1980	S. Santiam R.	Willamette	smolt	0 i/19/82	03/23/82	11.9	64,260	SFk Santiam River	--
1980	S. Santiam R.	Willamette	smolt	0 i/18/82	--	13.6	37,332	SFk Santiam River	--
1980	S. Santiam R.	Willamette	smolt	0 i/16/82	--	13.9	38,571	SFk Santiam River	--
1980	S. Santiam R.	Willamette	smolt	0 i/17/82	--	14.1	73,884	SFk Santiam River	--
1980	S. Santiam R.	Willamette	smolt	0 i/16/82	--	14.4	38,160	SFk Santiam River	--
1980	Carson[c]	Marion Forks	fing.	0 i/18/82	--	16.4	18,040	Santiam River and NFk-1	07-25-26
1980	Carson[c]	Marion Forks	fing.	0 i/15/82	--	16.6	17,264	Santiam River and NFk-1	07-25-27
1980	Carson[c]	Marion Forks	fing.	0 i/16/82	--	17.2	19,694	Santiam River and NFk-1	07-25-26
1980	Carson[c]	Marion Forks	fing.	1 1/03/81	--	21.0	15,744	Santiam River and NFk-1	--
1980	Carson[c]	Marion Forks	fing.	1 /03/81	--	21.0	1,749	Santiam River and NFk-1	AD-CUT
1980	Carson[c]	Marion Forks	fing.	1 '/03/81	--	22.0	15,504	Santiam River and NFk-1	--
1980	Carson[c]	Marion Forks	fing.	1 /03/81	--	22.0	1,722	Santiam River and NFk-1	AD-CUT
1980	Carson[c]	Marion Forks	fing.	/02/81	--	22.3	16,659	Santiam River and NFk-1	--
1980	Carson[c]	Marion Forks	fins.	1 /02/81	--	22.3	1,850	Santiam River and NFk-1	AD-CUT
1980	Carson[c]	Marion Forks	fing.	1 /02/81	--	22.5	15,816	Santiam River and NFk-1	--
1980	Carson[c]	Marion Forks	fing.	1 /02/81	--	22.5	1,757	Santiam River and NFk-1	AD-CUT
1980	Carson[c]	Marion Forks	fing.	1 /03/81	--	24.3	16,184	Santiam River and NFk-1	--
1980	Carson[c]	Marion Forks	fing.	1 /03/81	--	24.3	1,798	Santiam River and NFk-1	AD-CUT
1980	Carson[c]	Marion Forks	fing.	1 /02/81	--	27.3	7,617	Santiam River and NFk-1	--
1980	Carson[c]	Marion Forks	fing.	1 /02/81	--	27.3	846	Santiam River and NFL-1	AD-CUT
1980	N. Santiam R.	Marion Forks	fing.	0 i/23/82	--	17.0	16,660	Santiam River and NFk-1	--
1980	N. Santiam R.	Marion Forks	fing.	0 i/17/82	--	17.8	21,716	Santiam River and NFk-1	07-25-29
1980	Carson[c]	Marion Forks	smolt	0 i/23/82	--	11.8	15,635	Santiam River and NFk-1	--
1980	Carson[c]	Marion Forks	smolt	0 i/22/82	--	14.0	14,630	Santiam River and NFk-1	--
1980	Carson[c]	Marion Forks	smolt	0 i/19/82	--	15.0	16,500	Santiam River and NFk-1	07-25-25
1980	Carson[c]	Marion Forks	slllolt	0 i/18/82	--	15.2	17,632	Santiam River and NFk-1	07-25-25
1980	Carson[c]	Marion Forks	slnolt	0 i/17/82	--	15.2	17,632	Santiam River and NFk-1	07-25-26
1980	Carson[c]	Marion Forks	smolt	0 ;/24/82	--	15.4	11,550	Santiam River and NFk-1	--
1980	Carson[c]	Marion Forks	snlolt	0 ;/22/82	--	15.6	18,798	Santiam River and NFk-1	07-25-25
1980	Carson[c]	Marion Forks	smolt	0 ;/16/82	--	15.8	17,538	Santiam River and NFk-1	07-25-27
1980	Carson[c]	Marion Forks	smolt	0 ;/17/82	--	15.9	18,762	Santiam River and NFk-1	07-25-27
1980	N. Santiam R.	Marion Forks	smolt	0 ;/19/82	03/22/82	10.9	18,966	Santiam River and NFk-1	07-25-28
1980	N. Santiam R.	Marion Forks	snlolt	0 i/23/82	--	11.3	8,588	Santiam River and NFk-1	--
1980	N. Santiam R.	Harion Forks	smolt	0 ;/19/82	03/22/82	12.2	17,690	Santiam River and NFk-1	07-25-28

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a]

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1980	N. Santiam R.	Marion Forks	smolt	03/23/82	--	12.7	17,781	Santiam River and NFk-1	--
1980	N. Santiam R.	Marion Forks	smolt	03/17/82	--	12.8	11,520	Santiam River and NFk-1	07-25-29
1980	N. Santiam R.	Marion Forks	smolt	03/15/82	--	13.7	17,057	Santiam River and NFk-1	07-25-30
1980	N. Santiam R.	Marion Forks	molt	03/15/82	--	14.0	16,100	Santiam River and NFk-1	07-25-30
1980	N. Santiam R.	Marion Forks	molt	03/16/82	--	14.2	16,685	Santiam River and NFk-1	07-25-30
1980	N. Santiam R.	Marion Forks	smolt	03/22/82	--	14.5	17,110	Santiam River and NFL-1	07-25-28
1980	N. Santiam R.	Marion Forks	smolt	03/18/82	--	14.6	16,352	Santiam River and NFk-1	07-25-29
1980	S. Santiam R.	South Santiam	smolt	11/02/81	--	6.1	181,292	SFk Santiam River	--
1980	S. Santiam R.	South Santiam	smolt	03/16/82	--	7.5	20,850	SFk Santiam River	--
1980	S. Santiam R.	South Santiam	smolt	03/16/82	--	10.5	92,715	SFk Santiam River	--
1981	MFk Will. R.	Willamette	fry	06/03/82	--	193:o	53,840	Green Peter Reservoir	--
1981	MFk Will. R.	Uillamette	fry	06/03/82	--	230.0	291,850	Green Peter Reservoir	--
1981	MFk Will. R.	Willamette	fry	05/13/82	05/14/82	285.0	253,650	Green Peter Reservoir	--
1981	MFk Will. R.	Uillamette	fry	05/13/82	--	289.0	150,280	Green Peter Reservoir	--
1981	MFk Will. R.	Willamette	fry	05/14/82	--	321.0	256,800	Green Peter Reservoir	--
1981	MFk Will. R.	Willamette	fry	05/18/82	05/07/82	372.0	213,400	Green Peter Reservoir	--
1981	MFk Will. R.	Uillamette				394.0	112,275	Green Peter Reservoir	--
1981	MFk Will. R.	Willamette	fry	05/06/82	--	574.0	384,540	Green Peter Reservoir	--
1981	MFk Will. R.	Uillamette	fry	05/06/82	--	591.0	147,730	Green Peter Reservoir	--
1981	MFk Will. R.	Willamette	fry	05/07/82	--	620.0	393,670	Green Peter Reservoir	--
1981	S. Santiam R.	Willamette	smolt	11/10/82	11/11/82	6.6	56,600	SFk Santiam River	--
1981	S. Santiam R.	Uillamette	smolt	11/11/82	--	6.9	8,418	SFk Santiam River	--
1981	S. Santiam R.	Uillamette	smolt	11/12/82	--	7.2	24,818	SFk Santiam River	--
1981	N. Santiam R.	Marion Forks	fins.	03/15/83	--	17.0	19,890	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/14/83	--	17.4	3,600	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/14/83	--	17.4	16,400	Santiam River and NFL-1	RV
1981	N. Santiam R.	Marion Forks	fing.	03/14/83	--	17.5	19,425	Santiam River and NFk-1	RV
1981	N. Santiam R.	Marion Forks	fing.	03/14/83	--	17.8	20,648	Santiam River and NFk-1	RV
1981	N. Santiam R.	Marion Forks	fins.	03/15/83	03/16/83	18.0	15,300	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/15/83	--	18.4	17,848	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/14/83	--	19.0	23,560	Santiam River and NFL-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/14/83	--	19.2	21,120	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/15/83	03/17/83	20.0	37,598	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/14/83	03/15/83	20.7	25,047	Santiam River and NFL-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/16/83	03/17/83	21.0	31,287	Santiam River and NFL-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/15/83	--	21.7	45,353	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/16/83	--	22.0	17,820	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/16/83	--	22.5	23,400	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fing.	03/17/83	--	23.0	23,230	Santiam River and NFk-1	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Fin Clip	Code6
1981	N- Santiam R-	Marion Forks	fing.	03/17/83		23.5	24,910	Santiam River and NFk-1	--	
1981	N. Santiam R.	Marion Forks	fing.	03/17/83	--	24.0	18,474	Santiam River and NFk-1	--	
1981	N. Santiam R.	Marion Forks	fing.	03/17/83	--	25.5	22,440	Santiam River and NFL-1	--	
1981	MFk Will.[f]	McKenzie	fry	06/09/82	--	134.0	41,540	Green Peter Reservoir	--	
1981	MFk Will.[f]	McKenzie	smolt	11/08/82	--	6.1	7,436	Calapooia River	--	
1981	MFk Will.[f]	McKenzie	smolt	11/08/82	--	6.3	18,003	Calapooia River	--	
1981	N. Santiam R.	Marion Forks	smolt	03/16/83		6.5	7,408	Santiam River and NFk-I	AN	
1981	N. Santiam R.	Marion Forks	smolt	03/16/83	--	6.9	17,043	Santiam River and NFk-1	AN	
1981	N. Santiam R.	Marion Forks	smolt	11/08/82	--	8.9	8,241	Santiam River and NFk-1	LV	
1981	N. Santiam R.	Marion Forks	smolt	11/08/82	--	9.0	8,442	Santiam River and NFk-1	LV	
1981	N. Santiam R.	Marion Forks	smolt	11/08/82	--	9.3	9,393	Santiam River and NFk-1	LV	
1981	N. Santiam R.	Marion Forks	smolt	11/08/82	11/09/82	9.5	9,168	Santiem River and NFk-1	LV	
1981	N- Santiam R.	Marion Forks	smolt	11/09/82	--	9.7	9,700	Santiam River and NFk-1	--	
1981	N. Santiam R.	Marion Forks	smolt	11/08/82	--	9.7	18,876	Santiam River and NFk-1	LV	
1981	N. Santiam R.	Marion Forks	smolt	11/09/82	--	10.0	9,300	Santiam River and NFL-1	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/11/82	--	8.3	9,960	SFk Santiam River	--	
1981	S- Santiam R.	Dexter Pond	smolt	11/11/82		8.5	15,470	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	03/16/83	--	8.6	11,170	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/11/82	03/17/83	8.9	65,053	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/11/82	--	9.0	10,980	SFk Santiam River	--	
1981	S- Santiam R.	Dexter Pond	smolt	03/16/83	--	9.1	26,931	SFk Santiam River	--	
1981	S- Santiam R.	Dexter Pond	smolt	11/11/82	--	9.2	22,816	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/10/82		9.4	23,688	SFk Santiem River	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/10/82		9.5	12,160	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	03/15/83	--	9.6	16,285	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/10/82	--	9.7	11,931	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/10/82	--	9.8	12,544	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/11/82	--	10.1	7,878	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/11/82		10.5	19,090	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/11/82	--	10.7	14,338	SFk Santiam River	--	
1981	S. Santiam R.	Dexter Pond	smolt	11/10/82	11/11/82	11.0	26,730	SFk Santiam River	--	
1981	S. Santiam R.	South Santiam	smolt	11/08/82	11/09/82	5.8	47,212	SFk Santiam River	--	
1981	S. Santiam R.	South Santiam	smolt	11/08/82	--	6.2	26,102	SFk Santiam River	--	
1981	S. Santiam R.	South Santiam	smolt	11/09/82	--	6.3	50,652	SFk Santiam River	--	
1981	S. Santiam R.	South Santiam	smolt	03/16/83	--	8.4	37,548	SFk Santiam River	--	
1981	S. Santiam R.	South Santiam	smolt	03/16/83	--	10.5	146,895	SFk Santiam River	--	
1982	MFk Will. R.[f]	Uillamette	fry	03/23/83	--	594.0	89,394	Calapooia River	--	
1982	MFk Uill. R.[f]	Willamette	fry	03/23/83	--	716.0	10,700	Calapooia River	--	
1982	MFk Uill- R.[f]	Willamette	fry	03/23/83	--	716.0	150,160	Crabtree Creek	--	

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1982	MFk Uill- R.[f]	Willamette	fry	05/11/83	--	193.0	74,305	Green Peter Reservoir	--
1982	MFk Will. R.[f]	Willamette	fry	05/16/83	--	233.0	48,697	Green Peter Reservoir	--
1982	MFk Will. R.[f]	Willamette	fry	05/13/83	05/16/83	236.0	347,464	Green Peter Reservoir	--
1982	MFk Uill. R.[f]	Willamette	fry	04/22/83	--	275.0	203,500	Green Peter Reservoir	--
1982	MFk Will. R.[f]	Willamette	fry	05/11/83	05/12/83	298.0	406,668	Green Peter Reservoir	--
1982	MFk Will. R.[f]	Wi llamette	fry	04/22/83	--	313.0	145,858	Green Peter Reservoir	--
1982	MFk Uill. R.[f]	Willamette	fry	03/09/83	--	336.0	170,352	Green Peter Reservoir	--
1982	MFk Uill. R.[f]	Willamette	fry	04/22/83	--	340.0	99,960	Green Peter Reservoir	--
1982	MFk Will. R.[f]	Willamette	fry	03/09/83	--	341.0	191,251	Green Peter Reservoir	--
1982	MFk Will R.[f]	Wi 1 lamette	fry	05/12/83	--	375.0	311,125	Green Peter Reservoir	--
1982	MFk Will: R.[f]	Willamette	fry	03/23/83	--	716.0	251,241	SFk Santiam River	--
1982	MFk Will. R.[f]	Willamette	smolt	03/19/84	--	7.0	27,318	SFk Santiam River	--
1982	MFk Will. R.[f]	Uillamette	smolt	03/19/84	--	7.6	30,081	SFk Santiam River	--
1982	MFk Will. R.[f]	Uillamette	snwlt	03/19/84	--	7.9	35,906	SFk Santiam River	--
1982	MFk Will. R.[f]	Uillamette	smolt	03/19/84	--	8.8	38,009	SFk Santiam River	--
1982	N. Santiap R.	Marion Forks	fing.	03/26/84	--	16.2	21,222	Santiam River and NFk-1	--
1982	MFk Will.[f]	Marion Forks	fry	06/15/83	--	373.0	174,900	Foster Reservoir	--
1982	MFk Will.[f]	Marion Forks	fry	05/16/83	--	603.0	153,112	NFk Santiam River (Lower)	--
1982	MFk Will.[f]	Marion Forks	fry	06/15/83	--	373.0	210,700	SFk Santiam River	--
1982	MFk Will.[f]	Marion Forks	fry	04/27/83	--	550.0	151,250	Thomas Creek	--
1982	N. Santiam R.	Marion Forks	fry	05/25/83		357.0	108,228	MFk Santiam River	--
1982	N. Santiap R.	Marion Forks	fry	06/14/83	--	175.0	80,150	Santiam River and NFk-1	--
1982	MFk Will.[f]	Dexter Pond	smolt	11/07/83	--	6.2	14,468	Calapooia River	--
1982	MFk Will.[f]	Dexter Pond	snlolt	11/07/83	--	6.5	10,400	Calapooia River	--
1982	MFk Will.[f]	McKenzie	smolt	03/22/84	--	6.6	4,620	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	smolt	03/22/84	--	6.7	8,509	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	smolt	03/21/84	--	6.8	8,292	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	smolt	03/22/84	--	7.0	9,100	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	smolt	03/21/84	03/22/84	7.1	18,105	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	smolt	03/21/84	03/22/84	7.3	34,821	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	smolt	03/20/84	03/22/84	7.4	38,406	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	snlolt	03/22/84	--	7.7	28,315	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	smolt	03/22/84	--	7.8	13,650	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	smolt	03/22/84	--	7.9	12,857	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	smolt	03/21/84	--	8.1	2,025	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	smolt	03/22/84	--	8.5	10,030	SFk Santiam River	--
1982	MFk Will.[f]	McKenzie	snlolt	03/22/84		9.4	12,030	SFk Santiam River	--
1982	MFk Will.[f]	South Santiam	smolt	03/19/84		9.6	45,879	SFk Santiam River	--
1982	MFk Will.[f]	South Santiam	smolt	03/20/84	--	10.6	23,373	SFk Santiam River	--

Table 1 (TR)[a]. (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1982	MFk Will.[f]	South Santiam	smolt	03/20/84	--	12.0	33,516	SFk Santiam River	--
1982	N. Santiam R.	Dexter Pond	smolt	11/07/83	11/08/83	6.4	30,325	Santiam River and NFk-1	--
1982	N. Santism R.	Dexter Pond	smolt	11/08/83	--	6.8	10,880	Santiam River and NFk-1	--
1982	N. Santiam R.	Dexter Pond	smolt	11/08/83	--	6.9	8,620	Santiam River and NFk-1	--
1982	N. Santiam R.	Dexter Pond	slnolt	11/08/83	--	7.0	9,093	Santiam River and NFk-1	--
1982	N. Santiam R.	Dexter Pond	slnolt	11/07/83	--	7.1	10,792	Santiam River and NFk-1	--
1982	N. Santiam R.	Dexter Pond	smolt	11/08/83	--	7.2	9,000	Santiam River and NFk-1	--
1982	N. Santiam R.	Dexter Pond	smolt	11/07/83	11/08/83	7.4	18,346	Santiam River and NFk-1	--
1982	N. Santiam R.	Dexter Pond	smolt	11/07/83	--	7.5	26,843	Santiam River and NFk-1	--
1982	N. Santiam R.	Dexter Pond	slnolt	11/07/83	--	7.8	12,005	Santiam River and NFk-1	--
1982	N- Santiam R.	Dexter Pond	smolt	11/07/83	--	8.2	7,380	Santiam River and NFk-1	--
1982	N. Santiam R.	Dexter Pond	smolt	11/08/83	--	8.4	13,020	Santiam River and NFk-1	--
1982	N. Santiam R.	Dexter Pond	smolt	11/08/83	--	8.7	4,959	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	11/08/83	--	12.2	14,632	NFk-2 Santiam River	--
1982	N. Santiam R-	Marion Forks	smolt	03/26/84	--	8.0	8,879	Santiam River and NFk-1	07-29-05
1982	N. Santiam R.	Marion Forks	smolt	11/08/83	--	10.3	29,870	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/20/84	03/21/84	10.5	12,075	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	11/08/83	--	10.8	11,124	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/26/84	--	11.1	55,611	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	11/08/83	--	11.3	10,396	Santiam River and NFL-1	07-29-30
1982	N. Santiam R.	Marion Forks	slnolt	03/22/84	--	il.4	29,526	Santiam River and NFL-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/26/84	--	11.8	8,256	Santiam River and NFL-1	--
1982	N. Santism R.	Marion Forks	smolt	11/08/83	--	il.9	17,850	Santiam River and NFk-1	07-29-30
1982	N. Santiam R.	Marion Forks	smolt	11/08/83	03/26/84	12.2	35,483	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	snlolt	03/21/84	--	12.3	13,530	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	snlolt	03/21/84	03/26/84	13.1	103,619	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/20/84	03/26/84	13.3	25,134	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/20/84	--	13.6	13,620	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/26/84	--	13.7	14,107	Santiam River and NFk-1	--
1982	N- Santiam R.	Marion Forks	snlolt	03/26/84	--	13.8	14,076	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/21/84	03/26/84	13.9	28,771	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/26/84	--	14.1	8,177	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/22/84	--	14.5	10,585	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/19/84	--	14.5	18,705	Santiam River and NFk-1	07-28-63
1982	N. Santiam R.	Marion Forks	smolt	03/21/84	--	15.0	16,050	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	03/19/84	--	15.1	18,724	Santiam River and NFk-1	07-28-63
1982	N. Santiam R.	Marion Forks	smolt	03/19/84		15.2	19,710	Santiam River and NFk-1	07-28-63
1982	S. Santiam R.	South Santiam	smolt	11/08/83	--	6.5	32,045	SFk Santiam River	--
1982	S- Santiam R.	South Santiam	smolt	11/08/83		6.7	35,075	SFk Santism River	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1982	S. Santiam R.	South Santiam	smolt	11/08/83	--	7.0	72,765	SFk Santism River	--
1982	S. Santiam R.	South Santiam	smolt	11/07/83	--	7.8	33,189	SFk Santiam River	--
1982	S. Santiam R.	South Santiam	smolt	11/07/83	--	8.5	36,763	SFk Santism River	--
1983	S. Santiam R.	Willamette	fing.	05/23/84	--	125.0	5,950	Crabtree Creek	--
1983	S. Santiam R.	Willamette	fing.	05/23/84	--	79.0	55,596	SFk Santiam River	--
1983	S. Santiam R.	Uillamette	fing.	05/23/84	--	79.0	45,641	Thomas Creek	--
1983	S. Santiam R.	Willamette	fing.	05/23/84	--	125.0	38,025	Thomas Creek	--
1983	MFk Will- R.f	Willamette	fry	05/16/84	--	220.0	107,505	Calapoia River	--
1983	MFk Will. R.f	Wi llamette	fry	05/16/84	--	283.0	42,340	Calapooia River	--
1983	MFk Uill. R.f	Willamette	fry	04/16/84	04/17/84	317.0	353,690	Green Peter Reservoir	--
1983	MFk Will. R.f	Willamette	fry	04/17/84	--	343.0	130,736	Green Peter Reservoir	--
1983	MFk Will. R.f	Willamette	fry	04/19/84	04/20/84	355:o	313,950	Green Peter Reservoir	--
1983	MFk Uill. R.f	Willamette	fry	04/13/84	04/16/84	356.0	351,319	Green Peter Reservoir	--
1983	MFk Will. R.f	Uillamette	fry	04/20/84	--	370.0	100,565	Green Peter Reservoir	--
1983	MFk Will. R.f	Willamette	fry	04/18/84	04/19/84	407.0	375,311	Green Peter Reservoir	--
1983	MFk Will. R.f	Willamette	fry	04/13/84	--	424.0	177,167	Green Peter Reservoir	--
1983	MFk Will. R.f	Willamstte	fry	04/18/84	--	575.0	196,975	Green Peter Reservoir	--
1983	MFk Will. R.f	Willamette	fry	05/23/84		179.0	45,287	SFk Santism River	--
1983	MFk Uill. R.f	Willamette	fry	05/24/84	--	179.0	69,044	Thomas Creek	--
1983	MFk Will. R.f	Ui llamette	fry	05/24/84	--	235.0	46,950	Thomas Creek	--
1983	S. Santiam R.	Willamette	fry	05/22/84	--	169.0	98,734	Crabtree Creek	--
1983	S. Santiam R.	Willamette	fry	05/22/84	05/23/84	257.0	97,280	Crabtree Creek	--
1983	S- Santiam R.	Willamette	fry	05/16/84	--	260.0	204,160	NFk Santiam River (lower)	--
1983	S. Santiam R.	Willamette	fry	05/22/84	--	257.0	100,230	SFk Santiam River	--
1983	MFk Will.f	Marion Forks	fry	06/29/84	--	140.7	28,421	Horn Creek	--
1983	MFk Will.f	Marion Forks	smolt	11/14/84	--	7.4	6,253	Santiam River and NFk-1	--
1983	MFk Will.f	Marion Forks	smolt	11/13/84	--	8.3	39,984	Santiam River and NFk-1	--
1983	MFk Will.f	Marion Forks	smolt	11/08/84	11/09/84	8.4	67,681	Santiam River and NFk-1	--
1983	MFk Will.f	Marion Forks	smolt	11/07/84	--	8.4	27,636	Santiam River and NFk-1	07-30-24
1983	MFk Will.f	Marion Forks	smolt	03/11/85		8.6	43,165	Santiam River and NFk-1	07-29-02
1983	MFk Will.f	Marion Forks	smolt	11/10/84	--	8.9	31,949	Santiam River and NFk-1	--
1983	MFk Will.f	Marion Forks	smolt	03/13/85	--	11.6	61,331	Santiam River and NFk-1	--
1983	MFk Will.f	Marion Forks	smolt	03/14/85	--	11.7	60,269	Santiam River and NFk-1	--
1983	MFk Will.f	Marion Forks	smolt	03/15/85	--	11.8	61,091	Santiam River and NFk-1	--
1983	MFk Will.f	Marion Forks	smolt	03/12/85	--	12.1	23,576	Santiam River and NFk-1	--
1983	MFk Will.f	Marion Forks	snwlt	03/12/85	--	12.1	38,464	Santiam River and NFk-1	07-29-02
1983	MFk Will.f	Marion Forks	snlolt	03/18/85	--	13.6	32,091	Santiam River and NFk-i	--
1983	S. Santiam R.	Dexter Pond	snlolt	03/11/85	--	7.8	11,076	Calapooia River	--
1983	S. Santiam R.	Dexter Pond	smolt	03/12/85	--	9.2	9,745	Calapooia River	--

Table 1 (TR). (cont.1 Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1983	S. Santiem R.	Dexter Pond	smolt	11/06/84	--	6.0	8,070	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	11/05/84	--	7.3	8,903	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	11/05/84	11/06/84	7.5	33,485	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	11/06/84	03/12/85	7.6	40,578	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	11/06/84	--	7.7	10,163	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	11/05/84	03/22/85	7.8	28,145	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	11/06/84	--	7.9	13,628	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	11/06/84	03/19/85	8.0	23,112	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	11/06/84	03/21/85	8:1	22,031	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	11/05/84	--	8.2	10,250	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	11/06/84	--	8.3	13,280	SFk Santiem River	--
1983	S. Santism R.	Dexter Pond	smolt	03/12/85	--	8.4	10,080	SFk Santiam River	--
1983	S. Santism R.	Dexter Pond	smolt	03/19/85	--	8.5	10,455	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	snloit	03/19/85	--		9,831	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	slnolt	11/06/84	03/11/85	X:X	33,924	SFk Santiam River	--
1983	S. Santism R.	Dexter Pond	smolt	03/11/85	03/22/85	8.9	38,245	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	03/12/85	03/13/85	9.2	22,998	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	03/19/85	--	9.3	11,672	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	snwlt	03/19/85	--	9.4	15,134	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	03/13/85	03/21/85	9.5	22,602	SFk Santism River	--
1983	S. Santiam R.	Dexter Pond	smolt	03/11/85	03/19/85	9.6	23,517	SFk Santiam River	--
1983	S. Santism R.	Dexter Pond	smolt	03/12/85	--	9.9	11,880	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	03/12/85	--	10.0	11,590	SFk Santiam River	--
1983	S. Santiem R.	Dexter Pond	smolt	03/11/85	03/12/85	10.1	30,488	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	slnolt	03/19/85	--	10.3	31,518	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	03/21/85	--	10.4	29,102	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	03/21/85	--	10.5	16,150	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	03/19/85	--	10.9	13,405	SFk Santiam River	--
1983	S. Santiam R.	Dexter Pond	smolt	03/21/85	--	11.0	14,850	SFk Santiam River	--
1983	S. Santism R.	Dexter Pond	smolt	03/12/85	--	ii.?	17,540	SFk Santiam River	--
1983	S. Santiam R.	South Santiam	smolt	11/05/84	--	6.0	32,436	SFk Santiam River	--
1983	S. Santiam R.	South Santiam	smolt	11/05/84	11/06/84	6.3	63,800	SFk Santiam River	--
1983	S. Santiam R.	South Santiam	smolt	11/06/84	--	6.6	37,495	SFk Santiam River	--
1983	S. Santiam R.	South Santiam	smolt	11/16/84	--	6.7	31,698	SFk Santiam River	--
1983	S. Santiam R.	South Santiam	smolt	11/15/84	03/11/85	6.9	60,485	SFk Santiam River	--
1983	S. Santiem R.	South Santiam	smolt	03/11/85	--		53,830	SFk Santiam River	--
1983	s. Santiwn R.	South Santiam	smolt	03/12/85	--	3-x	25,320	SFk Santiam River	--
1984	S. Santism R.	Uillamette	fing.	06/04/85	--	122:o	106,750	Green Peter Reservoir	--
1984	S. Santiam R.	Willamette	fing.	07/08/85	--	45.4	46,308	SFk Santism River	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1984	MFk Will. R.[f]	Willamstte	fry	05/03/85		373.0	200,276	Calapooia River	--
1984	MFk Uill. R.[f]	Willamette	fry	04/29/85		396.0	150,322	SFk Santiam River	--
1984	MFk Will. R.[f]	Willamette	fry	04/30/85		396.0	150,478	Thomas Creek	--
1984	S. Santiam R.	Uillamette	fry	06/03/85	--	145.0	270,908	Green Peter Reservoir	--
1984	S- Santiam R.	Willamette	fry	06/03/85	06/04/85	153.0	263,166	Green Peter Reservoir	--
1984	S- Santiam R-	Uillamette	fry	05/07/85	--	257.0	332,903	Green Peter Reservoir	--
1984	S. Santiam R.	Willamette	fry	05/08/85	--	264.0	346,843	Green Peter Reservoir	--
1984	S. Santiam R-	Uillamette	fry	05/09/85	--	276.0	278,539	Green Peter Reservoir	--
1984	S., Santiam R-	Uillamette	fry	05/08/85	05/09/85	288.0	289,167	Green Peter Reservoir	--
1984	S. Santiam R.	Willamette	fry	05/07/85	05/08/85	308.0	111,904	Green Peter Reservoir	--
1984	S. Santiam R.	Uillamette	smolt	11/04/85	--	6.8	47,215	SFk Santiam River	--
1984	S. Santiam R-	Willamette	smolt	11/04/85	--	7.6	46,887	SFk Santiam River	--
1984	MFk Will.[T]	Stayton Pond	fing.	11/15/85		78.0	2,964	Santiam River and NFk-1	--
1984	N- Santiam R.	Marion Forks	fry	06/12/85		297.0	13,929	Horn Creek	--
1984	MFk Will.[T]	Stayton Pond	smolt	11/25/85		7.6	2,422	Santiam River and NFk-1	--
1984	MFk Will.'	Stayton Pond	smolt	11/26/85	--	8.5	2,865	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	03/13/86	--	7.3	9,371	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	03/13/86		7.9	12,087	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	03/13/86	--	8:0	11,515	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	03/13/86		8.8	13,019	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	03/13/86		10.2	10,780	Santiam River and NFk-1	07-37-01
1984	N. Santiam R.	Marion Forks	smolt	03/13/86	--	10.5	11,918	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	03/13/86		10.6	10,547	Santiam River and NFk-1	07-37-02
1984	N. Santiam R.	Marion Forks	smolt	03/14/86	--	10.7	10,788	Santiam River and NFk-1	07-36-63
1984	N. Santiam R.	Marion Forks	sliwlt	03/13/86	03/14/86	11.0	23,540	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	snlolt	03/10/86	03/13/86	11.1	27,790	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	03/14/86	--	il.2	12,880	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	03/10/86		11.4	13,737	Santiam River and NFk-1	--
1984	N- Santiam R.	Marion Forks	smolt	03/14/86	--	il.5	11,155	Santiam River and NFL-1	--
1984	N. Santiam R.	Marion Forks	smolt	03/10/86	03/13/86	11.6	27,318	Santiam River and NFL-1	--
1984	N. Santiam R.	Marion Forks	slnolt	03/10/86	03/14/86	il.?	35,919	Santiam River and NFk-I	--
1984	N. Santiam R.	Marion Forks	smolt	03/17/86	--	il.8	13,098	Santiam River and NFL-I	--
1984	N. Santiam R.	Marion Forks	smolt	03/17/86	--	il.9	15,042	Santiam River and NFk-I	--
1984	N. Santiam R.	Marion Forks	smolt	03/13/86	03/17/86	12.0	46,255	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	03/10/86	03/13/86	12.1	33,880	Santiam River and NFk-I	--
1984	N- Santiam R.	Marion Forks	smolt	03/13/86	--	12.5	16,240	Santiam River and NFk-1	--
1984	S- Santiam R.	Dexter Pond	smoit	11/06/85		6.4	158,997	SFk Santiam River	--
1984	S. Santiam R.	Dexter Pond	smolt	03/11/86	--	10.0	135,181	SFk Santiam River	--
1984	S. Santiam R.	Dexter Pond	smolt	03/11/86	--	10.5	32,865	SFk Santiam River	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nunber Released	Release Location	CWT Code/ Fin Clip[b]
1984	S. Santiam R.	Dexter Pond	smolt	03/10/86	03/11/86	11-Q	175,182	SFk Santiam River	--
1984	S. Santiam R.	Marion Forks	smolt	03/11/86	03/13/86	6.0	15,830	Santiam River and NFL-1	--
1984	S. Santiam R.	Marion Forks	smolt	03/14/86	--	6.8	9,860	Santiam River and NFk-1	--
1984	S. Santiam R.	Marion Forks	smolt	03/14/86	--	7.0	20,160	Santiam River and NFk-1	--
1984	S. Santiam R.	Marion Forks	smolt	03/14/86		7.3	11,096	Santism River and NFk-1	--
1984	S. Santism R.	Marion Forks	smolt	03/12/86	--	7.3	10,622	Santiam River and NFk-1	07-36-62
1984	S. Santiam R.	Marion Forks	smolt	11/04/85	--	8.1	10,602	Santiam River and NFk-1	07-36-57
1984	S. Santiam R.	Marion Forks	smolt	03/12/86	--	8.1	10,962	Santiam River and NFk-1	07-36-61
1984	S. Santism R.	Marion Forks	smolt	11/04/85	--	8.5	10,544	Santiam River and NFk-1	07-36-59
1984	S. Santism R.	Marion Forks	smolt	03/11/86	--	8.5	10,697	Santiem River and NFk-1	07-36-60
1984	S. Santiam R.	Marion Forks	smolt	11/04/85	--	8.6	10,282	Santiam River and NFk-1	07-36-58
1984	S. Santism R.	Marion Forks	smolt	11/04/85	--	8.7	9,962	Santiam River and NFk-1	--
1984	S. Santiam R.	Marion Forks	smolt	03/12/86	--	13.4	19,028	Santiam River and NFL-1	--
1984	S. Santiam R.	South Santiam	smolt	11/05/85	--	8.3	24,834	SFk Santism River	--
1984	s. Santiam R.	South Santiam	smolt	11/05/85	--	8.7	1,350	SFk Santiam River	--
1984	S. Santiam R.	South Santism	smolt	11/05/85	--	8.7	13,282	SFk Santiam River	07-36-51
1984	S. Santiam R.	South Santiam	smolt	11/05/85	--	8.7	13,312	SFk Santiam River	07-36-52
1984	S. Santism R.	South Santiam	smolt	11/04/85		8.8	28,090	SFk Santiam River	--
1984	S. Santiam R.	South Santiam	smoit	11/04/85	--	9.0	25,650	SFk Santiam River	--
1984	S. Santiam R.	South Santiam	smolt	11/05/85	--	9.4	12,523	SFk Santiam River	--
1984	S. Santiam R.	South Santiam	smolt	11/05/85	--	9.4	14,255	SFk Santiam River	07-36-53
1984	S. Santiem R.	South Santiam	smolt	11/05/85		9.4	13,717	SFk Santiam River	07-36-54
1984	S. Santiam R.	South Santiam	snwlt	11/04/85	--	9.5	27,256	SFk Santiam River	--
1984	S. Santiam R.	South Santiam	smolt	03/11/86	--	11.6	28,316	SFk Santiam River	--
1984	S. Santiam R.	South Santiam	smolt	03/12/86	--	11.7	26,664	SFk Santiam River	--
1984	S. Santiam R.	South Santiam	smolt	03/11/86	--	12.4	26,499	SFk Santiam River	--
1984	S. Santiam R.	South Santiam	smolt	03/12/86	--	12.5	28,850	SFk Santiam River	--
1985	S. Santiam R.	Willamette	fry	06/03/86	--	158.0	224,350	Green Peter Reservoir	--
1985	S. Santiam R.	Willamette	fry	06/04/86	--	178.0	235,850	Green Peter Reservoir	--
1985	S. Santiam R.	Willamette	fry	06/04/86	--	182.0	40,040	Green Peter Reservoir	--
1985	S. Santiam R.	Willamette	fry	06/19/86	--	180.0	131,964	SFk Santiam River	--
1985	S. Santiam R.	Willamette	fry	06/12/86		186.0	213,900	SFk Santiam River	--
1985	S. Santiam R.	Willamette	fry	06/19/86	--	203.7	74,336	SFk Santiam River	--
1985	S. Santism R.	Willamette	smolt	11/04/86	11/05/86	6.0	49,933	SFk Santiam River	--
1985	S. Santiam R.	Willamette	smolt	11/04/86	--	6.3	21,918	SFk Santiam River	--
1985	S. Santiam R.	Willamette	smolt	11/04/86	11/05/86	6.7	32,643	SFk Santiam River	--
1985	S- Santiam R.	Willamette	smolt	03/10/87	03/11/87	9.2	31,878	SFk Santiam River	--
1985	S. Santiam R.	Willamette	smolt	03/10/87	--	9.3	32,634	SFk Santiam River	--
1985	S. Santiam R.	Willamette	smolt	03/10/87	--	9.4	19,737	SFk Santiam River	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1985	S. Santiam R.	WiLlamette	smolt	0 5/10/87	--	9.6	58,799	SFk Santiam River	
1985	S.'Santiam R.	Willamette	slnolt	0 ;/10/8?	--	9.7	50,474	SFk Santiam River	--
1985	S. Santiam R.	WiLlamette	sllolt	0 ;/10/8?	--	10.0	34,694	SFk Santiam River	--
1985	N. Santiam R.	Marion Forks	smolt	0 ;/11/8?	--	5.9	9,071	Santiam River and NFk-1	--
1985	N- Santiam R.	Marion Forks	smolt	0 ;/lo/a?	--	6.2	16,895	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 i/10/8?	--	6.6	7,986	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 i/11/8?	--	6.8	30,449	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 5/10/87	--	7.0	12,740	Santiam River and NFk-1	
1985	N. Santiam R.	Marion Forks	smolt	0 i/11/8?	--	7.1	14,413	Santism River and NFk-1	
1985	N. Santiam R.	Harion Forks	smolt	0 5/11/87	--	7.7	'11,622	Santiam River and NFk-i	--
1985	N. Santiam R.	Marion Forks	smolt	0 i/11/8?	--	7.8	23,614	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 1/10/8?	03/11/87	7.9	13,351	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 5/09/87	03/10/87	8.0	11,840	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 5/11/87	--	8.1	10,409	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 i/09/8?	--	8.3	12,118	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 i/09/8?	--	8.4	11,340	Santiam River and NFk-1	
1985	N. Santiam R.	Marion Forks	smolt	0 i/11/8?	--	8.5	IQ,690	Santism River and NFk-1	
1985	N. Santiam R.	Marion Forks	smolt	0 i/IQ/8?	03/11/87	8.8	27,446	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 5/09/87	--	8.9	14,329	Santism River and NFk-1	--
1985	N. Santiam R.	Marion Forks	slnolt	0 i/09/8?	--	9.2	11,863	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 i/09/8?	--	10.5	67,463	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 ;/09/8?	--	10.6	14,310	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 i/09/8?	- -	IQ.7	23,069	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 i/lo/a?	--	10.7	8,155	Santiam River and NFk-1	07-39-44
1985	N. Santiam R.	Marion Forks	smolt	0 i/IQ/8?	- -	IQ.7	8,155	Santiam River and NFk-1	07-39-45
1985	N. Santiam R.	Marion Forks	smolt	0 i/09/8?	--	10.8	13,176	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 5/10/87	--	10.8	8,123	Santiam River and NFk-1	07-39-44
1985	N. Santiam R.	Marion Forks	smolt	0 i/IQ/8?	--	10.8	8,123	Santiam River and NFk-1	07-39-45
1985	N. Santiam R.	Marion Forks	smolt	0 ;/10/8?	--	12.0	14,520	Santiam River and NFk-1	
1985	N. Santiam R.	Marion Forks	smolt	0 i/09/8?	--	12.1	11,737	Santiam River and NFk-1	
1985	N. Santiam R.	Marion Forks	slnolt	0 i/IQ/8?	--	13.2	37,422	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	0 i/11/8?	--	10.4	8,125	SFk Santiam River	07-39-46
1985	N. Santiam R.	Marion Forks	smolt	0 i/11/8?	--	10.4	8,125	SFk Santiam River	07-39-47
1985	N. Santiam R.	Marion Forks	smolt	0 i/II/87	--	11.0	8,533	SFk Santiam River	07-39-46
1985	N. Santiam R.	Marion Forks	smolt	0 5/11/87	- -	11.0	8,533	SFk Santiam River	07-39-47
1985	S. Santiam R.	Dexter Pond	smolt	0 i/09/8?	--	8.5	166,700	SFk Santiam River	--
1985	S. Santiam R.	Dexter Pond	smolt	1 /03/86	--	8.6	172,626	SFk Santiam River	
1985	S. Santiam R.	South Santiam	smolt	1 /04/86	03/09/87	7.8	51,480	SFk Santiam River	--
1985	S. Santiam R.	South Santiam	smolt	0 5/09/87	--	8.1	25;llQ	SFk Santism River	

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1985	S. Santiam R.	Swth Santiam	smolt	11/03/86	--	8.2	37,310	SFk Santiam River	--
1985	S. Santiam R.	Swth Santiam	smolt	11/04/86	--	8.3	26,643	SFk Santiam River	--
1985	S. Santism R.	South Santiam	smolt	11/03/86	--	8.4	84	SFk Santiam River	--
1985	S. Santiam R.	South Santiam	smolt	11/03/86	--	8.4	13,131	SFk Santiam River	07-39-52
1985	S. Santiam R.	South Santiam	smolt	11/03/86	--	8.4	12,825	SFk Santiam River	07-39-53
1985	S. Santiam R.	South Santiam	smolt	11/04/86	03/09/87	8.5	53,805	SFk Santiam River	--
1986	S. Santiam R.	Willamette	fry	05/19/87	--	142.0	85,200	Green Peter Reservoir	--
1986	S. Santiam R.	Willamette	fry	05/19/87	--	211:Q	266,463	Green Peter Reservoir	--
1986	S. Santian R.	Wi 1 lamette	fry	05/19/87	--	216.0	149,040	Green Peter Reservoir	--
1986	S. Santiam R.	Willamette	smolt	11/10/87	11/11/87	6.4	30,640	SFk Santiw River	--
1986	S. Santiam R.	Willamette	smolt	11/10/87	--	6.7	32,454	SFk Santiam River	--
1986	S. Santiam R.	Willamette	smolt	11/10/87	--	6.8	71,495	SFk Santiam River	--
1986	S. Santiam R.	Willamette	smolt	11/10/87	--	7.2	36,026	SFk Santiam River	--
1986	S. Santiam R.	Willamette	smolt	03/08/88	--	9.0	22,365	SFk Santiam River	--
1986	S. Santiam R.	Willamette	smolt	03/08/88	--	9.1	32,494	SFk Santiam River	--
1986	S. Santiam R.	Willamette	smolt	03/08/88	--	9.3	28,389	SFk Santiam River	--
1986	S. Santiam R.	Uillamette	smolt	03/08/88	--	9.5	68,206	SFk Santiam River	--
1986	S. Santiam R.	Willamette	smolt	03/07/88	--	10.1	27,264	SFk Santiam River	--
1986	S. Santiam R.	Willamette	smoit	03/08/88	--	IQ:?	35,569	SFk Santiam River	--
1986	N. Santiam R.	Marion Forks	fing.	03/11/88	--	19.0	32,205	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	fing.	03/11/88	--	19.5	14,625	Santiam River and NFk-1	--
1986	S. Santiam R.	South Santiam	fing.	10/14/87	--	30.0	3,420	Green Peter Reservoir	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	--	7.8	11,778	Santiem River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	03/10/88	7.9	22,278	Santism River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	03/08/88	8:1	24,519	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	03/08/88	8.2	27,010	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/08/88	--	8.4	12,767	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	03/11/88	8.5	43,266	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	03/08/88	8.7	18,444	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/08/88	03/09/88	8.8	12,408	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/08/88	--	8.9	14,240	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/10/88	03/11/88	9.0	16,740	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	03/08/88	9.0	14,220	Santiam River and NFk-1	07-49-62
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	03/11/88	9.1	49,487	Santiem River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	--	9-2	28,112	Santiem River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88		9.3	15,340	Santiam River and NFk-1	--
1986	N. Santiem R.	Marion Forks	smolt	03/08/88	03/11/88	9.5	28,025	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/08/88	03/11/88	9.6	28,992	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	--	9.8	15,562	Santiam River and NFk-1	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Release Stage	Date (1)	Fish/ Date (2)	Number lb	Release Released	Location	CWT Code/ Fin Clip[b]
1986	N. Santiam R.	Marion Forks	smolt	03/10/88	03/11/88	9.9	14,949	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/10/88	--	10.2	14,025	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/07/88	03/08/88	10.3	18,334	Santiam River and NFk-1	07-49-62
1986	N. Santiam R.	Marion Forks	smolt	03/10/88	--	10.4	31,408	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/10/88		IQ.8	14,850	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	03/08/88		9.5	12,288	SFk Santiam River	07-50-01
1986	N. Santiam R.	Marion Forks	smolt	03/09/88		9.5	3,990	SFk Santiam River	07-50-10[9]
1986	N. Santiam R.	Marion Forks	smolt	03/08/88	03/09/88	10.3	17,809	SFk Santiam River	07-50-01
1986	S. Santiam R.	Dexter Pond	smolt	11/09/87	--	7.4	189,776	SFk Santiam River	--
1986	S. Santiam R.	Dexter Pond	smolt	03/09/88		9.7	177,870	SFk Santia River	--
1986	S. Santiam R.	South Santiam	smolt	03/07/88	--	9.4	20,013	SFk Santiam River	--
1986	S. Santiam R.	South Santiam	smolt	03/07/88	--	9.8	37,975	SFk Santiam River	--
1986	S. Santiam R.	South Santiam	smolt	03/07/88	--	10.0	73,490	SFk Santiam River	--
1986	S. Santiam R.	South Santiam	smolt	03/07/88	--	10.5	34,734	SFk Santiam River	--
1987	S. Santiam R.	Wi 1 lamette	fing.	08/10/88	--	40.0	9,200	Detroit Reservoir	--
1987	S. Santiam R.	Wi llamette	fing.	08/10/88	--	43.0	40,850	Detroit Reservoir	--
1987	S. Santiam R.	Willamette	smolt	11/17/88	11/18/88	6.7	19,729	SFk Santiam River	--
1987	S. Santiam R.	Uillamette	smolt	03/08/89		11.1	47,784	SFk Santiam River	--
1987	S. Santiam R.	Wi llamette	smolt	03/08/89	--	11.8	87,829	SFk Santiam River	--
1987	S. Santiam R.	Uillamette	smolt	03/08/89	--	12.0	42,719	SFk Santiam River	--
1987	S. Santiam R.	Uillamette	smolt	03/08/89	--	12.7	40,828	SFk Santiam River	--
1987	N. Santiam R.	Marion Forks	fing.	03/10/89	--	17.5	16.183	Santiam River and NFk-1	--
1987	S. Santiam R.	South Santiam	fing.	08/16/88	--	66.0	1,518	Foster Reservoir	--
1987	N. Santiam R.	Marion Forks	smolt	03/09/89	--	9.0	21,505	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/09/89	--	9.2	42,320	Santiam River and NFL-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/09/89		9.3	12,741	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/10/89		9.4	13,066	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/09/89	--	9.6	27,979	Santiam River and NFk-I	--
1987	N. Santiam R.	Marion Forks	smolt	03/10/89	--	9.6	15,019	Santiam River and NFk-1	07-50-47
1987	N. Santiam R.	Marion Forks	smolt	03/09/89	--	9.7	42,147	Santiam River and NFk-I	--
1987	N. Santiam R.	Marion Forks	smolt	03/09/89	--	9.8	12,588	Santiam River and NFk-I	--
1987	N. Santiam R.	Marion Forks	smolt	03/08/89	03/09/89	10.0	30,200	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/07/89	03/09/89	10.1	30,199	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/08/89	03/09/89	IQ.2	27,428	Santiam River at-d NFk-1	--
1987	N- Santiam R.	Marion Forks	smolt	03/10/89	--	10.3	13,802	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/08/89	--	IQ.4	13,624	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/09/89	--	10.5	15,330	Santiam River and NFL-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/07/89	03/10/89	10.6	29,150	Santiam River and NFL-I	--
1987	N. Santiam R.	Marion Forks	smolt	03/10/89	--	IQ.6	15,227	Santiam River and NFk-1	07-50-47

Table 1 (TR)[a]. (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1987	N. Santiam R.	Marion Forks	smolt	03/07/89	03/08/89	IQ.8	15,552	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/09/89	--	IQ.9	27,126	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smoit	03/10/89	--	11.0	13,740	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/09/89	--	il.3	14,223	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/10/89	--	11.4	33,154	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	03/10/89		9.2	15,576	SFk Santiam River	07-50-44
1987	N. Santiam R.	Marion Forks	smolt	03/10/89	--	9.3	14,171	SFk Santiam River	07-50-44
1987	S. Santiam R.	Dexter Pond	smolt	11/16/88	--	8.7	155,965	SFk Santiam River	--
1987	S. Santiam R.	Dexter Pond	smolt	03/06/89	03/07/89	8.9	176,420	SFk Santiam River	--
1987	S. Santiam R.	Dexter Pond	smolt	11/15/88	11/16/88	9.4	168,021	SFk Santiam River	--
1987	S. Santiam R.	South Santiam	smolt	10/12/88	--	8.0	52	Santiam River and NFk-1	--
1987	S. Santiam R.	South Santiam	smolt	10/12/88	--	8.0	348	Santiam River and NFk-1	AD
1987	S. Santiam R.	South Santiam	smolt	11/14/88	--	8.1	2,222	SFk Santiam River	--
1987	S. Santiam R.	South Santiam	smolt	11/14/88	--	8.1	25,551	SFk Santiam River	07-50-41
1987	S. Santiam R.	South Santiam	smolt	03/07/89	--	9.6	236,352	SFk Santiam River	--
1988	N. Santiam R.	Marion Forks	fing.	10/16/89	--	16.6	300	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	fing.	08/28/89	--	31.0	406	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	9.0	10,788	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	03/09/90	9.1	28,094	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	9.2	14,352	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/09/90		9.4	12,690	Santiam River and NFL-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/09/90	--	9.5	28,998	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	9.6	14,395	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/09/90		9.8	14,773	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	9.9	13,833	Santiam River and NFL-I	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90		10.1	26,303	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	03/09/90	10.2	28,540	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	03/09/90	IQ.4	44,338	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/09/90	--	10.6	15,663	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smoit	03/09/90	--	10.7	15,388	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	03/09/90	IQ.9	27,441	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	03/09/90	11.0	6,700	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	11.1	12,750	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	11.1	16,373	Santiam River and NFk-1	07-37-21
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	11.2	29,568	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	11.3	14,789	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	11.4	30,428	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	11.7	14,030	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	smolt	03/09/90	--	il.8	13,914	Santiam River and NFk-1	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stack	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1988	N. Santiam R.	Marion Forks	smolt	03/08/90	--	13.4	16,204	Santiam River and NFk-1	07-52-06
1988	N. Santiam R.	Marion Forks	smolt	10/16/89	--	13.6	408	Santiam River and NFk-1	--
1988	S. Santiam R.	Dexter Pond	smolt	11/13/89	11/15/89	7.1	284,027	SFk Santiam River	--
1988	S. Santiam R.	Dexter Pond	smolt	11/14/89	11/15/89	7.1	26,736	SFk Santiam River	07-52-08
1988	S. Santiam R.	Dexter Pond	smolt	11/15/89	11/16/89	7.7	168,534	SFk Santiam River	--
1988	S. Santiam R.	Dexter Pond	smolt	03/05/90	03/06/90	8.3	263,816	SFk Santiam River	--
1988	S. Santiam R.	Dexter Pond	smolt	03/05/90	--	8.3	14,601	SFk Santiam River	07-52-10
1988	S. Santiam R.	Dexter Pond	smolt	03/05/90	03/06/90	8.3	13,221	SFk Santiam River	07-52-11
1988	S., Santiam R.	South Santiam	smolt	03/05/90	--	9.3	66,031	SFk Santiam River	--
1988	S. Santiam R.	South Santiam	smolt	03/05/90	--	9.4	37,224	SFk Santiam River	--
1988	S. Santiam R.	South Santiam	smolt	03/05/90	--	9.6	32,784	SFk Santiam River	--
1988	S. Santiam R.	South Santiam	smolt	03/05/90	--	9.9	38,610	SFk Santiam River	--
1988	S. Santiam R.	South Santiam	smolt	03/05/90	--	10.0	36,550	SFk Santiam River	--
1988	S. Santiam R.	South Santiam	smolt	03/05/90		IQ.1	35,148	SFk Santiam River	--
1989	N. Santiam R.	Marion Forks	smolt	03/07/91		10.4	14,027	Santiam River and NFL-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/06/91	--	10.7	15,720	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/06/91	--	IQ.8	14,580	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/06/91		10.9	13,729	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/07/91	--	11.0	14,295	Santiam River and Nfk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/06/91	03/07/91	11.2	41,316	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/07/91		11.3	29,141	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/06/91	--	11.4	43,249	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/06/91	--	11.5	13,683	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/07/91	--	11.6	13,685	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/06/91	03/07/91	11.9	59,294	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/07/91		12.1	27,704	Santiam River and NFk-1	--
1989	N. Santiam R-	Marion Forks	smolt	03/06/91	--	12.2	17,690	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/05/91	--	12.3	16,357	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/07/91		12.4	14,131	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/06/91	--	12.4	17,112	Santiam River and NFk-1	07-55-27
1989	N. Santiam R.	Marion Forks	smolt	03/06/91	--	12.5	16,490	Santiam River and NFk-1	07-55-28
1989	N. Santiam R.	Marion Forks	smolt	03/07/91		12.6	17,262	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/06/91	--	12.7	13,706	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/05/91	03/07/91	12.9	32,236	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/07/91		13.0	15,402	Santiam River and NFL-I	--
1989	N. Santiam R.	Marion Forks	smolt	03/07/91	--	13.2	14,119	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/05/91	03/07/91	13.3	32,370	Santiam River and NFk-1	--
1989	N. Santiam R.	Marion Forks	smolt	03/05/91	--	13.8	17,043	Santiam River and NFk-1	--
1989	S. Santiam R.	Dexter Pond	smolt	11/16/90	11/19/90	9.1	116,310	SFk Santiam River	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Nuder Released	Release Location	CWT Code/ Fin Clip[b]
1989	S. Santiam R.	Dexter Pond	smolt	11/16/90	11/19/90	9.1	51,216	SFk Santiam River	07-55-01
1989	S. Santiam R.	Dexter Pond	smolt	11/16/90	--	9.1	6,062	SFk Santiam River	07-75-01
1989	S. Santiam R.	Dexter Pond	smolt	11/15/90	11/16/90	9.8	153,282	SFk Santiam River	--
1989	S. Santiam R.	Dexter Pond	smolt	11/15/90	11/16/90	9.8	75,485	SFk Santiam River	07-55-01
1989	S. Santiam R.	Dexter Pond	slnolt	03/04/91	03/05/91	10.5	112,964	SFk Santiam River	--
1989	S. Santiam R.	Dexter Pond	smolt	03/04/91	03/05/91	10.5	55,630	SFk Santiam River	07-55-02[h]
1989	S. Santiam R.	Dexter Pond	smolt	03/04/91	--	10.6	144,009	SFk Santiam River	--
1989	S. Santiam R.	Dexter Pond	smolt	03/04/91		IQ.6	70,920	SFk Santiam River	07-55-02[h]
1989	S. Santiam R.	South Santiam	smolt	03/05/91	--	9.8	28.432	SFk Santiam River	--
1989	S. Santiam R.	South Santiam	smolt	03/05/91		9.8	14,002	SFk Santiam River	07-55-04
1989	S. Santiam R.	South Santiam	smolt	03/06/91		10.0	27,135	SFk Santiam River	--
1989	S. Santiam R.	South Santiam	smolt	03/06/91	--	10.0	13,365	SFk Santiam River	07-55-04
1989	S. Santiam R.	South Santiam	slnolt	03/05/91		10.1	28,287	SFk Santiem River	
1989	S. Santiam R.	South Santiam	smoit	03/05/91		10.1	13,931	SFk Santiam River	07-55-04
1989	S. Santiam R.	South Santiam	smolt	03/05/91		IQ.5	30,533	SFk Santiam River	--
1989	S. Santiam R.	South Santiam	smolt	03/05/91		IQ.5	15,037	SFk Santiam River	07-55-04
1989	S- Santiam R.	South Santiam	smolt	03/05/91	--	IQ.6	56,711	SFk Santiam River	--
1989	S. Santiam R.	South Santiem	smolt	03/05/91	--	10.6	27,930	SFk Santiam River	07-55-04
1989	S. Santiam R.	South Santiam	smoit	03/05/91	--	11.2	29,716	SFk Santiam River	--
1989	S. Santiam R.	South Santiam	snlolt	03/05/91		11.2	14,636	SFk Santiam River	07-55-04
1990	N- Santiam R.	Marion Forks	fing.	07/17/91	--	82.0	28,679	Detroit Reservoir	
1990	I- Santism R.	Marion Forks	fing.	07/17/91	--	102.0	61,687	Detroit Reservoir	--
1990	S. Santiam R.	Dexter Pond	snwlt	11/12/91	--	8.7	65,064	SFk Santiam River	
1990	S. Santism R.	Dexter Pond	smolt	11/12/91		8.7	32,042	SFk Santiam River	07-56-26
1990	S. Santiam R.	Dexter Pond	smolt	11/12/91	--	8.8	11,910	SFk Santiam River	--
1990	S. Santiam R.	Dexter Pond	smolt	11/12/91	--	8.8	5,866	SFk Santiam River	07-56-26
1990	S. Santiam R.	Dexter Pond	snlolt	11/12/91	--	9.0	22,220	SFk Santiam River	--
1990	S. Santiam R.	Dexter Pond	smolt	11/12/91	--	9.0	10,942	SFk Santiam River	07-56-26
1990	S. Santiam R.	Dexter Pond	smolt	11/12/91	--	9.2	8,445	SFk Santiam River	--
1990	S. Santiam R.	Dexter Pond	smolt	11/12/91	--	9.2	4,159	SFk Santiam River	07-56-26
1990	S. Santiam R.	Dexter Pond	smolt	11/13/91	11/14/91	9.4	72,928	SFk Santiam River	--
1990	S. Santiam R.	Dexter Pond	smolt	11/13/91	11/14/91	9.4	28,344	SFk Santiam River	07-56-26
1990	S- Santiam R.	Dexter Pond	slnolt	11/12/91	11/13/91	9.5	45,320	SFk Santiam River	--
1990	S. Santiam R.	Dexter Pond	smolt	11/12/91	11/13/91	9.5	15,040	SFk Santiam River	07-56-26
1990	S. Santiam R.	Dexter Pond	smolt	11/13/91	--	9.7	53,096	SFk Santiam River	--
1990	S. Santiam R.	Dexter Pond	smolt	11/13/91		9.7	12,417	SFk Santiam River	07-56-26
1990	S. Santiam R.	Dexter Pond	smolt	11/13/91	--	9.8	46,091	SFk Santiam River	--
1990	S. Santiam R.	Dexter Pond	smolt	11/13/91		9.8	7,761	SFk Santiam River	07-50-26

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Fin Clip Code[b]
1990	S. Santiam R.	Dexter Pond	smolt	11/13/91	--	9.8	14,936	SFk Santiam River	07-56-26
1990	S. Santiam R.	Dexter Pond	smolt	11/12/91	--	9.9	14,726	SFk Santiam River	--
1990	S. Santiam R.	Dexter Pond	smolt	11/12/91	--	9.9	7,252	SFk Santiam River	07-56-26

a Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).
b North Santiam, South Santiam, Clackamas, and Middle Fork Willamette rivers stocks, and Eagle Creek stock are all considered part of the Willamette River stock.
c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = ieft maxiliary fin clip; RM = right maxiliary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.
d Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.
e Fall Creek Reservoir stock.
f Uillamette Fish Hatchery stock.
g This coded wire tag mark is recorded as having been used to tag juvenile fall chinook salmon released into the lower Columbia River subbasin.
h Juveniles with this tag group were also released into the Yamhill, Luckiamute, and Marys rivers and Rickreal Creek subbasin.

Table 2 (RH-1). Total escapement of spring chinook to the Marion Forks Hatchery by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1967	--	211	1,511	1,131	--	2,053	2,642

[a] Modified from Bennett (1990).
[b] Transformation of data from run year to brood year is based on age composition of return8 to South Santiam Hatchery (Smith et al. 1987, as reported in Oregon Department of Fish and Wildlife 1990), and assumes that: brood year + age = run year.

Table 3 (RH-2). Total escapement of spring chinook to the South Santiam Hatchery by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1967	--	158	1,015	523	--	1,696	1,538

[a] Modified from Bennett (1990).
[b] Transformation of data from run year to brood year is based on age composition of returns to South Santiam Hatchery (Smith et al. 1987, as reported in Oregon Department of Fish and Wildlife 1990), and assumes that: brood year + age = run year.

Table 4 (AC). Age composition (freshwater.ocean[a]) by brood year for spring chinook at Foster Dam[b,c].

Brood Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	2.1	2.2	2.3
1964	391	--	--	--	--	3	47	50
1965	926	--	--	--	—	3	53	44
1966	1,694	--	--	--	--	7	61	32
1967	5,123	--	--	--	--	3	83	14
1968	1,301	--	--	--	--	6	32	62
1969	3,428	--	--	--	--	2	46	52

[a] Assuming that fish spend 2 years in freshwater, and that freshwater and ocean ages sum to the total age of the fish.

[b] Modified from Smith et al. (1987, cited by Oregon Department of Fish and Wildlife 1990).

[c] Information was taken from fish that returned to South Santiam Hatchery, which includes an unknown proportion of naturally produced fish.

Table 5 (AR). Emigration of coded wire tagged hatchery spring chinook salmon released as juveniles in the Santiam and Calapooia rivers subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Santiam[c]	Elk River, OR	Hatchery Returns		
	1982		1	1
Santiam[c]	McKenzie River	Hatchery Returns		
	1982	--	2	2
	1983	--	--	--
	1984	--	--	--
	1985	--	--	--
	1986	--	--	--
	1987	--	--	--
	1988	--	1	1
Santiam[c]	Middle Fork River	Hatchery Returns		
	1982	--	15	15
	1983	--	1	1
	1984	--		--
	1985	--	1	1
Santiam[c]	Rogue River	Hatchery Returns		
	1988	--	1	1
Santiam[c]	Salmon River	Hatchery Returns		
	1979	--	1	1
	1980	--	1	1
Santiam[c]	Willamette River	Trap Returns		
	1988	--	2	4

a Based on the following tag codes: 07-17-30, 07-19-20, 07-19-21, 07-19-27, 07-19-43, 07-19-45, 07-19-46, 07-20-20, 07-20-21, 07-20-22, 07-22-47, 07-25-30, 07-36-57, 07-36-60, 07-36-61, 07-39-47, 09-16-21.

(cont.)

Table 5 (AE). (cont.) Emigration of coded wire tagged hatchery spring chinook salmon released as juveniles in the Santiam and Calapooia rivere aubbasin[a, b].

b Modified from Pacific States Marine Fisheries Commission's coded wire tag database.
c Santiam and Calapooia rivers subbasin.

Table 6 (TD). Parasites and diseases of spring chinook at hatcheries located in the Santiam River[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Marion Forks	*Epistylis sp.*
Parasite	Marion Forks	Gill amoeba
Parasite	Marion Forks	*Trichodina spp.*
Parasite	South Santiam	*Epistylis sp.*
Parasite	South Santiam	*Ceratomyxa shasta*
Bacteria	Marion Forks	Furunculosis *(Aeromonas salmonicida)*
Bacteria	Marion Forks	Gill disease
Bacteria	Marion Forks	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Marion Forks	Enteric redmouth *(Yersinia* ruckeri)
Bacteria	Marion Forks	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Marion Forks	*Aeromonas*
Bacteria	Marion Forks	*Pseudomonas*
Bacteria	South Santiam	Furunculosis *(Aeromonas salmonicida)*
Bacteria	South Santiam	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	South Santiam	Enteric redmouth (Yersinia *ruckeri)*
Bacteria	South Santiam	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	South Santiam	*Aeromonas*
Bacteria	South Santiam	*Pseudomonas*
Virus	Marion Forks	Infectious Hematopoietic Necrosis (IHN)
Virus	Marion Forks	Erythrocytic Inclusion Body Syndrome (EIBS)
Virus	South Santiam	Erythrocytic Inclusion Body Syndrome (EIBS)

[a] Personal communication, 1991, A. Amandi, Oregon Department of Fish and Wildlife, Research and Development Section, Corvallis, Oregon.

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SANTIAM RIVER SUBBASIN

Naturally Produced Fall Chinook Salmon

GEOGRAPHIC LOCATION

The Santiam and Calapooia rivers are regarded as one subbasin, and termed the Santiam and Calapooia rivers subbasin. For management purposes, Mill Creek is included as part of the Santiam and Calapooia rivers subbasin (Oregon Department of Fish and Wildlife 1990).

The Santiam River flows into the Willamette River at River Mile (RM) 108. At Santiam River RM 11.7, the river forks into the North Santiam and the South Santiam rivers. The Santiam River system drains an area of 1,827 square miles (Oregon Department of Fish and Wildlife 1990; see SANTIAM RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1).

The Calapooia River flows into the Willamette River at RM 119.5. The Calapooia River system drains an area of 374 square miles (Oregon Department of Fish and Wildlife 1990).

Mill Creek enters the Willamette River at RM 83.

ORIGIN

Fall chinook are not native to the Santiam and Calapooia rivers subbasin. A naturally producing population of fall chinook developed in the late 1960's as a result of hatchery releases in the subbasin (see SANTIAM RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon; Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Natural production occurs in the mainstem Santiam River, the North Santiam River up to Valentine Creek, the South Santiam River up to Hamilton Creek, Shelton Ditch, and the Salem Canal (Oregon Department of Fish and Wildlife 1990). Available spawning and rearing habitat in the Santiam River is rated as primarily of "good" quality (Tables 1 and 2).

Natural spawning is thought to be minimal or non-existent in the Calapooia River (Oregon Department of Fish and Wildlife 1990).

Fall chinook spawn and rear in Mill Creek (Oregon Department of Fish and Wildlife 1990). Available spawning and rearing habitat in Mill Creek is rated as primarily of "good" quality (Tables 3 and 4).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced fall chinook in the Santiam River system are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife 1989, cited by Oregon Department of Fish and Wildlife (1990).

No information is available on sport catch in the Calapooia River or Mill Creek.

The Santiam and Calapooia river systems have been closed to fall chinook angling since 1986 (Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of run size for naturally produced fall chinook in the Santiam River system are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

The current fall chinook run in the Calapooia River is believed to be minimal or non-existent (Oregon Department of Fish and Wildlife 1990). Although brood year specific estimates of run size for naturally produced fall chinook in the Calapooia River system are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Although brood year specific estimates of run size for naturally produced fall chinook in Mill Creek are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Numbers: No brood year specific estimates of spawner escapement are available for the Santiam and Calapooia rivers subbasin. Spawning ground counts are available for the mainstem Santiam River, the North and South Santiam, and Mill Creek in Hansen (1977, cited by Oregon Department of Fish and Wildlife 1990), Hansen (1978, cited by Oregon Department of Fish and Wildlife 1990), Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990), Smith et al. (1982, cited by Oregon Department of Fish and Wildlife 1990), and in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

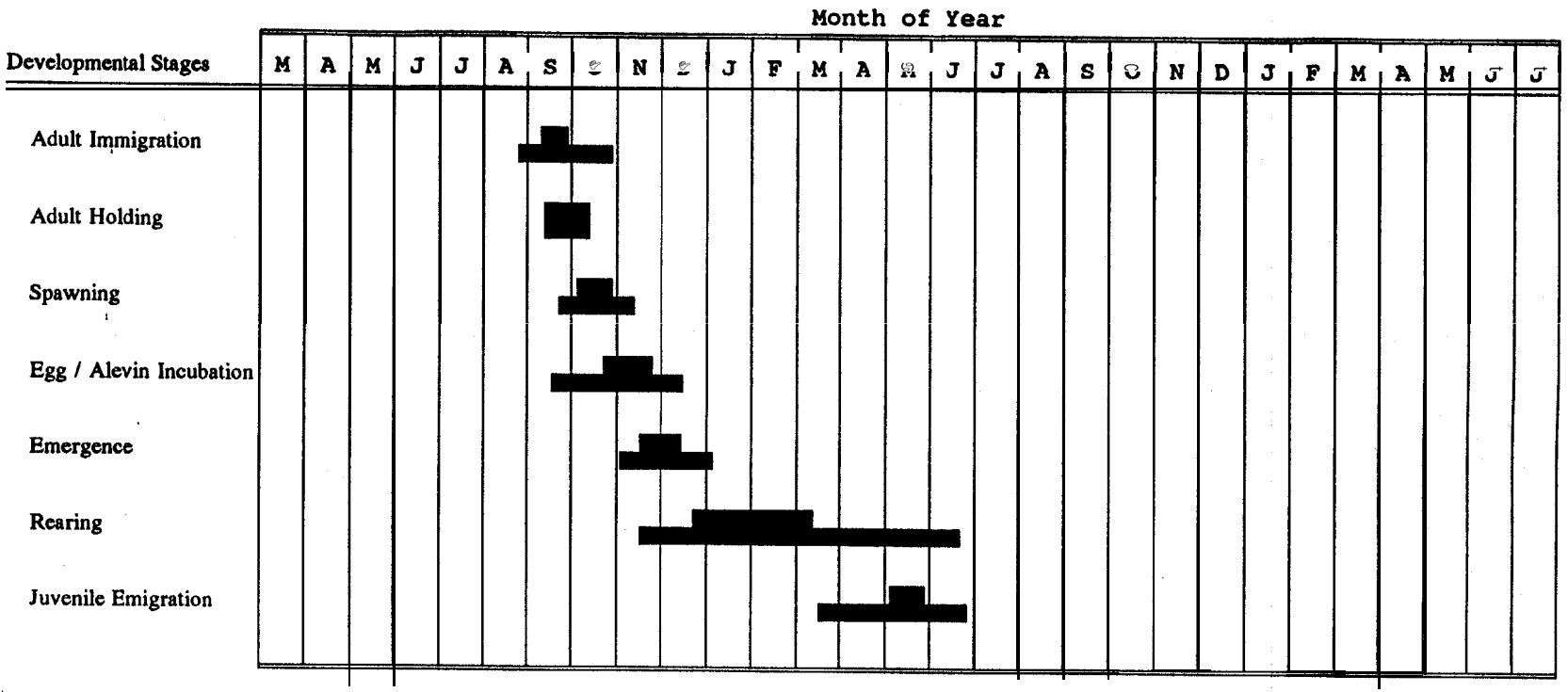
Spawning ground counts are available for the Calapooia River in Oregon Department of Fish and Wildlife (1990).

Strays

Coded wire tagged hatchery fall chinook, released as juveniles in the Elk River on the southern Oregon coast, were recovered in the Santiam and Calapooia rivers subbasin (Table 5).

Ratio

Although information on the sex ratio of naturally produced fall chinook is not available, information from returns of naturally and hatchery produced fish combined are available in Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990).



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.

Figure 1 (TT). Fall chinook freshwater life history in the Santiam River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (FIB-l). Estimated amount of spawning and rearing habitat by quality of Santiam River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	77.9	22.1	0.0	--	53.0	--
Acres (%)	--	--	--	--	a-	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratinge of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humane.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Santiam River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical feature8 such as waterfall barriers, as well as degradation caused by humans.

Table 3 (HB-3). Estimated amount of spawning and rearing habitat by quality of Mill Creek subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	80.0	20.0	0.0	--	18.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwent Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 4 (HB-4). Estimated amount of rearing only habitat by quality of Mill Creek subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 5 (AI). Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the Santiam and Calapooia rivers subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Elk River, OR	Santiam[c] 1987	Trap Returns --	1	1

[a] Based on the following tag codes: 07-29-24.
[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.
[c] Santiam and Calapooia rivers subbasin.

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SANTIAM RIVER SUBBASIN

Hatchery Produced Fall Chinook Salmon

ORIGIN

Hatchery fall chinook releases in the Santiam and Calapooia rivers subbasin have been mainly from the Willamette River substock of Lower Columbia River Hatchery (LRH) stock (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, ORIGIN). The Cowlitz substock of the LRH stock has been released on an experimental basis (Oregon Department of Fish and Wildlife 1990). The LRH fall chinook stock is informally called a "tule" fall chinook (Howell et al. 1985).

Fall chinook have been released to establish a self-sustaining run in the subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Currently, smolts from the Willamette substock of LRH stock fall chinook are primarily released into Mill Creek and the North and South Santiam rivers (Oregon Department of Fish and Wildlife 1990). Smolts from the 1978-84 broods reared at Stayton Pond were released from late March through June (Smith et al. 1985, cited by Oregon Department of Fish and Wildlife 1990).

Experimental releases from the Cowlitz substock of LRH stock fall chinook were made into Mill Creek from 1971-77, but were discontinued due to an undependable egg supply (Howell et al. 1985).

No releases have been made into the Calapooia River since 1968 (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

There is no information available that is specific to fry releases. Information on fry and fingerlings combined are presented in PRODUCTION, Fingerling.

Fingerling

This section includes information on releases of fry and fingerlings combined. Hatchery facilities in which fish were reared or acclimated prior to release in the subbasin include Big Creek, Bonneville, Cascade, Oxbow, Salem, Big Creek, Bonneville, and Sandy hatcheries, and Stayton and Aumsville ponds. Annual numbers released ranged from

48,876 to 7,152,695 fish (Table 1). Size at release ranged from 120.9 to 20.5 fish per pound (Table 1).

Smolts

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Big Creek and Salem hatcheries and Aumsville and Stayton ponds (Table 1). Annual numbers released ranged from 259,075 to 11,047,717 fish (Table 1). Size at release is unknown.

Jack and Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery fall chinook in the Santiam River system are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1989, cited by Oregon Department of Fish and Wildlife 1990).

No information is available on sport catch in the Calapooia River or Mill Creek.

The Santiam and Calapooia river systems have been closed to fall chinook angling since 1986 (Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of hatchery fall chinook run size in the Santiam and Calapooia rivers subbasin are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Hatchery Facilities

There are no hatchery facilities located in the subbasin that collect or spawn returning fish for subbasin hatchery production.

Sex Ratio

Although information on the sex ratio (percent females) of hatchery fall chinook is not available, information from returns of naturally and hatchery produced fish combined are available in Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery fall chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release location	CWT Code/ Fin Clip[c]
--	LRH	Oxbow	d	01/01/65	12/31/65[e]	--	860,790	North Santiam River	
--	LRH	Bonneville	d	01/01/65	12/31/65[e]	--	800,000	South Santiam River	
--	LRH	Oxbow	d	01/01/66	12/31/66[e]	--	499,994	South Santiam River	
--	LRH	Cascade	d	01/01/66	12/31/66[e]	--	350,000	North Santiam River	--
--	LRH	Big Creek	d	01/01/66	12/31/66[e]	--	500,187	North Santiam River	--
--	LRH	Bonneville	d	01/01/67	12/31/67[e]	--	500,000	Thomas Creek	
--	LRH	Bonneville	d	01/01/67	12/31/67[e]	--	2,000,000	South Santiam River	--
--	LRH	Bonneville	d	01/01/67	12/31/67[e]	--	485,000	Calapooia River	--
--	LRH	Cascade	d	01/01/67	12/31/67[e]	--	504,432	North Santiam River	
--	LRH	Cascade	d	01/01/67	12/31/67[e]	--	785,000	Calapooia River	--
--	LRH	Cascade	d	01/01/67	12/31/67[e]	--	795,000	Little North Santiam	--
--	LRH	Cascade	d	01/01/67	12/31/67[e]	--	408,000	North Santiam River	--
--	LRH	Cascade	d	01/01/67	12/31/67[e]	--	396,000	Stout Creek	--
--	LRH	Bonneville	d	01/01/68	12/31/68[e]	--	172,572	North Santiam River	--
--	LRH	Bonneville	d	01/01/68	12/31/68[e]	--	100,076	Stayton Pond	--
--	LRH	Bonneville	d	01/01/68	12/31/68[e]	--	511,274	Middle Santiam River	--
--	LRH	Bonneville	d	01/01/68	12/31/68[e]	--	495,658	South Santiam River	--
--	LRH	Cascade	d	01/01/68	12/31/68[e]	--	521,400	North Santiam River	--
--	LRH	Cascade	d	01/01/68	12/31/68[e]	--	1,254,815	Calapooia River	
--	LRH	Big Creek	d	01/01/68	12/31/68[e]	--	114,070	Santiam River	--
--	LRH	Big Creek	d	01/01/68	12/31/68[e]	--	257,298	South Santiam River	--
--	LRH	Salem	smolt	01/01/68	12/31/68[e]	--	1,741,317	Mill Creek	
--	LRH	Sandy	d	01/01/69	12/31/69[e]	--	48,876	Foster Reservoir	
--	LRH	Salem	smolt	01/01/69	12/31/69[e]	--	1,248,796	Mill Creek	
--	LRH	Big Creek	smolt	01/01/69	12/31/69[e]	--	246,140	South Santiam River	--
--	LRH	Stayton	smolt	01/01/69	12/31/69[e]	--	29,459	North Santiam River	--
--	LRH	Stayton	d	01/01/70	12/31/70[e]	--	4,120,074	North Santiam River	
--	LRH	Salem	smolt	01/01/70	12/31/70[e]	--	380,525	Mill Creek	--
--	LRH	Aumsville	smolt	01/01/70	12/31/70[e]	--	4,899,780	South Santiam River	--
--	LRH	Aumsville	d	01/01/71	12/31/71[e]	--	792,238	North Santiam River	--
--	LRH	Salem	d	01/01/71	12/31/71[e]	--	10,080	Mill Creek	--
--	LRH	Salem	smolt	01/01/71	12/31/71[e]	--	464,693	Mill Creek	--
--	LRH	Stayton	smolt	01/01/71	12/31/71[e]	--	3,737,296	North Santiam River	--
--	LRH	Aumsville	smolt	01/01/71	12/31/71[e]	--	4,531,460	North Santiam River	--
--	LRH	Salem	smolt	01/01/72	12/31/72[e]	--	867,790	Hill Creek	--
--	LRH	Stayton	smolt	01/01/72	12/31/72[e]	--	3,831,618	Stayton Pond	--
--	LRH	Aumsville	smolt	01/01/72	12/31/72[e]	--	3,758,318	South Santiam River	--
--	LRH	Aumsville	smolt	01/01/72	12/31/72[e]	--	106,296	Mill Creek	--
--	LRH	Salem	smolt	01/01/73	12/31/73[e]	--	1,749,294	Mill Creek	--

Table 1 (TR). (cont.) Hatchery fell chinook releases into the Santiem and Calapooia rivers subbasin by brood year end, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release location	CWT Code/ Fin Clip[c]
--	LRH	Stayton	slmlt	01/01/73	12/31/73[e]	--	4,365,456	North Santiam River	--
--	LRH	Aumsville	smolt	01/01/73	12/31/73[e]	--	3,391,307	South Santiem River	--
--	LRH	Aussville	smolt	01/01/73	12/31/73[e]	--	1,541,660	Mill Creek	--
--	LRH	Stayton	smolt	01/01/74	12/31/74[e]	--	4,019,625	North Santiam River	--
--	LRH	Stayton	smolt	01/01/74	12/31/74[e]	--	1,512,154	South Santiam River	--
--	LRH	Aunsville	smolt	01/01/74	12/31/74[e]	--	2,386,835	Mill Creek	--
--	LRH	Aumsville	smolt	01/01/74	12/31/74[e]	--	1,477,388	South Santiam River	--
--	LRH	Aunsville	smolt	01/01/75	12/31/75[e]	--	1,409,793	Mill Creek	--
--	LRH	Aumsville	smolt	01/01/75	12/31/75[e]	--	3,977,710	North Santiam River	--
--	LRH	Aunsville	smolt	01/01/75	12/31/75[e]	--	2,034,782	Crabtree Creek	--
--	LRH	Stayton	smolt	01/01/76	12/31/76[e]	--	62,700	Crebtree Creek	--
--	LRH	Stayton	smolt	01/01/76	12/31/76[e]	--	873,561	South Santiam River	--
--	LRH	Aunsville	smolt	01/01/76	12/31/76[e]	--	1,170,048	Crabtree Creek	--
--	LRH	Aunsville	smolt	01/01/76	12/31/76[e]	--	163,222	South Santiam River	--
--	LRH	Aumsville-Stayton	smolt	01/01/77	12/31/77[e]	--	259,075	Mill Creek	--
--	LRH	Stayton	smolt	01/01/79	12/31/79[e]	--	421,353	North Santiam River	--
--	LRH	Stayton	smolt	01/01/79	[illegible]	--	380,645	Middle Santiam River	--
--	LRH	Stayton	smolt	01/01/79	12/31/79[e] 12/31/79[e]	--	1,862,860	South Santiem River	--
--	LRH	Stayton	[illegible]	01/01/80	12/31/80[e]	--	71,065	North Santiam River	--
--	LRH	Stayton	smolt	01/01/80	12/31/80[e]	--	263,225	Santiam River	--
--	LRH	Stayton	smolt	01/01/80	12/31/80[e]	--	713,655	North Santiam River	--
--	LRH	Stayton	smolt	01/01/80	12/31/80[e]	--	382,525	Middle Santiem River	--
--	LRH	Stayton	smolt	01/01/80	12/31/80[e]	--	2,189,665	South Santiam River	--
1980	Tanner Creek	Aussville Ponds	fing.	04/28/81	--	72.5	74,439	MFk Santiam River	--
1980	Tanner Creek	Aussville Ponds	fing.	04/28/81	--	72.5	298	MFk Santiam River	AD-CUT
1980	Tanner Creek	Aumsville Ponds	fing.	04/28/81	--	75.4	75,737	MFk Santiam River	--
1980	Tanner Creek	Aunsville Ponds	fing.	04/28/81	--	75.4	457	MFk Santiam River	AD-CUT
1980	Tanner Creek	Aunsville Ponds	fing.	05/01/81	--	81.4	83,423	Santiam River and NFk-1	--
1980	Tanner Creek	Aumsville Ponds	fing.	05/01/81	--	81.4	419	Santiem River and NFk-1	AD-WT
1980	Tanner Creek	Aunsville Ponds	fing.	04/28/81	--	70.4	66,257	SFk Santiem River	--
1980	Tanner Creek	Aunsville Ponds	fing.	04/28/81	--		199	SFk Santiam River	AD-CUT
1980	Tanner Creek	Aussville Ponds	fing.	04/27/81	--	70.9	73,609	SFk Santiam River	--
1980	Tanner Creek	Aumsville Ponds	fing.	04/27/81	--	70.9	221	SFk Santiam River	AD
1980	Tanner Creek	Aussville Ponds	fing.	04/28/81	--	74.4	74,829	SFk Santiam River	--
1980	Tanner Creek	Aunsville Ponds	fing.	04/28/81	--	74.4	376	SFk Santiam River	AD-CUT
1980	Tanner Creek	Aumsville Ponds	fing.	04/27/81	--	75.9	79,550	SFk Santiam River	--
1980	Tanner Creek	Aunsville Ponds	fing.	04/27/81	--	75.9	239	SFk Santiam River	AD-WT
1980	Tanner Creek	Aumsville Ponds	fing.	05/01/81	--	85.1	87,296	SFk Santiam River	--
1980	Tanner Creek	Aumsville Ponds	fing.	05/01/81	--	85.1	526	SFk Santiam River	AD-CUT
1980	Tanner Creek	Aunsville Ponds	fing.	05/01/81	--	99.5	71,211	SFk Santiam River	--

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded uire tag code[a].

Brood Year	stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1980	Tanner Creek	Aumsville Ponds	fing.	05/01/81	--	99.5	429	SFk Santiam River	AD-CUT
1980	Tahner Creek	Stayton Pond	fing.	06/01/81	--	20.5	2,362	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	06/01/81	--	20.5	16	Santiam River and NFL-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	06/01/81	--	23.3	2,773	Santiem River and Nfk-1	··
1980	Tanner Creek	Stayton Pond	fing.	06/01/81	--	23.3	22	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	06/01/81	--	64.7	5,478	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	06/01/81	--	64.7	22	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	69.2	92,451	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	69.2	371	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	69.5	96,289	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	69.5	386	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	70.7	95,118	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	70.7	381	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	71.0	170,528	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	71.0	684	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	72.4	75,866	Sentiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fins.	04/29/81	--	72.4	228	Santiam River and NFk-1	AD-CUT
1980	fanner Creek	Stayton Pond	fing.	04/28/81	--	72.6	126,450	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	72.6	635	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	73.0	69,190	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	73.0	208	Santiam River and NFk-1	CUT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	- -	74.7	70,738	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	74.7	284	Santiam River and NFk-1	CUT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	04/28/81	75.1	134,266	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	75.1	416	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	75.1	130	Santiam River and NFL-1	CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	75.2	70.401	Santiam River and NFL-1	··
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	75.2	-353	Santiam River and NFk-1	CUT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	77.1	99,943	Santiam River and NFL-1	··
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	77.1	300	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	05/27/81	--	85.1	56,076	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	05/27/81	--	85.1	509	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	05/06/81	--	89.0	8,101	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	05/18/81	--	92.7	19,284	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	05/18/81	--	92.7	175	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	05/08/81	--	93.4	23,418	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	05/08/81	--	93.4	212	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	05/15/81	--	93.9	12,390	Santiam River and NFk-1	··
1980	Tanner Creek	Stayton Pond	fing.	05/15/81	--	93.9	99	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fins.	05/29/81	--	97.3	14,205	Santiam River and NFk-1	··

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tog code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1980	Tanner Creek	Stayton Pond	fing.	05/29/81		97.3	100	Santiam River and NFL-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	05/20/81	--	99.5	10,777	Santiam River and NFk-1	· ·
1980	Tanner Creek	Stayton Pond	fing.	05/20/81	--	99.5	65	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	05/11/81	--	99.7	29,218	Santiam River and NFk-1	· ·
1980	Tanner Creek	Stayton Pond	fing.	05/11/81	--	99.7	205	Santiem River end NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	05/06/81	--	100.0	6,193	Santiam River and NFk-1	· ·
1980	Tanner Creek	Stayton Pond	fing.	05/06/81	--	100.0	107	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	05/22/81	--	104.2	2,072	Santiam River and NFk-1	· ·
1980	Tanner Creek	Stayton Pond	fing.	05/22/81	--	104.2	12	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	06/01/81	--	120.9	12,022	Santiam River and NFk-1	· ·
1980	Tanner Creek	Stayton Pond	fing.	06/01/81	--	120.9	72	Santiam River and NFk-1	AD-CUT
1980	Tanner Creek	steyton Pond	fing.	04/28/81	--	68.0	62,922	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	68.0	252	SFk Santiam River	AD-CWT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81		70.8	130,579	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	70.8	520	SFk Santiam River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	70.9	106.752	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	70.9	-428	SFk Santiam River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	71.2	103,411	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	71.2	519	SFk Santiam River	AD-CUT
1980	Tanner Creek	steyton Pond	fing.	04/28/81	--	71.3	171,464	SFk Sentiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	71.3	343	SFk Santiam River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	71.6	94,147	SFk Santiam River	· ·
1980	Tamer Creek	Stayton Pond	fing.	04/28/81	--	71.6	378	SFk Santiam River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	71.9	32,970	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	71.9	132	SFk Santiam River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81		72.0	98,328	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	72.0	394	SFk Santiam River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	72.3	71,959	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/28/81		72.3	361	SFk Santiem River	CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81		73.5	142,065	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	73.5	642	SFk Santiam River	CWT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	74.6	67,295	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	74.6	202	SFk Santiam River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	04/29/81	74.8	169,747	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	74.8	493	SFk Santiam River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/29/81		74.8	359	SFk Santiam River	CUT
1980	Tanner Creek	Stayton Pond	fing.	04/28/81		75.1	101,667	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/28/81	--	75.1	510	SFk Santiam River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	78.8	73,865	SFk Santiam River	· ·
1980	Tanner Creek	Stayton Pond	fing.	04/27/81		78.8	222	SFk Santiam River	AD-CUT

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Santiem and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1980	Tanner Creek	Stayton Pond	fing.	04/30/81	--	82.0	39,213	SFk Sentiam River	--
1980	Tanner Creek	Stayton Pond	fing.	04/30/81	--	82.0	157	SFk Santiem River	AD-CUT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	--	82.8	102,734	SFk Santiam River	--
1980	Tanner Creek	Stayton Pond	fins.	04/27/81	--	82.8	516	SFk Santiam River	AD-CUT
1981	Tanner Creek	Stayton Pond	fing.	05/04/82	05/05/82	84.9	383,294	MFk Sentiam River	--
1981	Tanner Creek	Stayton Pond	fing.	05/04/82	05/05/82	84.9	14,726	MFk Sentiem River	07-26-62[f]
1981	Tanner Creek	Stayton Pond	fing.	05/03/82	05/21/82	90.7	1,312,743	Sentiam River and NFk-1	--
1981	Tanner Creek	Steyton Pond	fing.	05/03/82	05/21/82	90.7	56,123	Santiem River and NFk-1	07-26-62[f]
1981	Tanner Creek	Stayton Pond	fing.	05/03/82	05/06/82	87.7	2,199,699	SFk Sentiem River	--
1981	Tanner Creek	Stayton Pond	fing.	05/03/82	05/06/82	87.7	101,241	SFk Sentiem River	07-26-62[f]
1982	Tanner creek	Stayton Pond	fing.	04/26/83	05/04/83	77.4	830,183	Mill Creek	--
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	05/04/83	77.4	3,693	Hill Creek	07-23-28[g,h]
1982	Tanner Creek	Stayton Pond	fins.	04/26/83	05/04/83	77.4	3,693	Mill Creek	07-28-30[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	05/04/83	77.4	3,693	Mill Creek	07-28-31[i]
1982	Tanner Creek	Steyton Pond	fing.	04/26/83	05/04/83	77.4	3,693	Mill Creek	07-28-32[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	05/04/83	77.4	3,693	Hill Creek	07-28-33[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	05/04/83	77.4	3,693	Mill Creek	07-28-34[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	76.6	150,878	NFk Mill Creek	--
1982	Tanner Creek	Stayton Pond	fins.	04/26/83	04/28/83	76.6	487	NFk Mill Creek	07-23-28[g,h]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	76.6	487	NFk Mill Creek	07-28-30[i]
1982	Tanner Creek	Steyton Pond	fing.	04/26/83	04/28/83	76.6	487	NFk Hill Creek	07-28-31[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	76.6	487	NFk Mill Creek	07-28-32[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	76.6	487	NFk Mill Creek	07-28-33[i]
1982	Tanner Creek	steyton Pond	fing.	04/26/83	04/28/83	76.6	487	NFk Mill Creek	07-28-34[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	--	78.3	75,881	MFk Sentiam River	--
1982	Tanner Creek	Steyton Pond	fing.	04/26/83	--	78.3	271	MFk Santiam River	07-23-28[g,h]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	--	78.3	271	MFk Santiam River	07-28-30[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	--	78.3	271	MFk Santiam River	07-28-31[i]
1982	Tanner Creek	Steyton Pond	fing.	04/26/83	--	78.3	271	MFk Sentiem River	07-28-32[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	--	78.3	271	MFk Santiem River	07-28-33[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	--	78.3	271	MFk Sentiem River	07-28-34[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	05/20/83	81.0	1,413,797	Sentiam River end NFk-1	--
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	05/20/83	81.0	7,789	Santiam River and NFk-1	07-23-28[g,h]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	05/20/83	81.0	7,789	Santiam River and NFk-1	07-28-30[i]
1982	Tanner Creek	Steyton Pond	fing.	04/26/83	05/20/83	81.0	7,789	Sentiem River and NFk-1	07-28-31[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	05/20/83	81.0	7,789	Santiem River and NFk-1	07-28-32[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	05/20/83	81.0	7,789	Sentiam River and NFk-1	07-28-33[h]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	05/20/83	81.0	7,789	Sentiem River and NFL-1	07-28-34[i]
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	76.4	1,804,878	SFk Sentiam River	--
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	76.4	7,713	SFk Santiam River	07-23-28[g,h]

Table 1 (TR). (cont.) Hatchery fall chinook relesses into the Sentiam end Calapooia rivers subbasin by brood year end, if marked, coded wire tog code.

Brood Year	Stock	Hatchery	Life Stage	Relesse Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Fin Clip	Code
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	76.4	7,713	SFk Santiam River	07-28-30	i
1982	Tanner Creek	Steyton Pond	fing.	04/26/83	04/28/83	76.4	7,713	SFk Sentiam River	07-28-31	i
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	76.4	7,713	SFk Santism River	07-28-32	i
1982	Tanner Creek	Steyton Pond	fing.	04/26/83	04/28/83	76.4	7,713	SFk Santiam River	07-28-33	i
1982	Tanner Creek	Stayton Pond	fing.	04/26/83	04/28/83	76.4	7,713	SFk Sentiam River	07-28-34	i
1983	Tanner Creek	Steyton Pond	fing.	05/09/84	05/23/84	57.5	595,698	Mill Creek	--	
1983	Tanner Creek	Steyton Pond	fing.	05/09/84	05/23/84	57.5	3,684	Mill Creek	07-31-44	i
1983	Tanner Creek	Stayton Pond	fing.	05/09/84	05/23/84	57.5	3,684	Mill Creek	07-31-45	i
1983	Tanner Creek	Stayton Pond	fing.	05/09/84	05/23/84	57.5	3,684	Mill Creek	07-31-46	i
1983	Tanner Creek	Stayton Pond	fing.	05/09/84	05/23/84	57.5	3,684	Mill Creek	07-31-47	i
1983	Tanner Creek	Stayton Pond	fing.	05/09/84	05/23/84	57.5	3,684	Mill Creek	07-31-48	i
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/31/84	59.4	1,159,902	Santiam River and NFk-1	--	
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/31/84	59.4	7,421	Sentiam River and NFk-1	07-31-44	i
1983	Tanner Creek	Stayton Pond	fing.			59.4	7,421	Santiam River end NFk-1	07-31-45	i
1983	Tanner Creek	Stayton Pond	fing.	05/08/84 05/08/84	05/31/84 05/31/84	59.4	7,421	Santiem River and NFk-1	07-31-46	i
1983	Tanner Creek	Stayton Pond	fing.	05/08/84	05/31/84	59.4	7,421	Santiem River end NFk-1	07-31-47	i
1983	Tanner Creek	Steyton Pond	fine.	05/08/84	05/31/84	59.4	7,421	Santiem River and NFk-1	07-31-48	i
1983	Tanner Creek	Steyton Pond	fins.	05/09/84	05/15/84	56.4	1,363,725	SFk Santiam River	--	
1983	Tanner Creek	Steyton Pond	fins.	05/09/84	05/15/84	56.4	8,145	SFk Sentiam River	07-31-44	i
1983	Tanner Creek	Stayton Pond	fing.	05/09/84	05/15/84	56.4	8,145	SFk Sentiam River	07-31-45	i
1983	Tanner Creek	Stayton Pond	fing.	05/09/84	05/15/84	56.4	8,145	SFk Santiem River	07-31-46	i
1983	Tanner Creek	Steyton Pond	fing.	05/09/84	05/15/84	56.4	8,145	SFk Santiem River	07-31-47	i
1983	Tanner Creek	Stayton Pond	fing.	05/09/84	05/15/84	56.4	8,145	SFk Santiam River	07-31-48	i
1984	Tamer Creek	Stayton Pond	fins.	05/14/85	05/31/85	54.5	594,956	Hill Creek	--	
1984	Tanner Creek	Stayton Pond	fins.	05/14/85	05/31/85	54.5	5,999	Mill Creek	07-33-52	j
1984	Tanner Creek	Steyton Pond	fins.	05/14/85	05/31/85	54.5	5,999	Mill Creek	07-33-53	j
1984	Tanner Creek	Stayton Pod	fing.	05/14/85	05/31/85	54.5	5,999	Mill Creek	07-33-54	j
1984	Tanner Creek	Stayton Pond	fing.	05/14/85	05/31/85	54.5	5,999	Mill Creek	07-33-55	j
1984	Tanner Creek	Steyton Pond	fing.	05/14/85	05/31/85	54.5	5,999	Mill Creek	07-33-56	j
1984	Tanner Creek	Steyton Pond	fins.	05/31/85	--	52.6	67,354	Santiem River and NFk-1	--	
1984	Tanner Creek	Steyton Pond	fing.	05/31/85	--	52.6	605	Santiam River and NFk-1	07-33-52	j
1984	Tanner Creek	Steyton Pond	fing.	05/31/85	--	52.6	605	Santiam River end NFk-1	07-33-53	j
1984	Tanner Creek	Steyton Pond	fing.	05/31/85	--	52.6	605	Santiam River and NFk-1	07-33-54	j
1984	Tanner Creek	Stayton Pond	fing.	05/31/85	--	52.6	605	Santiam River and NFk-1	07-33-55	j
1984	Tanner Creek	Steyton Pond	fing.	05/31/85	--	52.6	605	Santiem River end NFk-1	07-33-56	j
1985	Tanner Creek	Steyton Pond	fing.	04/29/86	05/12/86	67.0	986,194	Mill Creek	--	
1985	Tanner Creek	Steyton Pond	fing.	04/29/86	05/12/86	67.0	7,153	Mill Creek	07-38-18	i
1985	Tanner Creek	Steyton Pond	fing.	04/29/86	05/12/86	67.0	7,153	Hi11 Creek	07-38-19	i
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/12/86	67.0	7,153	Mill Creek	07-38-20	i
1985	Tanner Creek	Stayton Pond	fins.	04/29/86	05/12/86	67.0	7,153	Mill Creek	07-38-21	i

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Santiam and Calepooie rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1985	Tanner Creek	Steyton Pond	fing.	04/29/86	05/12/86	67.0	7,153	Mill Creek	07-38-22[i]
1985	Tahner Creek	Stayton Pond	fing.	05/02/86	05/13/86	66.1	1,064,357	Santiam River and NFk-1	..
1985	Tanner Creek	Steyton Pond	fing.	05/02/86	05/13/86	66.1	8,178	Santiem River and NFk-1	07-38-18[i]
1985	Tanner Creek	Stayton Pond	fing.	05/02/86	05/13/86	66.1	8,178	Santiam River and NFk-1	07-38-19[i]
1985	Tanner Creek	Stayton Pond	fing.	05/02/86	05/13/86	66.1	8,178	Santiam River end NFk-1	07-38-20[i]
1985	Tanner Creek	Stayton Pond	fing.	05/02/86	05/13/86	66.1	8,178	Santiem River and NFk-1	07-38-21[i]
1985	Tanner Creek	Stayton Pond	fing.	05/02/86	05/13/86		8,178	Sentiam River end NFk-1	07-38-22[i]
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/06/86	67.3	876,929	SFk Sentiam River	..
1985	Tanner Creek	Stayton Pod	fing.	04/29/86	05/06/86	67.3	7,689	SFk Santiam River	07-38-18[i]
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/06/86	67.3	7,689	SFk Santiam River	07-38-19[i]
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/06/86	67.3	7,689	SFk Santiam River	07-38-20[i]
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/06/86	67.3	7,689	SFk Santiam River	07-38-21[i]
1985	Tanner Creek	Stayton Pond	fing.	04/29/86	05/06/86	67.3	7,689	SFk Sentiam River	07-38-22[i]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/07/87	60.3	973,590	Mill Creek	..
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/07/87	60.3	7,481	Hill Creek	07-40-50[i]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/07/87	60.3	7,481	Mill Creek	07-40-51[i]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/07/87	60.3	7,481	Mill Creek	07-40-52[i]
1986	Tanner Creek	Stayton Pond	fins.	04/28/87	05/07/87	60.3	7,481	Mill Creek	07-40-53[i]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/07/87	60.3	7,481	Mill Creek	07-40-54[i]
1986	Tanner Creek	Stayton Pond	fins.	04/28/87	05/07/87	59.8	1,099,151	Santiam River end NFk-1	..
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/07/87	59.8	7,737	Santiam River and NFk-1	07-40-50[i]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/07/87	59.8	7,737	Santiam River and NFk-1	07-40-51[i]
1986	Tanner Creek	Steyton Pond	fing.	04/28/87	05/07/87	59.8	7,737	Santiam River and NFk-1	07-40-52[i]
1986	Tanner Creek	Steyton Pond	fing.	04/28/87	05/07/87	59.8	7,737	Santiam River end NFk-1	07-40-53[i]
1986	Tanner Creek	Steyton Pond	fing.	04/28/87	05/07/87	59.8	7,737	Santiem River and NFk-1	07-40-54[i]
1986	Tanner Creek	Stayton Pond				60.3	1,488,194	SFk Santiam River	..
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	04/28/87 05/06/87 05/06/87	60.3	11,115	SFk Santiam River	07-40-50[i]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.3	11,115	SFk Sentiam River	07-40-51[i]
1986	Tanner Creek	Steyton Pond	fing.	04/28/87	05/06/87	60.3	11,115	SFk Santiam River	07-40-52[i]
1986	Tanner Creek	Steyton Pond	fing.	04/28/87	05/06/87	60.3	11,115	SFk Sentiam River	07-40-53[i]
1986	Tanner Creek	Stayton Pond	fing.	04/28/87	05/06/87	60.3	11,115	SFk Santiam River	07-40-54[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	56.3	868,212	Mill Creek	..
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	56.3	7,235	Mill Creek	07-45-26[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	56.3	7,235	Hill Creek	07-45-27[i]
1987	Tanner Creek	Steyton Pond	fins.	04/27/88	05/07/88	56.3	7,235	Mill Creek	07-45-28[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	56.3	7,235	Mill Creek	07-45-29[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	56.3	7,235	Hill Creek	07-45-30[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	55.3	819,578	Sentiam River and NFk-1	..
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	55.3	7,186	Santiem River end NFk-1	07-45-26[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	55.3	7,186	Santiam River end NFk-1	07-45-27[i]

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Sentiw and Calapooia rivers subbasin by brood year and, if marked, coded wire teg code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Dote (1)	Relerse Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	55.3	7,186	Santiam River and NFk-1	07-45-28[i]
1987	Tanner Creek	stoyton Pond	fing.	04/27/88	05/07/88	55.3	7,186	Santimn River and NFk-1	07-45-29[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	55.3	7,186	Santiam River and NFk-1	07-45-30[i]
1987	Tanner Creek	stsyton Pond	fing.	04/27/88	--	52.7	66,113	SFk Santiam River	--
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	--	52.7	2,397	SFk Santiam River	07-45-26[i]
1987	Tanner Creek	Stayton Pond	fing.	04/28/88	--	54.0	113,927	SFk Santiam River	--
1987	Tanner Creek	Stayton Pond	fins.	04/28/88	--	54.0	3,523	SFk Santimn River	07-45-26[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	55.9	1,210,413	SFk Santimn River	--
1987	Tenner Creek	Stayton Pond	fins.	04/27/88	05/07/88	55.9	10,349	SFk Santiam River	07-45-26[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	55.9	10,349	SFk Sentiam River	07-45-27[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	55.9	10,349	SFk Santiam River	07-45-28[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	55.9	10,349	SFk Ssntiam River	07-45-29[i]
1987	Tanner Creek	Stayton Pond	fing.	04/27/88	05/07/88	55.9	10,349	SFk Santiam River	07-45-30[i]
1988	Tanner Creek	Stayton Pond	fing.	04/25/89	04/27/89	61.6	312,288	Mill Creek	--
1988	Tanner Creek	stoyton Pod	fing.	04/25/89	04/27/89	61.6	10,991	Mill Creek	07-50-12[i]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89	65.9	251,437	Mill Creek	--
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89	65.9	2,259	Hill Creek	07-50-12[i]
1988	Tanner Creek	steyton Pond	fing.	05/01/89	05/03/89	65.9	2,259	Mill Creek	07-50-15[k]
1988	Tanner Creek	Steyton Pond	fing.	05/01/89	05/03/89	65.9	2,259	Mill Creek	07-50-17[k]
1988	Tanner Creek	Steyton Pond	fing.	05/01/89	05/03/89	65.9	2,259	Mill Creek	07-50-18[k]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89	65.9	2,259	Mill Creek	07-50-20[k]
1988	Tanner Creek	Stayton Pond	fing.	05/02/89	--	67.2	48,420	Brietenbush River	--
1988	Tanner Creek	Stayton Pond	fing.	05/02/89	--	67.2	392	Brietenbush River	07-50-12[i]
1988	Tanner Creek	Stayton Pond	fing.	05/02/89	--	67.2	392	Brietenbush River	07-50-15[k]
1988	Tanner Creek	steyton Pond	fing.	05/02/89	--	67.2	392	Brietenbush River	07-50-17[k]
1988	Tanner Creek	stsytan Pond	fing.	05/02/89	--	67.2	392	Brietenbush River	07-50-18[k]
1988	Tenner Creek	Stayton Pond	fing.	05/02/89	--	67.2	392	Brietenbush River	07-50-20[k]
1988	Tanner Creek	stsyton Pond	fing.	04/26/89	04/28/89	61.7	791,208	Santiam River and NFk-1	--
1988	Tanner Creek	Stayton Pond	fing.	04/26/89	04/28/89	61.7	28.696	Sentiam River and NFk-1	07-50-12[i]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89	64.4	203,918	Santian River and NFk-1	--
1988	Tanner Creek	Stayton Pond	fins.	05/01/89	05/03/89	64.4	2,465	Santiam River end NFk-1	07-50-12[i]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89	64.4	2,465	Santiem River and NFk-1	07-50-15[k]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/03/89		2,465	Santiam River end NFk-1	07-50-17[k]
1988	Tanner Creek	steyton Pond	fing.	05/01/89	05/03/89	64.4	2,465	Santiwn River and NFk-1	07-50-18[k]
1988	Tanner Creek	Stayton Pod	fing.	05/01/89	05/03/89	64.4	2,465	Santiem River and NFk-1	07-50-20[k]
1988	Tanner Creek	stoyton Pond	fing.	04/25/89	04/28/89	61.5	849.823	SFk Santiem River	--
1988	Tanner Creek	Stayton Pond	fing.	04/25/89	04/28/89	61.5	29,910	SFk Santiam River	07-50-12[i]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/02/89	64.3	312,702	SFk Santiam River	--
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/02/89	64.3	2,741	SFk Sentiam River	07-50-12[i]
1988	Tanner Creek	steyton Pond	fing.	05/01/89	05/02/89		2,741	SFk Santiam River	07-50-15[k]

Table 1 (TR). (cont.) Hatchery fall chinook releases into the Santiam end Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/02/89	64.3	2,741	SFk Santiam River	07-50-17[k]
1988	Tenner Creek	Stayton Pond	fing.	05/01/89	05/02/89	64.3	2,741	SFk Santiam River	07-50-18[k]
1988	Tanner Creek	Stayton Pond	fing.	05/01/89	05/02/89	64.3	2,741	SFk Sentiam River	07-50-20[k]
1989	Tanner Creek	Stayton Pond	fing.	05/03/90	05/09/90	44.5	956,344	Mill Creek	--
1989	Tanner Creek	Stayton Pond	fing.	05/03/90	05/09/90	44.5	46,113	Mill Creek	07-52-18[g]
1989	Tanner Creek	Stayton Pond	fing.	05/01/90	05/11/90	42.9	591,681	Santiem River and NFk-1	--
1989	Tanner Creek	Stayton Pond	fing.	05/01/90	05/11/90	42.9	22,095	Santiam River and NFk-1	07-52-18[g]
1989	Tanner Creek	Stayton Pond	fing.	05/01/90	05/08/90	43.6	1,161,675	SFk Santiam River	--
1989	Tanner Creek	Stayton Pond	fing.	05/01/90	05/08/90	43.6	50,929	SFk Santiam River	07-52-18[g]
1990	Tanner Creek	Stayton Pond	fing.	04/29/91		55.0	303	Mill Creek	--
1990	Tanner Creek	Stayton Pond	fing.	04/30/91	--	55.3	1,612,389	Mill Creek	--
1990	Tanner Creek	Stayton Pond	fing.	04/30/91	--	55.3	6,581	Mill Creek	07-52-27[l]
1990	Tanner Creek	Steyton Pond	fing.	04/30/91	--	55.3	6,581	Mill Creek	07-52-28[l]
1990	Tanner Creek	Stayton Pond	fing.	04/30/91		55.3	6,581	Mill Creek	07-52-29'
1990	Tanner Creek	Stayton Pond	fins.	04/30/91		55.3	6,581	Mill Creek	07-52-30'
1990	Tanner Creek	Steyton Pond	fing.	04/30/91	--	55.3	6,581	Mill Creek	07-52-31'
1990	Tanner Creek	Stayton Pond	fing.	04/29/91	--	57.0	345,236	Mill Creek	--
1990	Tanner Creek	Stayton Pond	fing.	04/29/91		57.0	6,328	Mill Creek	07-52-27[l]
1990	Tanner Creek	Stayton Pond	fing.	05/02/91	05/09/91	55.8	5,043,773	Santiam River end NFL-1	--
1990	Tanner Creek	Stayton Pond	fing.	05/02/91	05/09/91	55.8	71,565	Santiam River end NFk-1	07-52-27[l]
1990	Tanner Creek	Stayton Pond	fing.	05/06/91	05/08/91	55.8	40,196	Santiam River end NFk-1	07-52-29[l]

a Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish end Wildlife 1990); and Oregon Department of Fish and Wildlife's hatchery production database.

b For the 1969-80 release years, the stock is unknown, but assumed to be LRH stock (Lower Columbia River Hatchery stock) or BPH stock (Bonneville Pool Hatchery stock), based on the associated hatchery. Both LRH end BPH stocks are informally called tules. Tanner Creek stock is part of the LRH stock group.

c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded uire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, end the content, if known, is Listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

d These releases are of fry and/or fingerling.

e Month(s) and day(s) of release unknown. Standardized to the first end last day of the year.

f Juveniles with this tag group were also released into the Molalla and Pudding rivers, Middle Fork Uillamette River, and mainstem Willamette River subbasins.

g Juveniles uith this tag group were elso released into the lower Columbia River, Molalla and Pudding rivers, end mainstem Uillamette River subbasins.

(cont.)

Table 1 (TR)[a]. (cont.) Hatchery fall chinook releases into the Sentiam end Calapooia rivers subbssin by brood year and, if marked, coded uire tag code[b].

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h This coded wire tog mark is reported as having been used to mark juveniles from the 1984 brood releases in the lower Columbia River subbesin.
i Jweniles uith this tag group were also released into the Molalla and Pudding rivers, and msinstem Uillamette River subbasins.
j Juveniles with this tag group were rlso relersed into the lower Columbia River, and msinstem Uillwnette River subbasins.
k Juveniles with this tag group were also relersed into the msinstem Willamette River subbasin.
1 Juveniles with this tag group were also released into the lower Columbia River and Molalla and Pudding rivers subbasins.

REFERENCES

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SANTIAM RIVER SUBBASIN

Naturally Produced Coho Salmon

GEOGRAPHIC LOCATION

The Santiam and Calapooia rivers are regarded as one subbasin, and termed the Santiam and Calapooia rivers subbasin. For management purposes, Mill Creek is included as part of the Santiam and Calapooia rivers subbasin (Oregon Department of Fish and Wildlife 1990).

The Santiam River flows into the Willamette River at River Mile (RM) 108. At Santiam River RM 11.7, the river forks into the North Santiam and the South Santiam rivers. The Santiam River system drains an area of 1,827 square miles (Oregon Department of Fish and Wildlife 1990; see SANTIAM RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1).

The Calapooia River flows into the Willamette River at RM 119.5, and the Calapooia River system drains an area of 374 square miles (Oregon Department of Fish and Wildlife 1990).

Mill Creek enters the Willamette River at RM 83.

ORIGIN

Coho are not native to the Santiam and Calapooia rivers subbasin. Hatchery fish are known to spawn in the subbasin, however, the current status of a naturally producing run is unknown (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Spawning has been documented in the Santiam and Calapooia River systems, although runs of naturally produced coho are currently believed to be minimal or non-existent (Oregon Department of Fish and Wildlife 1990). Mill Creek is believed to support some natural production (Oregon Department of Fish and Wildlife 1990). Available spawning and rearing habitat in Mill Creek is rated as "fair" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

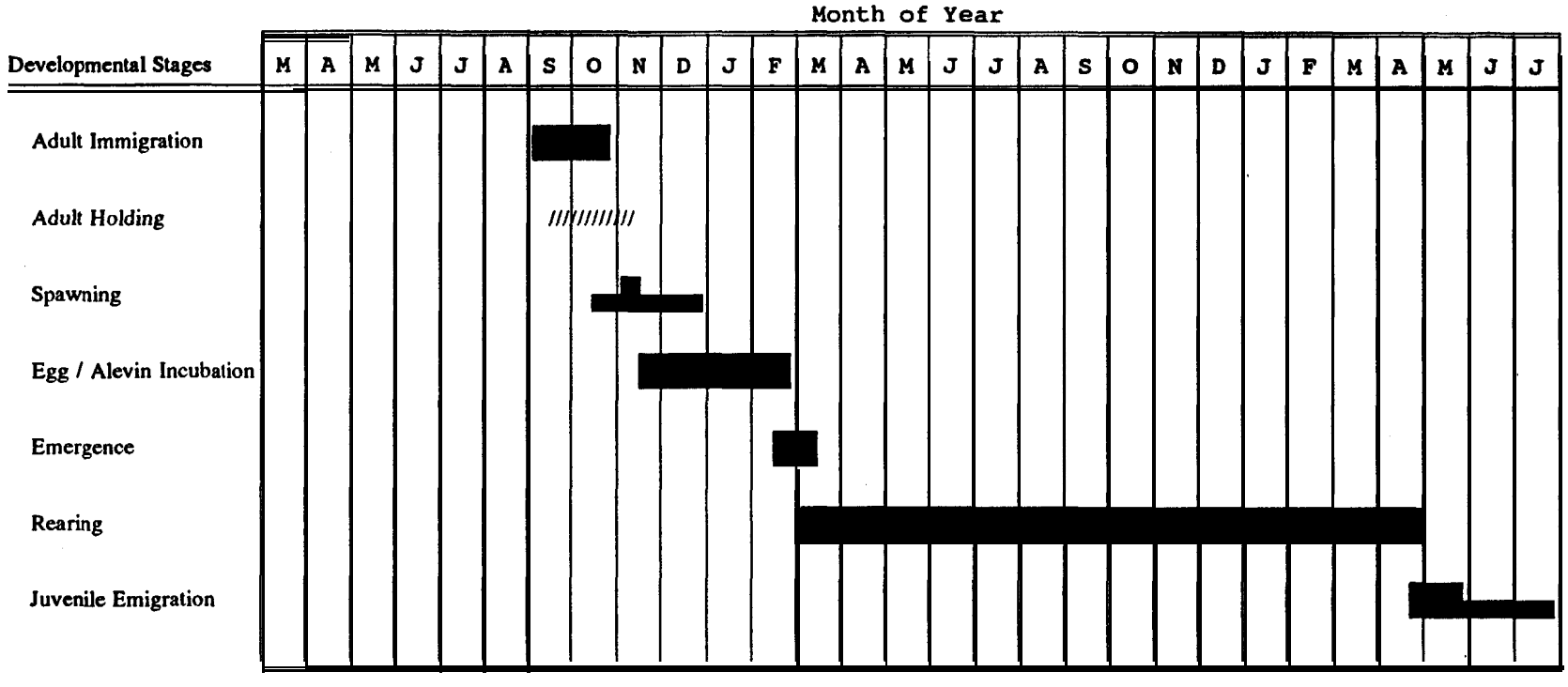
Subbasin: Although brood year specific estimates of sport harvest for naturally

produced fish are not available, estimates by run year exist for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1989, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Strays

Coho from remnant populations in nearby streams sometimes stray into the Santiam and Calapooia rivers subbasin (Oregon Department of Fish and Wildlife 1990).



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.
3. Hatched bars indicate inferred timing.

Figure 1 (TT). Coho (early run) freshwater life history in the Santiam River subbasin ○rego○ Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Mill Creek subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	100.0	0.0	--	26.0	
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Mill Creek subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Santiam and Calapooia Rivers). -Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

SANTIAM RIVER SUBBASIN

Hatchery Produced Coho Salmon

ORIGIN

Hatchery coho were released into the subbasin, beginning in the 1950's, to establish a self-sustaining run (Oregon Department of Fish and Wildlife 1990). The effort was not successful, and currently, the Santiam and Calapooia river systems are considered unsuitable for coho production (Oregon Department of Fish and Wildlife 1990). The majority of coho releases in the subbasin have been from the Lower Columbia Early Run (LCER) stock (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, ORIGIN). Some releases of coastal stock have also occurred (Oregon Department of Fish and Wildlife 1990).

The hatchery supplementation program in the Santiam and Calapooia rivers subbasin was discontinued after the 1985 brood release.

DISTRIBUTION

Subbasin

Coho were introduced into the Santiam and Calapooia rivers subbasin in the 1950's as fry, fin erlings, smolts, and adults (Oregon Department of Fish and Wildlife 1990). During the 19%O's and early 1970's, hatchery fish were released into the North and South Santiam rivers, the Calapooia River, and in Mill Creek (Table 1). In the 1980's, fry and fingerlings were released into Mill Creek (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Big Creek, Bonneville, Cascade, Klaskanine, Oxbow, and Sandy hatcheries (Table 1). Annual numbers released ranged from 83,950 to 3,813,333 fish (Table 1). Size at release ranged from to fish per pound (Table 1). In 1983, fry were released at a size of 1,150 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Bonneville, Cascade, Klaskanine, Oxbow, and Sandy hatcheries (Table 1). Annual numbers released ranged from 44,340 to 420,882 fish (Table 1). In 1985, fingerlings were released at a size of 2 13.5 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Alsea, Bonneville, Cascade, Klaskanine, and Sandy hatcheries (Table 1). Annual numbers released ranged from 50,960 to 378,665 fish (Table 1).

Jack and Adult

Hatchery facilities in which adult fish were held prior to release in the subbasin include Big Creek, Bonneville, Cascade, Eagle Creek, Klaskanine, and Sandy hatcheries (Table 1). Annual numbers released ranged from 150 to 7,961 fish (Table 1).

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery fish are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1989, cited by Oregon Department of Fish and Wildlife 1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES and see SANDY RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES.

Table 1 (TR). Hatchery coho releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Nunber Released	Release Location	CUT Code/ Fin Clip
1957	Unknown	Sandy	fing.	08/21/58	--	--	44,340	South Santiam	--
1958	Unknown	Sandy	fing.	04/30/59		--	46,000	South Santiam	--
1959	Unknown	Sandy	fing.	05/11/60		--	77.759	South Santiam	
1960	Unknown	Sandy	fing.	05/11/61		--	75,180	South Santiam	
1960	Unknown	Sandy	fing.	07/15/61		--	25,733	South Santiam	
1961	Unknown	Bonneville	fry	03/30/62			194,054	North Santiam	--
1961	Unknown	Bonneville	fry	03/29/62	--		280,042	Calapooia	--
1962	Unknown	gonneville	fry	05/06/63	--	--	384,448	North Santiam	--
1962	Unknown	Bonneville	fry	03/14/63			850,000	South Santiam	--
1962	Unknown	Klaskanine	fry	01/08/63			502,444	Calapooia	--
1963	Unknown	Sandy	smolt	03/10/65			68,998	South Santiam	--
1964	Unknown	gonneville	fry	04/01/65		--	494,728	Calapooia	--
1964	Unknown	Cascade	fry	04/22/65		--	696,850	South Santiam	--
1964	Unknown	Klaskanine	fing.	06/04/65		--	50,400	South Santiam	--
1964	Unknown	Bonneville	fing.	08/05/65		--	121,040	South Santiam	--
1964	Unknown	Bonneville	fing.	08/12/65	--	--	48,225	South Santiam	--
1964	Unknown	Cascade	fing.	08/09/65		--	45,714	North Santiam	--
1964	Unknown	Cascade	fing.	07/17/65		--	46,951	South Santiam	--
1964	Unknown	Cascade	fing.	08/10/65		--	108,552	South Santiam	--
1964	Unknown	Sandy	smolt	03/05/66	--	--	15,111	South Santiam	--
1964	Unknown	Sandy	smolt	03/08/66		--	15,049	South Santiam	--
1964	Unknown	Sandy	smolt	03/14/66		--	44,599	South Santiam	--
1964	Unknown	Sandy	smolt	03/03/66	--	--	28,913	Calapooia	--
1964	Unknown	Cascade	adult	11/19/64		--	307	Hill Creek	--
1964	Unknown	Cascade	adult	10/26/64		--	150	Mill Creek	--
1964	Unknown	Cascade	adult	10/20/64		--	1,400	South Santiam	--
1965	Unknown	Bonneville	fry	04/06/66		--	450,000	South Santiam	--
1965	Unknown	Klaskanine	fry	02/21/66		--	305,478	South Santiam	--
1965	Unknown	Klaskanine	fry	02/18/66	--	--	221,156	Calapooia	
1965	Unknown	oxbow	fry	02/10/66		--	231,756	South Santiam	
1965	Unknown	Big Creek	fry	02/11/66	--	--	260,675	North Santiam	--
1965	Unknown	Big Creek	fry	02/14/66	--	--	281,912	South Santiam	--
1965	Unknown	Sandy	fry	03/15/66		--	90,000	South Santiam	--
1965	Unknown	Sandy	adult	12/07/65	--	--	163	Hill Creek	--
1965	Unknown	Sandy	adult	12/06/65		--	200	Mill Creek	--
1966	Unknown	Bonneville	fry	02/28/67			125,865	Mill Creek	--
1966	Unknown	Bonneville	fry	01/28/67			55,940	North Santiam	--
1966	Unknown	Bonneville	fry	02/28/67	--		209,795	North Santiam	--
1966	Unknown	Bonneville	fry	04/01/67	--		147,415	Calapooia	--

Table 1 (TR). (cont.) Hatchery coho releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CUT Code/ Fin Clip
1966	Unknoun	Klaskanine	fry	02/15/67	--	--	2,514,124	South Santiam	--
1966	Unknoun	Big Creek	fry	02/27/67	--	--	444,288	South Santiam	--
1966	Unknown	Sandy	fry	03/24/67	--	--	315,906	South Santiam	--
1966	Unknown	Sandy	fing.	06/07/67	--	--	123,900	Calapooia	--
1966	Unknoun	Big Creek	adult	11/22/66	--	--	150	South Santiam	--
1966	Unknown	Bonneville	adult	10/28/67	--	--	113	South Santiam	--
1966	Unknown	Cascade	adult	11/02/66	--	--	594	South Santiam	--
1967	Unknoun	Bonnevi lle	fry	03/11/68	--	--	744,660	South Santiam	--
1967	Unknown	Klaskanine	fry	03/04/68	--	--	521,000	South Santiam	--
1967	Uqknoun	Cascade	fry	03/19/68	--	--	442,541	South Santiam	--
1967	Unknoun	Cascade	fry	03/15/68	--	--	363,754	Calapooia	--
1967	Unknown	Sandy	fry	03/06/68	--	--	310.887	North Santiam	--
1967	Unknown	Sandy	fry	03/06/68	--	--	366; 985	South Santiam	--
1967	Unknown	Bonneville	adult	03/11/68	--	--	1,145	South Santiam	--
1967	Unknown	Bonneville	adult	09/22/67	--	--	784	South Santiam	--
1967	Unknown	Bonnevi 1 le	adult	09/22/67	--	--	290	Calapooia	--
1967	Unknoun	Cascade	adult	10/05/67	--	--	1,024	South Santiam	--
1967	Unknown	Cascade	adult	03/19/68	--	--	1,150	South Santiam	--
1967	Unknoun	Klaskanine	adult	03/04/68	--	--	2,160	South Santiam	--
1967	Unknown	Sandy	adult	03/06/68	--	--	1,126	South Santiam	--
1968	Unknown	Bonneville	fry	03/18/69	--	--	787,819	South Santiam	--
1968	Unknown	Bonnevi lle	fry	03/27/69	--	--	456,788	Calapooia	--
1968	Unknown	Cascade	fry	04/11/69	--	--	398,400	North Sentiam	--
1968	Unknown	Cascade	fry	04/25/69	--	--	120,600	South Santiam	--
1968	Unknown	Sandy	fry	03/04/69	--	--	41,944	Mill Creek	--
1968	Unknown	Sandy	fry	03/04/69	--	--	62,916	North Santiam	--
1968	Unknown	Sandy	fry	03/04/69	--	--	188,758	South Santiam	--
1968	Unknown	Big Creek	smolt	03/16/70	--	--	73,920	South Santiam	--
1968	Unknown	Cascade	smolt	03/23/70	--	--	112,000	South Santiam	--
1968	Unknown	Cascade	smolt	03/20/70	--	--	19,992	Calapooia	--
1968	Unknoun	Klaskanine	smolt	03/19/70	--	--	28,440	Mill Creek	--
1968	Unknown	Sandy	smolt	03/30/70	--	--	20,234	South Santiam	--
1968	Unknown	Big Creek	adult	10/22/68	--	--	200	South Santiam	--
1968	Unknown	Bonneville	adult	09/13/68	--	--	150	Mill Creek	--
1968	Unknown	Bonneville	adult	09/10/68	--	--	1,464	South Santiam	--
1968	Unknown	Bonneville	adult	09/09/68		--	566	Calapooia	--
1969	Unknown	Bonneville	fry	04/01/70		--	408,515	South Santiam	--
1969	Unknown	Bonneville	fry	04/14/70	--	--	398,127	Calapooia	--
1969	Unknown	Cascade	fry	04/07/70	--	--	391,000	South Santiam	--

Table 1 (TR). (cont.) Hatchery coho releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1969	Unknown	Sandy	fry	02/26/70	--	--	221,438	Mill Creek	--
1969	Unknoun	Sandy	fry	02/26/70	--	--	221,436	North Santiam	--
1969	Unknown	Sandy	fry	03/17/70	--	_	381,600	Calapooia	--
1969	Unknown	Alsea	smolt	03/18/71	--		15,001	Mill Creek	--
1969	Unknown	Cascade	smolt	03/17/71	--	--	218,278	South Santiam	--
1969	Unknown	Cascade	smolt	03/17/71	--		123,275	Calapooia	--
1969	Unknom	Big Creek	adult	11/06/69	--	--	540	South Santiam	--
1969	Unknown	Bonneville	adult	09/23/69	_		200	South Santiam	--
1970	Unknown	Alsea	smolt	03/23/72	_		12,320	Mill Creek	--
1970	Unknown	Cascade	smolt	03/28/72	--	_	13,875	Mill Creek	--
1970	Unknom	Cascade	smolt	04/04/72	--	_	218,412	South Santiam	--
1970	Unknoun	Cascade	smolt	03/29/72	--	--	98,523	Calapooia	--
1971	Unknown	Cascade	smolt	03/14/73	--	--	160,957	South Santiam	--
1971	Unknown	Bonneville	smolt	03/21/73	--	--	40,405	North Santiam	--
1971	Unknown	Bonneville	smolt	03/15/73	--	--	177,303	South Sent i am	--
1971	Unknoun	Sandy	adult	11/23/71	--	--	150	South Santiam	--
1972	Unknown	Cascade	fing.	06/29/73	_	--	99,184	South Santiam	--
1972	Unknoun	Sandy	smolt	04/02/74	--	--	38,447	North Santiam	--
1972	Unknoun	Sandy	smolt	04/02/74	--	--	39; 458	South Santiam	--
1972	Unknown	Bonneville	smolt	03/22/74	--	--	300,421	South Santiam	--
1972	Unknown	Bonneville	adult	11/17/72	--	--	200	South Santiam	--
1972	Unknown	Sandy	adult	11/21/72	--	--	158	South Santiam	--
1973	Unknown	Eagle Creek NFH	adult	11/02/73	--	--	363	South Sent i am	--
1974	Unknom	Cascade	smolt	04/20/76	--	--	50,960	South Santiam	--
1982	Tanner Cr	Cascade	fry	02/23/83	--	1,150	35,650	Mill Creek	--
1982	Tanner Cr	Cascade	fry	02/23/83	_	1,150	24,150	NFk Mill Creek	--
1982	Tanner Cr	Cascade	fry	02/23/83	_	1,150	24,150	SFk Mi 11 Creek	--
1983	Unknom	Cascade	fry	unknown	_	--	118,754	Mill Creek	--
1984	Sandy R.[c]	Oxbow (Herman)	fing.	05/09/85	--	213.5	55,480	Mill Creek	--
1984	Sandy R.[c]	Oxbow (Herman)	f ing.	05/09/85	--	213.5	12,790	Aunsville Ponds	--
1985	Unknoun	Oxbow	fing.	unknoun	--	--	55,480	Mill Creek	--

a Modified from Williams (1983, cited by Oregon Department of Fish and Wildlife 1990); personal communication, W. Hunt, Oregon Department of Fish and Wildlife (cited by Oregon Department of Fish and Wildlife 1990); and Oregon Department of Fish and Wildlife's hatchery production database.

b Of the "Unknown" stocks, those released from Alsea Hatchery were probably coastal stock, and all others were probably LCER stock. LCER refers to Lower Columbia Early Run stock, a "catchall" name for early run hatchery stocks, including Eagle Creek, Clackamas River, Sandy River, Big Creek, and Tamer Creek stocks. These stocks have been previously grouped as early run Toutle stock, or just early run coho. Coulitz stock is part of a late run stock group.

C Sandy Fish Hatchery stock.

REFERENCES

Oregon De artment of Fish and Wildlife. 1989. Oregon salmon and steelhead catch data, 19781986. Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Santiam and Calapooia Rivers). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

Williams, R. 1983. Releases of coho salmon into the upper Willamette River, Oregon. Oregon Department of Fish and Wildlife, Information Report 83-3, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990).

SANTIAM RIVER SUBBASIN

Naturally Produced Sockeye Salmon

GEOGRAPHIC LOCATION

The Santiam and Calapooia rivers are regarded as one subbasin, and termed the Santiam and Calapooia rivers subbasin. For management purposes, Mill Creek is included as part of the Santiam and Calapooia rivers subbasin (Oregon Department of Fish and Wildlife 1990).

The Santiam River flows into the Willamette River at River Mile (RM) 108. At Santiam River RM 11.7, the river forks into the North Santiam and the South Santiam rivers. The Santiam River system drains an area of 1,827 square miles (Oregon Department of Fish and Wildlife 1990; see SANTIAM RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1).

The Calapooia River flows into the Willamette River at RM 119.5, and the Calapooia River system drains an area of 374 square miles (Oregon Department of Fish and Wildlife 1990).

Mill Creek enters the Willamette River at RM 83.

ORIGIN

Sockeye are not native to the Santiam and Calapooia rivers subbasin (Oregon Department of Fish and Wildlife 1990). A naturally producing population of sockeye occurs as a result of hatchery releases in the subbasin (see SANTIAM RIVER SUBBASIN, Hatchery Produced Sockeye Salmon; Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

A naturally producing population of sockeye occurred above Green Peter Reservoir (i.e. Foster Dam) from 1970-84 (Oregon Department of Fish and Wildlife 1990). In 1984, the Oregon Department of Fish and Wildlife implemented a program to kill sockeye salmon returning to Foster Dam in order to eliminate the naturally producing population above the dam (Oregon Department of Fish and Wildlife 1990). The program was implemented because of a concern that sockeye may transfer IHN to other species of anadromous fish in the subbasin (Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of the number of naturally produced sockeye returning to the Santiam River system are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Frazier

(1988, cited by Oregon Department of Fish and Wildlife 1990) and in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

JUVENILE LIFE HISTORY

Residualism

Sockeye are believed to have residualized as kokanee in Green Peter Reservoir and contribute, along with hatchery kokanee releases, to the sport fishery that exists in the reservoir (Oregon Department of Fish and Wildlife 1990).

DISEASES

Sockeye are frequently carriers of the infectious hematopoietic necrosis (IHN) virus (Oregon Department of Fish and Wildlife 1990).

REFERENCES

Frazier, P.A. 1988. Fish passage at Willamette Falls in 1987. Oregon Department of Fish and Wildlife, Annual Report, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Santiam and Calapooia Rivers). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

SANTIAM RIVER SUBBASIN

Hatchery Produced Sockeye Salmon

ORIGIN

Sockeye were introduced into the Santiam and Calapooia rivers subbasin in the late 1960's (Oregon Department of Fish and Wildlife 1990). Sockeye were released to "determine the feasibility of producing harvestable numbers by rearing Juveniles to smolt size in reservoirs" (Lukas and Kom 1968, cited by Oregon Department of Fish and Wildlife 1990). Broodstock was collected from returns to the Columbia River and from fish collected in the Adams River in British Columbia (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Sockeye were released into Green Peter Reservoir, on the Middle Fork Santiam, in 1967 and 1968 (Oregon Department of Fish and Wildlife 1990). The Santiam and Calapooia rivers subbasin is no longer supplemented with hatchery sockeye (Oregon Department of Fish and Wildlife 1990). Sockeye adults that return to the subbasin may be products of releases of kokanee in Green Peter Reservoir (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

There are no records of releases in the subbasin.

Fingerling

A total of 143,000 and 243,000 fingerlings were released in 1967 and 1968, respectively (Oregon Department of Fish and Wildlife 1990; Table 1). The life history stage of the 1966 brood is uncertain, but records indicate that they were released at a size of 85-95 mm (Oregon Department of Fish and Wildlife 1990).

Smolt

There are no records of releases in the subbasin.

Jack and Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery sockeye are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Campbell and Locke (1968, cited by Oregon Department of Fish and Wildlife 1990), Campbell and Locke (1969, cited by Oregon Department of Fish and Wildlife 1990), Campbell and Locke (1970, cited by Oregon Department of Fish and Wildlife 1990), Campbell and Locke (1971, cited by Oregon Department of Fish and Wildlife 1990), Campbell and Daily (1972, cited by Oregon Department of Fish and Wildlife 1990), Campbell and Daily (1973, cited by Oregon Department of Fish and Wildlife 1990), and in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of the number of hatchery sockeye returning to the Santiam River system are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Frazier (1988, cited by Oregon Department of Fish and Wildlife 1990) and in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Hatchery Facilities

There are no hatchery facilities located in the subbasin that collect or spawn returning fish for subbasin hatchery production.

JUVENILE LIFE HISTORY

Residualism

Sockeye are believed to have residualized as kokanee in Green Peter Reservoir and contribute, along with hatchery kokanee releases, to the sport fishery that exists in the reservoir (Oregon Department of Fish and Wildlife 1990).

DISEASES

Sockeye are frequently carriers of the infectious hematopoietic necrosis (IHN) virus (Oregon Department of Fish and Wildlife 1990).

Table 1 (TR). Hatchery sockeye releases into the Santiam and celapooia rivers subbasin by brood *year and,* if marked, coded uire tag code'.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release location	CUT Code/ Fin Clip
1966	Columbia River	Unknown	b	01/01/67	12/31/67[c]	-	143,000	Green Peter Reservoir	--
--	Adams River	Unknoun	fing.	01/01/68	12/31/68[c]	-	243,000	Green Peter Reservoir	--

a Modified from Oregon Department of Fish and Uildlife (1990).
b Life history stage unknown.
c Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.

REFERENCES

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SANTIAM RIVER SUBBASIN

Naturally Produced Summer Steelhead

GEOGRAPHIC LOCATION

The Santiam and Calapooia rivers are regarded as one subbasin, and termed the Santiam and Calapooia rivers subbasin. For management purposes, Mill Creek is included as part of the Santiam and Calapooia rivers subbasin (Oregon Department of Fish and Wildlife 1990).

The Santiam River flows into the Willamette River at River Mile (RM) 108. At Santiam River RM 11.7, the river forks into the North Santiam and the South Santiam rivers. The Santiam River system drains an area of 1,827 square miles (Oregon Department of Fish and Wildlife 1990; see SANTIAM RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1).

The Calapooia River flows into the Willamette River at RM 119.5. The Calapooia River system drains an area of 374 square miles (Oregon Department of Fish and Wildlife 1990).

Mill Creek enters the Willamette River at RM 83.

ORIGIN

Summer steelhead are not native to the Santiam and Calapooia rivers subbasin. Natural production occurs as a result of hatchery releases in the subbasin (see SANTIAM RIVER SUBBASIN, Hatchery Produced Summer Steelhead) but is considered minimal (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Natural production of summer steelhead in the Santiam and Calapooia rivers subbasin is not desired, nor is it closely monitored (Oregon Department of Fish and Wildlife 1990). In the Santiam river system, summer steelhead are known to spawn in Rock and Mad creeks, on the North Santiam River, and in Hamilton, McDowell and Wiley creeks, on-the South Santiam River (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990). Habitat in the Santiam River considered suitable for spawning and rearing is rated as primarily of "fair" quality (Tables 1 and 2).

Data on natural production in the Calapooia River and Mill Creek is not available. Habitat in Mill Creek considered suitable for spawning and rearing is rated as "fair" quality (Tables 3 and 4).

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced fish are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1989, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: The size of the naturally produced run of summer steelhead to the Santiam and Calapooia rivers subbasin is unknown, but assumed to be very small (Oregon Department of Fish and Wildlife 1990).

Spawning Area

Numbers: No brood year specific estimates of spawner escapement to the Santiam and Calapooia rivers subbasin are available. Spawning ground counts in Rock and Mad creeks, in the North Santiam, and in Hamilton, McDowell, and Wiley creeks, in the South Santiam are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Santiam River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	29.5	70.5	0.0	--	69.3	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Santiam River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (HB-3). Estimated amount of spawning and rearing habitat by quality of Mill Creek subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	100.0	0.0	--	18.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 4 (HB-4). Estimated amount of rearing only habitat by quality of Mill Creek subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

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SANTIAM RIVER SUBBASIN

Hatchery Produced Summer Steelhead

ORIGIN

Releases of hatchery summer steelhead into the Santiam and Calapooia rivers subbasin began in 1966 (Buchanan 1975, cited by Oregon Department of Fish and Wildlife 1990), to provide increased recreational fishing opportunities (Oregon Department of Fish and Wildlife 1990).

Hatchery summer steelhead released into the Santiam and Calapooia rivers subbasin are progeny of hatchery broodstock derived from the Skamania stock of summer steelhead (Howell et al. 1985) which originated from the Skamania River in Washington. The hatchery stock that was developed by the hatchery program in the Santiam and Calapooia rivers subbasin is still commonly referred to as the Skamania stock but is more specifically defined as the Foster stock (Oregon Department of Fish and Wildlife 1990). Hatchery programs at South Santiam and Roaring River hatcheries collect hatchery broodstock from the Foster stock of summer steelhead returning to Foster Dam (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Currently, smolts are released primarily into the North Santiam, South Santiam, and Little North Santiam rivers (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990). In general, smolts are released in April and early May (Oregon Department of Fish and Wildlife 1990).

Summer steelhead have never been released into the Calapooia River drainage (Oregon Department of Fish and Wildlife 1990).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. Estimates are for Skamania stock summer steelhead that spawn and rear in the wild. The methodology used to generate these approximations is unknown.

PRODUCTION

Release

Egg

There are no records of releases in the subbasin.

Fry

There are no records of releases in the subbasin.

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include South Santiam, Roaring River and Marion Forks hatcheries (Table 1). Annual numbers released ranged from 5,986 to 101,713 fish (Table 1). Size at release ranged from 94.0 to 22.4 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include South Santiam, Roaring River, Alsea, Gnat Creek, Marion Forks, McKenzie, Oak Springs, and Willamette hatcheries, and Trojan Pond (Table 1). Annual numbers released ranged from 213,724 to 473,677 fish (Table 1). Size at release ranged from 8.7 to 4.1 fish per pound (Table 1).

Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery summer steelhead are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1989, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Hatchery Facilities

Numbers: Although brood year specific estimates of the number of summer steelhead returning to South Santiam Hatchery are not available, estimates by run year for escapement of Skamania stock summer steelhead are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Fork Length

Annual estimates of mean forlk length are available for summer steelhead returning to Foster Dam (Table 2). Data was available by ocean age only; all returning adults were assumed to have migrated as age 1 smolts (see ADULT LIFE HISTORY, Age Structure).

Mean fork length was estimated at 56.5 cm for l-salt fish, 69.3 cm for 2-salt fish, and 80.0 cm for 3-salt fish (Table 2).

Age Structure

Estimates of age structure are available for hatchery summer steelhead returning to Foster Dam (Table 3). Data was available by ocean age only. Total age was determined based on

the assumption that all returning adults had migrated as age 1 smolts (i.e. freshwater age 1). This assumption was based on data that indicates subyearling releases have a fairly low smolt to returning adult survival rate (see JUVENILE LIFE HISTORY, Survival Rate) and that the majority of hatchery juvenile fish released as yearlings migrate as smolts in the year of release (see JUVENILE LIFE HISTORY, Aee Structure).

Annual estimates of age structure, by brood year, ranged from 1.5% to 21.1% 1 salt fish, 72.8% to 94.2% 2 salt fish, and 2.1% to 17.1% 3 salt fish (Table 3).

sex Ratio

Females comprised approximately 50% of the annual summer steelhead run returning to Foster Dam during the 1983-86 run years (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Fecundity

Although brood year specific fecundities of females spawned at South Santiam Hatchery are not available, estimates by run year for Skamania stock summer steelhead are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

JUVENILE LIFE HISTORY

Aee Structure

Hatchery fish are currently released as age 1 smolts and are assumed to outmigrate in the year of release (Oregon Department of Fish and Wildlife 1990).

Survival Rate

Egg to fry survival of the 1984 brood at South Santiam Hatchery was 85% (Howell et al. 1985).

Smolt to adult survival rates vary depending on size at release. Smolts that are released at a size greater than 20 cm (fork length) returned at twice the rate of smolts released at 18 to 20 cm, and at ten times the rate of smolts released at a size less than 18 cm (Wade and Buchanan 1983, cited by Howell 1985).

BIOCHEMICAL-GENETIC CHARACTERISTICS

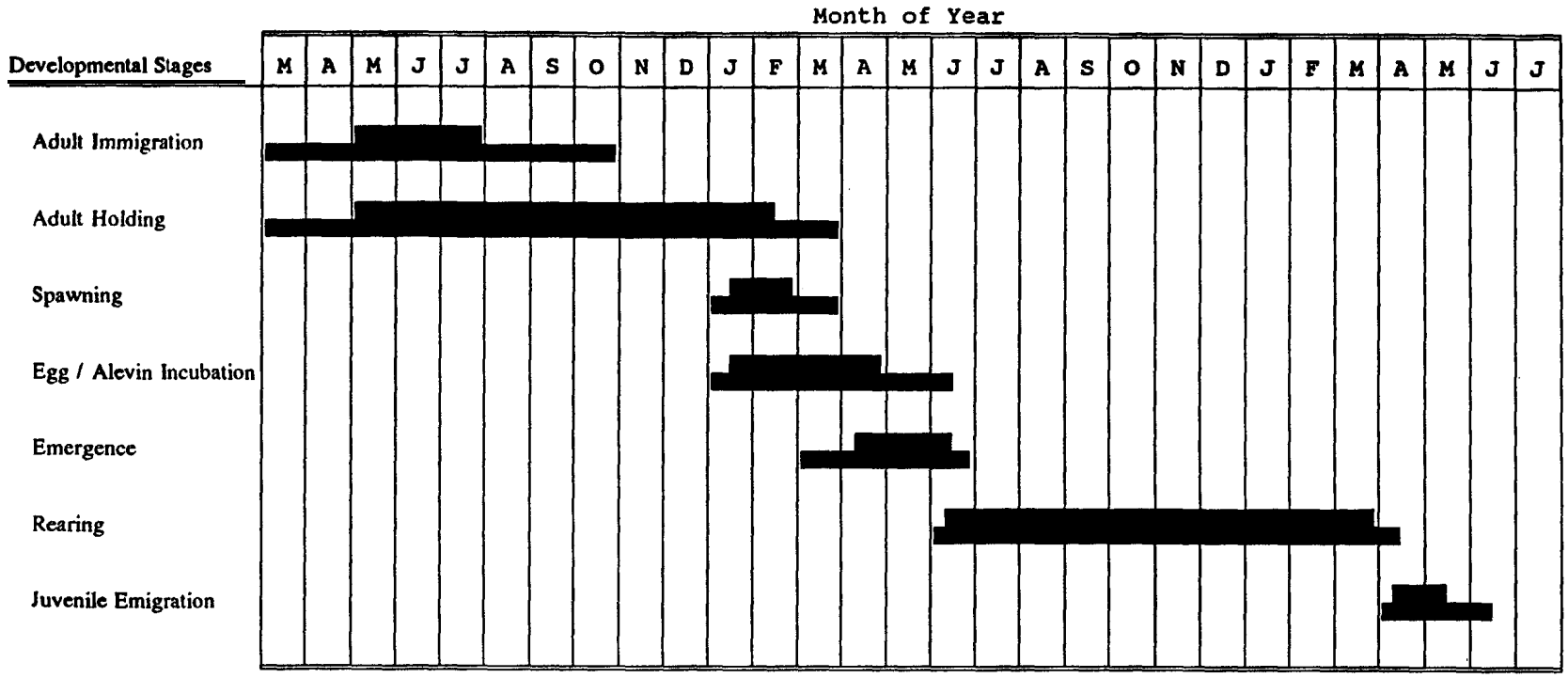
Juvenile hatchery summer steelhead were sampled from South Santiam Hatchery in 1985 and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele mobilities and allele frequencies were determined for 20 enzyme systems (Appendix Table 4). No rare alleles were detected.

Schreck et al. (1986) classified Columbia River Basin steelhead into several clusters of similar stocks based on biochemical, morphological and life history characters. Columbia River Basin steelhead stocks segregated into two primary groups, those from west of the Cascade Mountains and those from east of the Cascades. As expected, Skamania hatchery summer steelhead from South Santiam hatchery clustered with other stocks from west of the Cascades. This primary group was composed of 3 subgroups. At the subgroup level,

summer steelhead from South Santiam Hatchery were found to be more similar to other hatchery stocks of summer and winter steelhead than to other steelhead from west of the Cascades. This subgroup was characterized by the earliest average spawning time; the lowest average head and maxillary length, the lowest number of scales in the lateral series and above the lateral line, and the highest average caudal peduncle length. This group also had the lowest frequency of the common malate dehydrogenase allele, and the greatest average frequencies of the common L-lactate dehydrogenase and dipeptidase alleles. The summer stocks placed in this group are all originally from the Skamania Hatchery stock of summer steelhead.

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile summer steelhead for subbasin hatchery production (Table 4). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see MCKENZIE RIVER SUBBASIN, Hatchery Produced Summer Steelhead; see MIDDLE FORK RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES; and see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.

Figure 2 (TT). Skamania summer steelhead freshwater life history in the Santiam River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (TR). Hatchery summer steelhead releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code'.

Brood year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
--	Skamania	Alsea	smolt	01/01/76	12/31/76[c]	--	106,690	North Santiam	--
--	Skamania	Roaring River	smolt	01/01/76	12/31/76[c]	--	163,560	South Santiam	--
--	Skamania	South Santiam	smolt	01/01/76	12/31/76[c]	--	40,970	Minto	--
--	Skamania	South Santiam	smolt	01/01/76	12/31/76[c]	--	41,129	North Santiam	--
--	Skamania	South Santiam	smolt	01/01/76	12/31/76[c]	--	110,304	South Santiam	--
--	Skamania	Alsea	smolt	01/01/77	12/31/77[c]	--	106,987	Santiam Subbasin	--
--	Skamania	Roaring River	smolt	01/01/77	12/31/77[c]	--	41,771	North Santiam	--
--	Skamania	Roaring River	smolt	01/01/77	12/31/77[c]	--	41,310	South Santiam	--
--	Skamania	Roaring River	smolt	01/01/77	12/31/77[c]	--	2,750	Roaring River	--
--	Skamania	South Santiam	smolt	01/01/77	12/31/77[c]	--	19,838	North Santiam	--
--	Skamania	South Santiam	smolt	01/01/77	12/31/77[c]	--	122,907	South Santiam	--
--	Skamania	South Santiam	fing.	01/01/77	12/31/77[c]	--	7,191	Sunnyside Park Pond	--
--	Skamania	Alsea	smolt	01/01/78	12/31/78[c]	--	53,324	North Santiam	--
--	Skamania	Alsea	smolt	01/01/78	12/31/78[c]	--	77,298	South Santiam	--
--	Skamania	Roaring River	smolt	01/01/78	12/31/78[c]	--	41,370	North Santiam	--
--	Skamania	Roaring River	smolt	01/01/78	12/31/78[c]	--	41,732	South Santiam	--
--	Skamania	Roaring River	fing.	01/01/78	12/31/78[c]	--	5,986	Roaring River	--
--	Skamania	Alsea	smolt	01/01/79	12/31/79[c]	--	100,503	North Santiam	--
--	Skamania	Roaring River	smolt	01/01/79	12/31/79[c]	--	68,949	South Santiam	--
--	Skamania	Roaring River	smolt	01/01/79	12/31/79[c]	--	7,725	Roaring River	--
--	Skamania	South Santiam	smolt	01/01/79	12/31/79[c]	--	86,542	North Santiam	--
--	Skamania	South Santiam	smolt	01/01/79	12/31/79[c]	--	80,152	South Santiam	--
--	Skamania	Roaring River	fing.	01/01/79	12/31/79[c]	--	58,824	Santiam Subbasin	--
--	Skamania	South Santiam	fing.	01/01/79	12/31/79[c]	--	26,638	North Santiam River	--
1979	Skamania	Alsea	smolt	04/16/80	04/17/80	6.5	51,656	Santiam River and NFk-1	--
1979	Skamania	Alsea	smolt	04/17/80	--	6.9	34,017	Santiam River and NFk-1	--
1979	Skamania	Alsea	smolt	04/16/80	—	6.5	40,008	SFk Santiam River	--
1979	Skamania R.	Roaring River	smolt	04/15/80		5.5	39,995	Santiam River and NFL-1	--
1979	Skamania R.	Roaring River	smolt	04/16/80	--	5.6	20,104	SFk Santiam River	--
1979	Skamania R.	Roaring River	smolt	04/17/80	04/23/80	5.7	20,948	SFk Santiam River	--
1979	Skamania R.	South Santiam	smolt	04/16/80	--	5.0	23,124	Santiam River and NFL-1	--
1979	Skamania R.	South Santiam	smolt	04/18/80		5.5	16,115	Santiam River and NFk-1	--
1979	Skamania R.	South Santiam	smolt	04/15/80	04/16/80	5.7	15,942	Santiam River and NFk-1	--
1979	Skamania R.	South Santiam	smolt	04/14/80	--	6.0	38,370	Santiam River and NFk-1	--
1979	Skamania R.	South Santiam	smolt	04/15/80	04/18/80	5.0	48,449	SFk Santiam River	--
1979	Skamania R.	South Santiam	smolt	04/15/80	--	5.2	25,283	SFk Santiam River	--
1979	Skamania R.	South Santiam	smolt	04/15/80		6.9	23,882	SFk Santiam River	--
1980	Skamania R.	Roaring River	fing.	09/19/80	--	84.8	18,654	MFk Santiam River	--
1980	Skamania R.	Roaring River	fing.	09/11/80	--	94.0	6,116	Roaring River	--

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Santiam and Calapooia rivers s&basin by brood year and, if marked, coded wire tag code[a].

Brood Tear	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1980	Skamsnia	Alsea	smolt	05/04/81	--	4.9	40,033	Santiam River and NFk-1	--
1980	Skamania	Alsea	smolt	05/05/81	--	5.2	41,632	Santiam River and NFk-1	--
1980	Skamania	Alsea	smolt	05/05/81	--	5.2	42,218	SFk Santiam River	--
1980	Skamenia	Oak Springs	smolt	05/05/81	--	4.4	10,052	Santiam River and NFk-1	--
1980	Skamania	Oak Springs	smolt	04/29/81	05/04/81	4.5	17,303	Santiam River and NFk-1	--
1980	Skamania	Oak Springs	smolt	05/04/81	--	4.6	17,802	Sentiam River and NFk-1	--
1980	Skamania R.	Roaring River	smolt	04/30/81	--	5.4	9,990	Santiam River and NFk-1	--
1980	Skamania R.	Roaring River	smolt	04/30/81	--	5.8	7,192	Santiam River and NFk-1	--
1980	Skamania R.	Roaring River	smolt	05/01/81	--	7.3	24,449	Santiam River and NFk-1	--
1980	Skamania R.	Roaring River	smolt	04/30/81	05/01/81	5.4	17,226	SFk Santiam River	--
1980	Skamsnia R.	Roaring River	smolt	04/30/81	--	5.8	6,815	SFk Santiam River	--
1980	Skamenia R.	Roaring River	smolt	05/01/81	--		16,097	SFk Santiam River	--
1980	Skamsnia R.	South Santiam	smolt	04/14/81	04/15/81	5::	8,821	Santiam River and NFk-1	--
1980	Skamania R.	South Santiam	smolt	04/13/81	--	5.2	9,880	Santiam River and NFk-1	--
1980	Skamania R.	South Santiam	smolt	04/13/81	--	5.0	4,100	SFk Santiam River	--
1980	Skamania R.	South Santiam	smolt	04/13/81	--	5.1	18,819	SFk Santiam River	--
1980	Skamania R.	South Santiam	smolt	04/13/81	--	5.2	19,785	SFk Santiam River	--
1980	Skamania R.	South Santiam	smolt	04/13/81	--	5.3	20,617	SFk Sentiam River	--
1981	Skamsnia	Oak Springs	smolt	04/28/82	--	4.1	25,773	Santiam River and NFk-1	--
1981	Skamania	Oak Springs	smolt	04/27/82	--	4.2	18,879	Santiam River and NFk-1	--
1981	Skamenia	Oak Springs	smolt	04/29/82	--	4.9	6,370	Santiam River and NFk-1	--
1981	Skamania	Oak Springs	smolt	04/30/82	--	5.1	8,620	Santiam River and NFk-1	--
1981	Skamania	Oak Springs	smolt	04/30/82	--	5.2	11,596	North Santiam	--
1981	Skamania R.	Roaring River	smolt	05/03/82	05/05/82	6.2	29,611	Santiam River and NFk-1	--
1981	Skamania R.	Roaring River	smolt	05/05/82	--	6.8	10,724	Santiem River and NFk-1	--
1981	Skamenia R.	Roaring River	smolt	05/05/82	--	6.6	16,896	SFk Santiam River	--
1981	Skamanie R.	Roaring River	smolt	05/05/82	--	6.8	19,244	SFk Santiam River	--
1981	Skamania R.	South Sentiam	smolt	04/19/82	--	5.0	8,700	Santiem River and NFL-1	--
1981	Skamania R.	South Sentiam	smolt	04/19/82		5.3	11,768	Santiem River and NFk-1	--
1981	Skamania R.	South Santiam	smolt	04/19/82		5.7	9,804	Santiem River and NFL-1	--
1981	Skamanie R.	South Santiam	smolt	04/18/82	--	5:o	15,550	SFk Santiam River	--
1981	Skamsnia R.	South Santiam	smolt	04/07/82	--	5.2	10,348	SFk Santiam River	--
1981	Skamania R.	South Sentiam	smolt	04/07/82	04/20/82	5.3	83,163	SFk Santiam River	--
1981	Skamanie R.	Trojan Pond	smolt	04/29/82	--	5.0	30,305	Santiam River and NFk-1	--
1982	Skamania R.	Roaring River	fing.	09/27/82	--	22.4	16,800	Santiem River and NFk-1	--
1982	Skamania R.	Roaring River	fing.	09/20/82	--	58.4	48,180	Sentiam River and NFk-1	--
1982	Skamania R.	South Sentiam	fing.	09/09/82	--	28.8	9,014	SFk Santiam River	--

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Santiam and Calapooia river8 subbasin by brood year and, if marked, Coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nunber Released	Release Location	CWT Code/ Fin Clip[b]
1982	Skemanie R.	South Santiam	fing.	09109182	--	29.1	9,021	SFk Santiam River	--
1982	Skamania R.	South Santiam	fing.	09109182	--	37.0	9,398	SFk Santiem River	--
1982	Skamania R.	South Santiam	fing.	09/10/82	--	37.5	9,300	SFk Santiem River	--
	Skamania	South Santiam	smolt	01/01/83	12/31/83[c]		134,176	North Santiam	--
1982	Skamania R.	Gnet Creek	smolt	04126183	--	-1.9	8,947	Santiem River end NFk-1	--
1982	Skamania R.	Gnat Creek	smolt	04/25/83	--	5.0	28,600	Sentiem River end NFk-1	--
1982	Skamania R.	Gnat Creek	smolt	04125183	--	5.3	6,281	Santiem River and NFk-1	--
1982	Skamania R.	McKenzie	smolt	04/27/83	--	4.8	4,056	Santiam River end NFk-1	--
1982	Skamania R.	McKenzie	smolt	04120183	04121/83	4.9	22,113	Santiam River end NFk-1	--
i982	Skamania R.	McKenzie	smolt	04/21/83	--	5.0	9,100	Santiam River and NFk-1	--
1982	Skamania R.	Roaring River	smolt	04106183	04107183	5.7	17,898	NFk Santiam River (Lower)	--
1982	Skamania R.	Roaring River	smolt	04106183	04/07/83	5.7	55,079	Santiam River and NFk-1	--
1982	Skamania R.	South Santiam	smolt	04124183		4.6	13,959	SFk Santiam River	AN-LV
1982	Skamania R.	South Santiam	smolt	04/24/83	--	4.6	13,959	SFk Santiam River	AN-RV
1982	Skamania R.	South Sentiam	smolt	04/24/83	--	4.6	13,959	SFk Santiam River	RV-LM
1982	Skamania R.	South Sentiam	smolt	04124183	--	4.6	13,958	SFk Santiam River	RV-RM
1982	Skamania R.	South Santiam	smolt	04114183	04115183	5.0	70,600	SFk Santiam River	--
1983	Skamania R.	Marion Forks	fing.	09123183	--	34.9	20,940	Santiam River and NFk-1	--
1983	Skamania R.	Roaring River	fing.	08/31/83	--	43.0	24,209	SFk Santiam River	--
1983	Skamania R.	South Santiam	fing.	08/31/83	--	25.0	33,000	SFk Sentiem River	--
1983	Skamania R.	Willamette	smolt	04130184	05101184	5.3	23,631	Santiam River end NFk-1	AD
1983	Skamania R.	Willamette	smolt	04/30/84	--	5.7	35,711	Santiam River end NFk-1	AD
1983	Skamania R.	Uillemette	smolt	05/01/84	--	5.3	9,543	SFk Sentiam River	AD
1983	Skamania R.	Marion Forks	smolt	05/02/84	05/03/84	8.7	22,620	Santiam River and NFk-1	AD
1983	Skamania R.	Roaring River	smolt	04119184	04/25/84	5.4	25,736	NFk Santiam River (Lower)	AD
1983	Skamania R.	Roaring River	smolt	04/19/84	04120184	5.4	30.294	Santiam River end NFk-1	AD
1983	Skamania R.	Roaring River	smolt	04/20/84	--	5.4	24,242	SFk Santism River	AD
1983	Skamania R.	South Santiam	smolt	04/18/84	04120184	5.0	35,550	Santiam River end NFk-1	AD
1983	Skamania R.	South Santiam	smolt	04/17/84	04120184	5.0	105,450	SFk Santiam River	AD
1984	Skamania R.	Roaring River	fing.	08/22/84	--	61.5	17,836	SFk Santiam River	--
1984	Skamania R.	South Santism	fing.	07/18/84	--	66.7	7,337	SFk Santiam River	
--	Skamania	Roaring River	smolt	01/01/85	12/31/85[c]	--	116,503	North Santiam	--
--	Skamania	McKenzie	smolt	01/01/85	12/31/85[c]	--	41,168	North Santiam	--
1984	Skamania R.	McKenzie	smolt	04119185	--	4.7	11,938	Santiam River and NFk-1	AD
1984	Skamania R.	McKenzie	smolt	04119185	--	4.9	8,967	Santiam River end NFk-1	AD
1984	Skamania R.	McKenzie	smolt	04/19/85	--	5.7	20,263	Santiam River and NFk-1	AD
1984	Skamania R.	Roaring River	smolt	04126185		6.1	17,748	NFk Santiam River (Lower)	AD
1984	Skamania R.	Roaring River	smolt	04125185	--	6.0	20,562	Santiam River end NFk-1	AD

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Santiam and Calapooie rivers subbasin by brood year and, if msrked, coded wire tag code[a].

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nuder Released	Release Location	CWT Code/ Fin Clip[b]
1984	Skamania R.	Roaring River	smolt	04124185	04126185	6.1	76,292	Santiem River and NFk-1	AD
1984	Skamania R.	Roaring River	smolt	04125185	--	6.2	19,649	Ssntiam River end NFk-1	AD
1984	Skamsnia R.	South Santiem	smolt	04116185	--	5:o	22,270	SFk Santiam River	AD
1984	Skamania R.	South Sentiem	smolt	04116185	--	5.4	23,706	SFk Santiam River	AD
1984	Skamania R.	South Santiam	smolt	04116185	--	5.5	23,706	SFk Santiam River	AD
1964	Skamania R.	South Santiam	smolt	04116185	--	5.6	23,311	SFk Santiam River	AD
1984	Skamania R.	South Santiem	smolt	04116185	--	5.8	23,954	SFk Santiam River	AD
1984	Skamania R.	South Santiam	smolt	04116185	--	6:0	23,640	SFk Sentiam River	AD
1985	Skamania R.	Roaring River	fing.	09123185	--	30.1	33,406	Santiam River and NFk-1	--
1985	Skamania R.	McKenzie	smolt	04129186	--	5.2	20,924	Sentiam River end NFL-1	AD
1985	Skamania R.	McKenzie	smolt	04129186	--	5.3	19,053	Santiem River and NFk-1	AD
1985	Skamania R.	Roaring River	smolt	04115186	--	5.4	6,259	NFk Sentiem River (Lower)	AD
1985	Skamania R.	Rowing River	smolt	04/16/86	--	5.5	6,265	NFk Santiam River (lower)	AD
1985	Skamania R.	Roaring River	smolt	04/15/86	--	5.4	24,297	Santiam River end NFk-1	AD
1985	Skamania R.	Rowing River	smolt	04/15/86	04116186	5.5	61,318	Santiam River end NFk-1	AD
1985	Skamsnia R.	Roaring River	smolt	04/15/86	--	5.6	16,518	Santiam River and NFk-1	AD
1985	Skamania R.	South Santiam	smolt	04108186	--	4.5	604	Green Peter Reservoir	AD
1985	Skamania R.	South Sentiam	smolt	04/09/86	--	5.2	11,258	SFk Santiam River	AD
1985	Skamania R.	South Santiem	smolt	04/09/86	--	5.3	6,999	SFk Santiem River	AD
1985	Skamania R.	South Santiam	smolt	04109186	--	5.4	10,352	SFk Sentiem River	AD
1985	Skamsnia R.	South Sentiam	smolt	04109186	--	5.5	38,573	SFk Sentiem River	AD
1985	Skamania R.	South Sentiam	smolt	04/09/86	--	5.6	31,698	Sfk Santiam River	AD
1985	Skamsnia R.	South Santiam	smolt	04/09/86	--	5.7	12,597	SFk Santiam River	AD
1985	Skamsnia R.	South Santiam	sntolt	04109186	--	5.9	19,488	SFk Santiem River	AD
1985	Skamania R.	South Santiam	smolt	04109186	--	6.0	18,762	SFk Santiam River	AD
1986	Skamania R.	Roaring River	f ing.	08113186	--	77.7	30,303	SFk Santiam River	--
1986	Skamania R.	South Santiem	fing.	09123186	--	58.9	2,768	SFk Santiam River	AD
1986	Skamania R.	Willamette	smolt	04115187	--	5.8	43,471	Sentiam River and NFk-1	AD
1986	Skamania R.	Willemette	smolt	04114187	--	5.9	17,246	Santiam River end NFL-1	AD
1986	Skamania R.	Uillemette	smolt	04/14/87	04115187	6.1	19,181	Santiem River and NFk-1	AD
1986	Skamania R.	Willamette	smolt	04120187	--	6.3	3,150	Santiem River end NFk-1	AD
1986	Skamsnia R.	McKenzie	smolt	04/14/87	--	5.1	25,637	Santiam River end NFk-1	AD
1986	Skamania R.	McKenzie	slnolt	04/13/87	--	5.3	12,985	Santiam River end NFk-1	AD
1986	Skamania R.	Roaring River	smolt	04/16/87	--	5.7	20,073	NFk Sentiam River (Lower)	AD
1986	Skamsnia R.	Roaring River	smolt	04/15/87	--	4.7	42,588	Santiam River end Nfk-1	AD
1986	Skemsnie R.	Roaring River	smolt	04/15/87	--	4.9	8,879	Sentiam River end NFk-1	AD
1986	Skamsnia R.	South Santiem	smolt	04102187	--	5.0	500	Green Peter Reservoir	AD
1986	Skamsnia R.	South Santiam	smolt	04113187	--	4.6	5,704	SFk Sentiem River	AD

Teble 1(TR). (cont.) Hatchery summer steelhead releeses into the Santiam and Calapooia rivers subbasin by brood year end, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	life Stage	Release Dote (1)	Releese Date (2)	Fish/ lb	Number Released	Release location	CWT Code/ Fin Clip[b]
1986	Skemanie R.	South Santiam	smolt	04113187	--	4.9	19,401	SFk Santiam River	AD
1986	Skamania R.	South Santiam	smolt	04/13/87	--	5.0	32,645	SFk Santiam River	AD
1986	Skamania R.	South Santiam	smolt	04/13/87	--	5.1	31,059	SFk Santiam River	AD
1986	Skamania R.	South Santiem	smolt	04113187	--	5.2	19,759	SFk Sentiam River	AD
1986	Skamania R.	South Santiem	smolt	04/13/87	--	5.3	42,133	SFk Santiam River	AD
1986	Skamania R.	South Santiam	sntolt	04/13/87	--	5.4	6,588	SFk Santiam River	AD
1986	Skamanie R.	South Santiam	smolt	04/13/87		5.5	2,640	Sfk Santiam River	AD
1987	Skamania R.	South Santiem	f ing.	10/14/87	--	52.0	8,840	Green Peter Reservoir	--
1987	Skamania R.	McKenzie	smolt	04112188	--	5.4	29,700	Santiam River end NFk-1	AD
1987	Skamania R.	Roaring River	smolt	04/26/88	04/27/88	5.7	22,578	NFk Santiam River (Lower)	AD
1987	Skamania R.	Roaring River	smolt	04/26/88	--	5.6	24,577	Sentiem River end NFk-1	AD
1987	Skamania R.	Roaring River	smolt	04126188	04127188	5.7	67,032	Santiam River end NFk-1	AD
1987	Skamania R.	South Sentiam	smolt	04/04/88		5:o	500	Green Peter Reservoir	AD-RM
1987	Skamania R.	South Santiam	smolt	04111188	04112188	5.0	40,690	Santiam River end NFL-1	AD
1987	Skamania R.	South Santiam	smolt	04/11/88	--	5.0	160,930	SFk Santiam River	AD
1988	Skamania R.	Roaring River	fing.	09/17/88	--	55:o	44,000	Green Peter Reservoir	--
1988	Skamania R.	South Sentiam	fing.	09/30/88		33.0	19,157	Green Peter Reservoir	--
1988	Skamania R.	South Sentiam	fing.	09/22/88	--	38.0	4,598	Green Peter Reservoir	AD
1988	Skamania R.	South Sentiam	fing.	09/29/88		38.6	1,756	Green Peter Reservoir	—
1988	Skamania R.	South Santiam	fing.	09124188	--	42.7	4,014	Green Peter Reservoir	AD
1988	McKenzie R.	McKenzie	smolt	04112189	--	5.5	5,500	Santiam River and NFk-1	AD
1988	McKenzie R.	McKenzie	smolt	04/12/89		5.6	8,176	Santiam River end NFk-1	--
1988	McKenzie R.	McKenzie	smolt	04112189	--	5.6	12,936	Santiam River end NFL-1	AD
1988	McKenzie R.	McKenzie	smolt	04112189	--	5.7	13,479	Santiam River end NFk-1	AD
1988	Skamania R.	Roaring River	smolt	04/25/89	--	6.9	38,243	Sentiam River and NFk-1	AD
1988	Skamania R.	Roaring River	smolt	04126189	--	7.0	3,705	Santiem River end NFk-1	AD
1988	Skamania R.	Roaring River	smolt	04/25/89	--	7.5	31,349	Santiam River end NFk-1	AD
1988	Skamania R.	Roaring River	smolt	04/25/89	--	8:0	36,754	Santiam River end NFk-1	AD
1988	Skamania R.	South Santiam	snlolt	04/13/89	04114189	5.3	15,181	NFk Santiam River (Lower)	AD
1988	Skamania R.	South Santiam	smolt	04113189	--	5.3	6,625	Santiam River end NFk-1	AD
1988	Skamania R.	South Santiam	smolt	04/13/89	--	5.4	13,382	Santiam River end NFk-1	AD
1988	Skemania R.	South Santiam	smolt	04/13/89	--	5.2	21,499	SFk Santiam River	AD
1988	Skamania R.	South Santiem	smolt	04113189	--	5.3	17,596	SFk Santiam River	AD
1988	Skamania R.	South Santiam	smolt	04/13/89	--	5.4	12,015	SFk Santiam River	AD
1988	Skemania R.	South Santiam	smolt	04/13/89	--	5.5	57,326	SFk Santiam River	AD
1988	Skamania R.	South Santiam	smolt	04/13/89	--	5.6	22,372	SFk Santiam River	AD
1988	Skamania R.	South Santiam	snlolt	04/13/89	--	5.7	29,294	SFk Santiam River	AD
1989	Skamania R.	Roaring River	fins.	09129189	—	31.0	27,435	Green Peter Reservoir	--

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Santiem and Calapooia rivers subbasin by brood year snd, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release location	CWT Code/ Fin Clip[b]
1989	Skamania R.	Roaring River	fing.	09129189	--	60.0	22,800	Green Peter Reservoir	--
1989	Skemania R.	South Santiam	fing.	10109189	--	51.5	6,077	Green Peter Reservoir	--
1989	Skamania R.	McKenzie	smolt	04/16/90	--	4.9	20,825	Santiam River end NFk-1	AD
1989	Skamania R.	McKenzie	smolt	04116190	—	5.1	20,599	Santiam River end NFk-1	AD
1989	Skamanie R.	Roaring River	smolt	04/17/90	--	5.9	3,067	NFk Santiem River (lower)	AD
1989	Skemsnia R.	Roaring River	smolt	04118190		6.1	10,004	NFk Santiam River (Lower)	AD
1989	Skamania R.	Roaring River	smolt	04/18/90	--	5.8	38,974	Santiam River and NFL-1	AD
1989	Skemania R.	Roaring River	smolt	04/17/90	--	5.9	6,608	Santiam River and NFk-1	AD
1989	Skamania R.	Roaring River	smolt	04/17/90	04118190	6.1	30,254	Sentiam River end NFk-1	AD
1989	Skemsnie R.	Roaring River	smolt	04118190	--	6.3	44,601	Santiem River end NFk-1	AD
1989	Skamanie R.	Swth Santiem	smolt	04117190	--	5.0	40,303	Santiem River end NFk-1	AD
1989	Skemania R.	South Sentiam	smolt	04/16/90	04/17/90	5.0	80,267	SFk Santiam River	AD
1989	Skamania R.	South Sentiam	smolt	04116190	—	5.5	37,172	SFk Santiam River	AD
1989	Skamania R.	South Santiam	smolt	04116190	—	5.7	2,356	SFk Santiem River	--
1989	Skamania R.	South Sentiam	smolt	04/16/90	--	5.7	6,276	SFk Santiam River	AD
1989	Skamania R.	South Santiem	smolt	04/16/90		5.7	6,276	SFk Santiam River	LM
1989	Skamania R.	South Santiam	smolt	04/16/90	—	5.7	6,276	SFk Santiam River	LP
1989	Skamania R.	South Sentiam	smolt	04116190		5.7	6,276	SFk Santiam River	RM
1989	Skamania R.	South Sentiem	smolt	04116190	--	5.7	6,276	SFk Santiam River	RP
1989	Skamania R.	South Santiam	smolt	04/16/90		5.7	6,276	SFk Santiam River	RV-LM
1989	Skamania R.	South Santiam	smolt	04116190	—	5.7	6,276	SFk Santiam River	RV-RM
IWO	Skamania R.	McKenzie	smolt	04/15/91	--	4.9	20,923	Santiam River end NFk-1	AD
IWO	Skemenia R.	McKenzie	smolt	04/15/91	--	5.0	21,850	Sentiem River and Nfk-1	AD
IWO	Skamenia R.	Roaring River	smolt	04117191	--	6.5	10,009	NFk Sentiam River (lower)	AD
IWO	Skamania R.	Roaring River	smolt	04/17/91		6.6	10,030	NFk Santiam River (Lower)	AD
IWO	Skemsnia R.	Roaring River	smolt	04117191	--	6.5	41,892	Santiam River end NFk-1	AD
1990	Skamenia R.	Roaring River	smolt	04/17/91	--	6.6	65,272	Santiem River end NFk-1	AD
IWO	Skemenia R.	South Sentiem	smolt	04116191	--	4.7	7,802	Santiam River and NFk-1	AD
IWO	Skamania R.	South Santiam	smolt	04116191	--	5.0	32,293	Santiam River and NFk-1	AD
1990	Skemania R.	South Santiam	smolt	04116191	--	5.1	10,404	Santiam River end NFk-1	AD
1990	Skamania R.	South Sentiem	smolt	04116191	--	4.7	6,342	SFk Sentiam River	AD
1990	Skemania R.	South Sentiem	smolt	04/15/91	--	4.9	17,787	SFk Sentiem River	AD
IWO	Skamania R.	South Santiam	smolt	04115191	04/16/91	5.0	67,975	SFk Santiam River	AD
IWO	Skamania R.	South Santiam	smolt	04/16/91	--	5.1	18,082	SFk Santiam River	AD
IWO	Skamanie R.	Swth Santiam	smolt	04/15/91	--	5.3	13,886	SFk Sentiam River	AD

Table 1 (TR). (cont.) Hatchery summer steelheed releeses into the Santiam and Calapooia rivers subbasin by brood year end, if marked, coded wire tag code[a].

Brood Year	Stock	Hetchery	life Stage	Release Dote (1)	Release Date (2)	Fish/ lb	Number Releesed	Release Location	CWT Code/ Fin Clip[b]
1990	Skamania R .	South Santiam	smolt	04/15/91	- -	5.4	4,644	SFk Santiam River	--
1990	Skamania R .	South Sentiam	smolt	04/15/91	- -	5.4	27,297	Sfk Santiam River	AD

a Modified from Oregon Department of Fish and Uildlife (unpublished dote, cited by Oregon Department of Fish and Uildlife 1990); and Oregon Department of Fish end Wildlife's hatchery production database.

b D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); Fg = freeze brand; CB = cold brand. For cold brends, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described 8s being on the right or left side of the fish, end in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied et the right posterior position, end the actual mark was "U4". The "AU" code has not been identified.

c Month(s) and day(s) of release unknown. Standardized to the first end lest day of the year.

d McKenzie Fish Hetchery stock.

Table 2 (AL). Mean fork length by brood year and age class (freshwater. ocean[a]) for summer steelhead at Foster Dam[b].

Brood Year	Mean Fork Length (cm) 1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4
1979	--	69.3	80.0	--	--	--	--	--
N	--	1,268	100	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--
1981	56.5	--	--	--	--	--	--	--
N	50	--	--	--	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--

a Data by ocean age only; all summer steelhead were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Age Structure).
b Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Howell et al. 1985).

Table 3 (AC). Age composition (freshwater.ocean[a]) by brood year for hatchery summer steelhead at Foster Dam[b].

Brood Year	N	Age Composition (%) 1.1	1.2	1.3	1.4	2.1	2.2	2.3
1969	--	8.7	72.8	16.3	2.2	--	--	--
1970	--	7.5	84.4	8.0	0.2	--	--	--
1971	--	5.2	87.8	6.8	0.1	--	--	--
1972	--	5.1	85.6	9.3	0.0	--	--	--
1973	--	11.0	86.7	2.9	0.0	--	--	--
1974	--	21.1	86.6	2.1	0.0	--	--	--
1975	--	8.1	88.0	4.2	0.0	--	--	--
1976	--	2.8	88.9	8.3	0.0	--	--	--
1977	--	6.1	76.8	17.1	0.0	--	--	--
1978	--	2.9	94.2	2.9	0.0	--	--	--
1979	--	1.5	87.6	11.0	0.0	--	--	--

a Data by ocean age only; all summer steelhead were assumed to have migrated as age 1+ smolta (see ADULT LIFE HISTORY, Aae Structure).
b Modified from Howell et al. (1985).

Table 4 (TD). Parasites and diseases of summer steelhead at hatcheries located in the Santiam River[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Roaring River	*Trichodina spp.*
Parasite	Roaring River	*Gyrodactylus*
Parasite	Roaring River	*Ichthyobodo spp.*
Parasite	Roaring River	*Nanophyetus*
Parasite	South Santiam	*Ceratomyxa shasta*
Parasite	South Santiam	*Epistylis sp.*
Parasite	South Santiam	*Trichodina spp.*
Parasite	South Santiam	Ich (Ichthyophthirius multifilis)
Parasite	South Santiam	*Trichophrya*
Bacteria	South Santiam	Furunculosis *(Aeromonas salmonicida)*
Bacteria	South Santiam	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	South Santiam	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	South Santiam	*Aeromonas spp.*
Bacteria	South Santiam	*Pseudomonas*
Bacteria	South Santiam	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Roaring River	Coldwater disease *(Cytophaga psychrophila)*
Virus	South Santiam	Infectious Hematopoietic Necrosis (IHN)
Virus	South Santiam	Viral Erythropoietic Necrosis (VEN)

[a] Personal communication, 1991, A. Amandi, Oregon Department of Fish and Wildlife, Research and Development Section, Corvallis, Oregon.

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SANTIAM 110

SANTIAM RIVER SUBBASIN

Naturally Produced Winter Steelhead

GEOGRAPHIC LOCATION

The Santiam and Calapooia rivers are regarded as one subbasin, and termed the Santiam and Calapooia rivers subbasin. For management purposes, Mill Creek is included as part of the Santiam and Calapooia rivers subbasin (Oregon Department of Fish and Wildlife 1990).

The Santiam River flows into the Willamette River at River Mile (RM) 108. At Santiam River RM 11.7, the river forks into the North Santiam and the South Santiam rivers. The Santiam River system drains an area of 1,827 square miles (Oregon Department of Fish and Wildlife 1990; see SANTIAM RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1).

The Calapooia River flows into the Willamette River at RM 119.5. The Calapooia River system drains an area of 374 square miles (Oregon Department of Fish and Wildlife 1990).

Mill Creek enters the Willamette River at RM 83.

ORIGIN

Winter steelhead are native to the Santiam and Calapooia rivers subbasin. Natural production occurs as a result of subbasin hatchery releases of the North and South santiam substocks of the Willamette stock of winter steelhead (see SANTIAM RIVER SUBBASIN, Hatchery Produced Winter Steelhead). Big Creek and Klaskanine stocks have also been released into the subbasin (see SANTIAM RIVER SUBBASIN, Hatchery Produced Winter Steelhead) but the extent to which these stocks have contributed to natural production is unknown (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Historically, natural winter steelhead production areas were located in the North Santiam and Little North Santiam rivers and in Mad and Rock creeks. In the South Santiam River system, the primary winter steelhead production areas were located in the upper mainstem of the South Santiam and in Thomas, Crabtree, McDowell, Wiley, Canyon, and Moose creeks. The mainstem Middle Santiam and Quartzville Creek also provided spawning areas (Oregon Department of Fish and Wildlife 1990). The construction of dams in the subbasin has resulted in a decrease in natural production. Some of the historic spawning and rearing areas are now inaccessible, or less easily accessible, and downstream passage of juveniles is impaired (Oregon Department of Fish and Wildlife 1990).

Currently, winter steelhead occur only below Big Cliff Dam on the North Santiam. In the South Santiam, natural production has decreased above Foster Dam, and no production occurs in the Middle Santiam above Green Peter Dam (Oregon Department of Fish and Wildlife 1990). Habitat in the Santiam River considered suitable for spawning and rearing is rated as primarily of "fair" quality (Tables 1 and 2).

In the Calapooia River, winter steelhead still utilize the uppermost tributaries, although the current run is smaller than the historic run. Thompson's Mill Dam and Sodom Ditch impede adult passage, and juveniles are lost to unscreened diversions and irrigation ditches (Oregon Department of Fish and Wildlife 1990). Habitat in the Calapooia River considered suitable for spawning and rearing is rated as primarily of "fair" quality (Tables 3 and 4).

Habitat in Mill Creek considered suitable for spawning and rearing is rated as "fair" quality (Tables 5 and 6).

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of harvest for naturally produced winter steelhead are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Although run timing information for naturally produced winter steelhead is not available, mformation on the run timing for the combined run of naturally and hatchery produced winter steelhead is available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990) and in Oregon Department of Fish and Wildlife (1990).

Numbers: Although brood year specific estimates of the run size of naturally produced winter steelhead in the Santiam and Calapooia rivers subbasin are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Frazier (1987, cited by Oregon Department of Fish and Wildlife 1990), Oregon Department of Fish and Wildlife (1989, cited by Oregon Department of Fish and Wildlife 1990), and in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Spawning Area

Timing: Hutchison et al. (1966, cited by Howell et al. 1985) report that winter steelhead in the Santiam and Calapooia rivers subbasin spawn in May.

Numbers: Although brood year specific estimates of spawner escapement are not available, estimates by run year for spawner escapement of winter steelhead are available in Clady (1971, cited by Oregon Department of Fish and Wildlife 1990), Howell et al. (1985, cited by Oregon Department of Fish and Wildlife 1990), and in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Spawning ground counts in the North Santiam, South Santiam, and Calapooia rivers are

available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Age Structure

Although brood year specific estimates of age structure for naturally produced winter steelhead are not available, estimates by run year are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Howell et al. 1985).

Sex Ratio

Although brood year specific estimates of sex ratio (percent females) are not available, estimates by run year are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Fecundity

In 1982, the average fecundity of females trapped at Foster Dam was 3,500 eggs per female (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Repeat Spawners

No spawner checks were observed in scale samples collected from adults returning to Minto Dam in the 1956-57 through 1958-59 run years (DeCew 1969, cited by Howell et al, 1985). Spawner checks were observed in 2% of the scale samples collected from winter steelhead returning to Foster Dam in the 1978-79 and 1979-80 run years. Spawner checks were observed in 4% of the scale samples collected from winter steelhead returning in the 1980-81 run year (Oregon Department of Fish and Wildlife unpublished data, cited by Howell et al. 1985).

JUVENILE LIFE HISTORY

Fork Length

The average length of smolts in the North Santiam, from the 1958 and 1959 brood years, was 18.3 cm (DeCew 1969, cited by Oregon Department of Fish and Wildlife 1990).

Age Structure

Although brood year specific estimates of juvenile age structure are not available, estimates by run year are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Howell et al. 1985).

Migration Timing

In the North Santiam, smolt outmigration begins in early spring (DeCew 1969, cited by Oregon Department of Fish and Wildlife 1990).

BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile winter steelhead collected from Thomas Creek in 1983, 1984 and 1985, Wiley

Creek in 1984 and 1985, and the Calapooia River in 1983 and 1984, were analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele frequencies and allele mobilities were determined for at least 13 loci in each sample location and year (Appendix Table 4). From the seven population samples, one rare allele was detected. The rare allele was at the malate dehydrogenase-3,4 locus in the Wiley Creek sample from 1984.

Schreck et al. (1986) classified Columbia River Basin steelhead into several clusters of similar stocks based on biochemical, morphological and life history characters. Columbia River Basin steelhead stocks segregated into two primary groups, those from west of the Cascade Mountains and those from east of the Cascades. As expected, wild winter steelhead from Thomas Creek, Wiley Creek and the Calapooia River clustered with other stocks from west of the Cascades. This primary group was composed of 3 subgroups. At the subgroup level, Thomas Creek, Wiley Creek and the Calapooia River stocks were found to be more similar to each other and to Marion Forks hatchery stock than to other steelhead from west of the Cascades. This subgroup was characterized by the lowest average number of anal fin rays and the latest average times of freshwater entry and spawning. This subgroup also had the greatest average frequencies of the common aconitate hydratase and glucose phosphate isomerase-3 alleles, and the lowest average frequencies of the common glycerol-3-phosphate dehydrogenase and superoxide dismutase alleles.

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Santiam River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.4	30.3	69.1	0.2	--	209.0	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Santiam River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (HB-3). Estimated amount of spawning and rearing habitat by quality of Calapooia River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	66.2	33.8	--	60.4	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 4 (HB-4). Estimated amount of rearing only habitat by quality of Calapooia River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Rating5 of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 5 (HB-5). Estimated amount of spawning and rearing habitat by quality of Mill Creek subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	100.0	0.0	--	18.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 6 (HB-6). Estimated amount of rearing only habitat by quality of Mill Creek subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

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SANTIAM RIVER SUBBASIN

Hatchery Produced Winter Steelhead

ORIGIN

Hatchery winter steelhead have been released in the Santiam and Calapooia rivers subbasin since 1952. Releases have been primarily of North Santiam and South Santiam substocks of the late run Willamette stock. Big Creek and Klaskanine River stocks have also been released into the subbasin.

The North Santiam substock of the Willamette stock is reared at Marion Forks Hatchery. Broodstock for the North Santiam substock is a combination of native fish and hatchery fish collected at Minto Dam (Oregon Department of Fish and Wildlife 1990a). Earlier broodstock collections, from 1930-50, were from the Breitenbush River (Oregon Department of Fish and Wildlife 1986, cited by Oregon Department of Fish and Wildlife 1990a).

There is no current hatchery program for the South Santiam substock of the Willamette stock. The former South Santiam Hatchery (on Coal Creek) reared South Santiam substock from 1926-44, using Willamette winter steelhead returning to the South Santiam River. Active hatchery propagation of the substock has occurred sporadically, with supplementation from Marion Forks Hatchery, since that time (Oregon Department of Fish and Wildlife 1986, cited by Oregon Department of Fish and Wildlife 1990a; Oregon Department of Fish and Wildlife 1990a).

The subbasin has been supplemented with hatchery winter steelhead to 1) mitigate for habitat lost due to the construction of dams, 2) provide returns for broodstock collection, and 3) increase recreational fishing opportunities in the subbasin (Oregon Department of Fish and Wildlife 1990a).

DISTRIBUTION

Subbasin

Winter steelhead fry, fingerlings and smolts have been released into various tributaries of the Santiam and Calapooia rivers subbasin (Table 1). Smolts have been released primarily in April, and fingerlings have been released from April to September (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

The only hatchery facility in which fry were reared or acclimated prior to release in the subbasin was Marion Forks Hatchery (Table 1). Annual numbers released ranged from 57,759 to 223,889 fish (Table 1). Size at release ranged from 2,290.5 to 101.9 fish per

pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Marion Forks, and Roaring River hatcheries (Table 1). Annual numbers released ranged from 8,337 to 96,656 fish (Table 1). Size at release ranged from 90.0 to 19.2 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Big Creek, Marion Forks, Roaring River, and South Santiam hatcheries (Table I). Annual numbers released ranged from 19,076 to 142,660 fish (Table 1). Size at release ranged from 15.0 to 3.6 fish per pound (Table 1).

Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of harvest for hatchery winter steelhead are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990a).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Although run timing information for hatchery winter steelhead is not available, information on run timing for the combined run of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990a) and Oregon Department of Fish and Wildlife (199Oa).

Numbers: Although brood year specific estimates of the run size of hatchery winter steelhead in the Santiam and Calapooia rivers subbasin are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Frazier (1987, cited by Oregon Department of Fish and Wildlife 1990a), Oregon Department of Fish and Wildlife (1989, cited by Oregon Department of Fish and Wildlife 1990a), and in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990a).

Hatchery Facilities

Timing: Estimates of timing of return are available at Foster trap (Foster Dam) and the Minto collection facility (Minto Dam). Foster trap is usually operated from February

through June and the Minto collection facility from early April to early May (Oregon Department of Fish and Wildlife 1990a).

Adults have been collected at Foster trap from mid-February through early June (Howell et al. 1985, cited by Oregon Department of Fish and Wildlife 1990a) and at the Minto collection facility during April and May (personal communication, T. Jones, ODFW, Marion Forks Hatchery, cited by Oregon Department of Fish and Wildlife 1990a).

Winter steelhead are spawned at Marion Forks Hatchery during late April and May (Howell et al. 1985).

Numbers: Although brood year specific estimates of the number of hatchery fish returning to the hatchery collection facilities are not available, estimates by run year are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990a).

Run year specific estimates of the numbers of males and females spawned at Marion Forks and South Santiam hatcheries are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990a).

Survival: Run year specific estimates of pre-spawning mortality at Marion Forks Hatchery are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990a).

Egg to fry survival at Marion Forks Hatchery averaged 83% in 1984 (Oregon Department of Fish and Wildlife unpublished data, cited by Howell et al. 1985).

Age Structure

Returns from the 1984 brood winter steelhead releases were 84% 2-salt fish, 16% 3-salt fish, and less than 1% l-salt fish (Buchanan et al. 1983, cited by Howell et al. 1985). Run year specific data on age composition is available in DeCew (1969, cited by Oregon Department of Fish and Wildlife 1990a).

Sex Ratio

The female:male sex ratio at Minto Dam was approximately 1: 1 in 1983 and 1984 (Howell et al. 1985). At Foster Dam in 1983 and 1984, the number of females was 1.6 to 1.9 times greater than the number of males (Howell et al. 1985).

Fecundity

Run year specific data on average fecundity at Marion Forks Hatchery is available in Howell et al. (1985).

Repeat Spawners

Buchanan et al. (1983, cited by Howell et al. 1985) report that "few of the 3-salt fish (returning from the 1978 brood year) were repeat spawners."

JUVENILE LIFE HISTORY

Fork Length

Prior to release into the North Santiam River in 1977, two groups of smolts averaged 17-21 cm (Buchanan 1977, cited by Howell et al. 1985).

Age Structure

Hatchery winter steelhead are currently released as age 2 smolts during the first or second week of April.

Survival Rate

The estimated average smolt to returning adult survival rate for the 1980-86 brood releases below Foster Dam was 0.9% to 1.3%. Adjusting for non-migrating smolts raised the average return rate to 1.7% (Oregon Department of Fish and Wildlife 1990a).

BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile winter steelhead were sampled from Marion Forks Hatchery in 1985 and analyzed electrophoretically at selected protem-coding loci (Schreck et al. 1986). Relative allele frequencies and allele mobilities were determined for 20 loci (Appendix Table 4). No rare alleles were detected.

Schreck et al. (1986) classified Columbia River Basin steelhead into several clusters of similar stocks based on biochemical, morphological and life history characters. Columbia River Basin steelhead stocks segregated into two primary groups, those from west of the Cascade Mountains and those from east of the Cascades. As expected, hatchery winter steelhead from Marion Forks hatchery clustered with other stocks from west of the Cascades. This primary group was composed of 3 subgroups. At the subgroup level, Marion Forks hatchery stock was more similar to wild winter steelhead from Thomas Creek, Wiley Creek and the Calapooia River than to other steelhead from west of the Cascades. This subgroup was characterized by the lowest average number of anal fin rays and the latest average times of freshwater entry and spawning. This subgroup also had the greatest average frequencies of the common aconitate hydratase and glucose phosphate isomerase-3 alleles, and the lowest average frequencies of the common glycerol-3-phosphate dehydrogenase and superoxide dismutase alleles.

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile winter steelhead for subbasin hatchery production (Table 2). In recent years, returning adults at Marion Forks Hatchery have been infected with the IHN virus (Oregon Department of Fish and Wildlife 1990). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES.

Table 1 (TR). Hatchery **winter steelhead** releases into the Sentiam and Calapooia rivers **subbasin** by brood year and, if marked, coded wire **tag** code'.

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release location	CWT Code/ Fin Clip[b]
	Big Creek	Gnat Creek	smolt	01/01/78	12/31/78[c]	-	19,076	Mill Creek	--
1977	North Santiam	Marion Forks	f ing.	06/01/78	--	46.9	23,435	Big Cliff Reservoir	--
1977	North Santiam	Marion Forks	smolt	04/09/79	--	5.3	38,824	North Santiw River	RM
1977	North Santiam	Marion Forks	smolt	04/09/79	--	5.5	38,920	North Santiam River	LM
	North Santiam	Marion Forks	fry	01/01/78	12/31/78[c]	-	96,038	Big Cliff Reservoir	--
--	Big Creek	Roaring River	fing.	01/01/79	12/31/79[c]	--	12,441	Roaring	--
--	Big Creek	Roaring River	molt	01/01/80	12/31/80[c]	--	22,090	Mi 11 Creek	--
1978	N. Santiam R.	Marion Forks	smolt	04/16/80	--	5.5	13,101	Foster Reservoir	RV-RM
1978	N. Santiam R.	Marion Forks	smolt	04/14/80	04/15/80	5.5	13,475	Green Peter Reservoir	LV-RM
1978	N. Santiam R.	Marion Forks	smolt	04/14/80	--	5.6	8,959	Green Peter Reservoir	LV-RM
1978	N. Santiam R.	Marion Forks	smolt	04/16/80	--	5.5	633	Santiam River and NFk-1	LV-LM
1978	N. Santiam R.	Marion Forks	smolt	04/16/80	--	6.3	19,908	Santiam River and NFk-1	--
1978	N. Santiam R.	Marion Forks	smolt	04/16/80	--	6.3	19,959	Santiam River and NFk-1	LV
1978	N. Santiam R.	Marion Forks	smolt	04/17/80	04/18/80	6.4	9,920	Santiam River and NFk-1	LV
1978	N. Santiam R.	Marion Forks	smolt	04/15/80	--	5.5	18,700	SFk Santiam River	LV-LM
1978	N. Santiam R.	Marion Forks	smolt	04/15/80	--	5.5	13,101	SFk Santiam River	RV-RM
1979	North Santiam	Marion Forks	fry	07/10/79	-	2,290.5	75.586	gig Cliff Reservoir	--
1979	North Santiam	Marion Forks	smolt	01/19/81	--	10.0	10,000	Young Lake, Mi 11 Creek	--
1979	N. Santiam R.	Marion Forks	smolt	04/02/81	--	5.1	13,449	Green Peter Reservoir	--
1979	N. Santiam R.	Marion Forks	smolt	04/02/81	--	5.1	1,494	Green Peter Reservoir	RM
1979	N. Santiam R.	Marion Forks	smolt	04/09/81	-	5.7	7,974	NFk-2 Santiam River	--
1979	N. Santiam R.	Marion Forks	smolt	01/19/80	--	10.0	6,640	NFk-2 Santiam River	--
1979	N. Santiam R.	Marion Forks	smolt	04/15/81	04/16/81	5.3	12,482	Santiam River and NFk-1	--
1979	N. Santiam R.	Marion Forks	smolt	04/08/81	-	5.6	10,002	Santiam River and NFk-1	--
1979	N. Santiam R.	Marion Forks	smolt	04/09/81	--	5.7	8,037	Santiam River and NFk-1	--
1979	N. Santiam R.	Marion Forks	smolt	04/17/81	--	6.8	17,544	Santiam River and NFk-1	--
1979	N. Santiam R.	Marion Forks	smolt	04/13/81	--	5.2	25,694	SFk Santiam River	--
1979	N. Santiam R.	Marion Forks	smolt	04/13/81	--	5.2	1,456	SFk Santiam River	LV
1979	N. Santiam R.	Marion Forks	smolt	04/13/81	--	5.2	1,398	SFk Santiam River	RV
1979	N. Santiam R.	South Santiam	smolt	04/14/81	04/16/81	5.5	17,804	Foster Reservoir	--
1979	N. Santiam R.	South Santiam	smolt	04/14/81	-	5.5	1,569	Foster Reservoir	LM
1979	N. Santiam R.	South Santiam	smolt	04/16/81	--	5.5	408	Foster Reservoir	LV
1979	N. Santiam R.	South Santiam	smolt	04/14/81	-	5.2	6,038	SFk Santiam River	--
1979	N. Santiam R.	South Santiam	smolt	04/14/81	--	5.2	670	SFk Santiam River	RV
1980	North Santiam	Marion Forks	fry	07/10/80	--	2,216.7	223,889	Neil Creek, Thomas Creek	--
1980	Big Cr[d]	Roaring River	fing.	09/19/80	--	69.8	58,632	MFk Santiam River	--
1980	N. Santiam R.	Marion Forks	smolt	04/13/82	--	5.5	15,675	Foster Reservoir	RV-LM
1980	N. Santiam R.	Marion Forks	smolt	04/01/82	--	5.4	15,174	Green Peter Reservoir	LV-LM
1980	N. Santiam R.	Marion Forks	smolt	04/12/82	--	3.6	4,680	NFk-2 Santiam River	--

Table 1 (TR). (cont.) Hatchery winter steelhead releases into the Santiam and Calapooia rivers subbasin by brood year and, if msrked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1980	N. Santiam R.	Marion Forks	smolt	04/12/82	04/15/82	6.0	15,179	NFk-2 Santiam River	--
1980	N. Santiam R.	Marion Forks	smolt	04/15/82	04/16/82	7.1	19,595	NFk-2 Santiam River	--
1980	N. Santiam R.	Marion Forks	smolt	04/13/82	--	5.6	15,120	SFk Santiam River	LV-RR
1980	N. Santiam R.	Marion Forks	smolt	04/01/82	--	5.7	15,616	SFk Santiam River	RV-RM
1981	N. Santiam R.	Marion Forks	fing.	08/11/82	--	27.0	4,050	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fing.	08/11/82	--	28.0	13,720	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	fins.	08/11/82	--	37.0	10,360	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	smolt	04/13/83	--	6.2	16,368	Foster Reservoir	RM
1981	N., Santiam R.	Marion Forks	smolt	04/15/83	--	5.5	1,502	Green Peter Reservoir	--
1981	N. Santiam R.	Marion Forks	smolt	04/01/83	--	7.0	8,260	Green Peter Reservoir	LV
1981	N. Santiam R.	Marion Forks	smolt	04/01/83	--	6.8	8,160	MFk Santiam River	RV
1981	N. Santiam R.	Marion Forks	smolt	04/11/83	--	5.4	9,882	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	smolt	04/11/83	--	6.5	13,715	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	smolt	04/15/83	--	6.7	20,300	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	smolt	04/14/83	--	6.9	2,553	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	smolt	03/03/83	--	7.0	3,920	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	smolt	04/14/83	--	7.1	17,252	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	smolt	04/25/83	--	7.3	13,064	Santiam River and NFk-1	--
1981	N. Santiam R.	Marion Forks	smolt	04/13/83	--	6.6	17,054	SFk Santiam River	LM
1982	N. Santiam R.	Marion Forks	fing.	09/09/83	--	19.2	23,600	Santiam River and NFL-1	--
1982	N. Santiam R.	Marion Forks	fry	06/14/83	--	102.0	61,150	Crabtree Creek	--
1982	N. Santiam R.	Marion Forks	fry	08/17/82	--	874.0	a74	Horn Creek	--
1982	N. Santiam R.	Marion Forks	fry	11/06/82	--	204.0	30,600	MFk Santiam River	--
1982	N. Santiam R.	Marion Forks	fry	11/06/82	--	230.0	20,700	MFk Santiam River	--
1982	N. Santiam R.	Marion Forks	fry	11/05/82	--	204.0	30,600	Quartzville Creek	--
1982	N. Santiam R.	Marion Forks	fry	11/05/82	--	230.0	20,700	Quartzville Creek	--
1982	S. Santiam R.	Marion Forks	fry	08/17/82	--	874.0	1,748	Horn Creek	--
1982	S. Santiam R.	Marion Forks	fry	11/06/82	--	207.0	10,764	MFk Santiam River	--
1982	S. Santiam R.	Marion Forks	fry	11/05/82	--	207.0	10,764	Quartzville Creek	--
1982	N. Santiam R.	Marion Forks	smolt	04/16/84	--	5.6	11,088	Foster Reservoir	AD-RM
1982	N. Santiam R.	Marion Forks	smolt	04/09/84	--	5.6	1,999	Green Peter Reservoir	AU-RM
1982	N. Santiam R.	Marion Forks	smolt	04/09/84	--	6.6	11,015	Green Peter Reservoir	LM
1982	N. Santiam R.	Marion Forks	smolt	02/10/84	--	15.0	2,483	Horn Creek	--
1982	N. Santiam R.	Marion Forks	smolt	04109184	--	5.6	1,999	MFk Santiam River	AD-RM
1982	N. Santiam R.	Marion Forks	smolt	04111184	--	5.3	22,898	Santiam River and NFk-1	--
1982	N. Santiam R.	Marion Forks	smolt	09/23/83	--	13.3	19,285	Santiam River and NFL-1	--
1982	N. Santiam R.	Marion Forks	smolt	04/09/84	--	5.7	3,642	SFk Santiam River	RM
1982	N. Santiam R.	Marion Forks	smolt	04/12/84	--	6.2	7,626	SFk Santiam River	RM

Table 1 (TR). (cont.) Hatchery winter steelhead releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nunber Released	Release Location	CWT Code/ Fin Clip[b]
1982	N. Santiam R.	Marion Forks	smolt	04/16/ 4	--	E	11,733	SFk Santiam River	AD-LM
1982	S. Santiam R.	Marion Forks	smolt	04/12/ 4	--		5,014	Santiam River and NFk-1	--
1982	S. Santiam R.	Marion Forks	smolt	04/12/ 4	--	6:0	16,050	Santiam River and NFk-1	--
1983	N. Santiam R.	Marion Forks	fing.	07/30/ 4	--	47.1	8,337	Horn Creek	--
1983	N. Santiam R.	Marion Forks	fry	03/26/ 4	--	100.9	10,796	Quartzville Creek	RV-RM
1983	N. Santiam R.	Marion Forks	fry	03127, 4	--	101.1	38,426	Quartrville Creek	RV-RM
1983	S. Santiam R.	Marion Forks	fry	03/26/ 4	--	105.4	8,537	Quartzville Creek	RV-LM
1983	N. Santiam R.	Marion Forks	smolt	04/16/ 5	--	5.0	533	Green Peter Reservoir	FB
1983	N. Santiam R.	Marion Forks	smolt	04/09/ 5	--	5.8	4,060	Green Peter Reservoir	AD+
1983	N. Santiam R.	Marion Forks	smolt	04/09/ 5	04/10/85	6.2	7,161	Green Peter Reservoir	07-28-03
1983	N. Santiam R.	Marion Forks	smolt	04/09/ 5	--	6.4	8,446	Green Peter Reservoir	07-28-03
1983	N. Santiam R.	Marion Forks	smolt	03/25/ 5	--	6.1	1,300	Horn Creek	AD-LV
1983	N. Santiam R.	Marion Forks	smolt	03/25/ 5	--	6.1	885	Horn Creek	AD-RV
1983	N. Santiam R.	Marion Forks	smolt	03/25/ 5	--	6.1	1,036	Horn Creek	LV
1983	N. Santiam R.	Marion Forks	smolt	04115, 5	--	5.0	281	MFk Santiam River	FB
1983	N. Santiam R.	Marion Forks	smolt	04/08/ 5	--	5.2	7,592	Nfk-2 Santiam River	--
1983	N. Santiam R.	Marion Forks	smolt	04/15/ 5	--	5.0	271	Quartzville Creek	FB
1983	N. Santiam R.	Marion Forks	smolt	04/10/85	04/11/85	5.7	24,197	Santiam River and NFk-1	--
1983	N. Santiam R.	Marion Forks	smolt	04/09/85	--	5.9	13,601	Santiam River and NFk-1	--
1983	N. Santiam R.	Marion Forks	smolt	04/08/85	04/09/85	5.4	9,018	SFk Santiam River	RV
1983	N. Santiam R.	Marion Forks	smolt	04/08/85	--	6.4	5,760	SFk Santiem River	07-28-03
1983	N. Santiam R.	Marion Forks	smolt	04/08/85	--	6.4	7,712	SFk Santiam River	AD+
1984	N. Santiam R.	Marion Forks	fing.	04/08/85	--	70.2	5,127	Green Peter Reservoir	07-32-12
1984	N. Santiam R.	Marion Forks	f ing.	04/08/85	--	70.5	5,220	Green Peter Reservoir	07-32-12
1984	N. Santiam R.	Marion Forks	fing.	04/02/85	--	69.7	5,434	MFk Santiam River	07-32-11
1984	N. Santiam R.	Marion Forks	fing.	04/02/85	--	70.2	5,127	MFk Santiam River	07-32-11
1984	N. Santiam R.	Marion Forks	fing.	04/08/85	--	70.2	5,549	MFk Santiam River	07-32-13
1984	N. Santiam R.	Marion Forks	fing.	04/01/85	--	69.3	4,992	guartrville Creek	07-32-15
1984	N. Santiam R.	Marion Forks	f ing.	04/03/85	--	69.6	5,571	guartzville Creek	07-32-10
1984	N. Santiam R.	Marion Forks	fing.	04/12/85	--	69.8	5,793	guartzville Creek	07-32-14
1984	N. Santiam R.	Marion Forks	fing.	04/03/85	--	70.2	5,127	guartzville Creek	07-32-10
1984	S. Santism R.	Marion Forks	fing.	04/23/85	--	88.3	8,653	Quartrville Creek	--
1984	N. Santiam R.	Marion Forks	fry	04/18/85	--	116.4	63,449	Green Peter Reservoir	--
1984	S. Santiam R.	Marion Forks	fry	04/08/85	--	106.1	5,200	Green Peter Reservoir	07-32-15
1984	S. Santiam R.	Marion Forks	fry	04/02/85	--	106.4	5,105	MFk Santiam River	07-32-12
1984	S. Santiam R.	Marion Forks	fry	04/08/85	--	106.5	5,325	MFk Santiam River	07-32-13
1984	S. Santiam R.	Marion Forks	fry	04102185	--	106.7	19,105	MFk Santiam River	--
1984	S. Santiam R.	Marion Forks	fry	04/12/85	--	106.1	5,200	Quartzville Creek	07-32-14

Table 1 (TR). (cont.) Hatchery winter steelhead releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1984	S. Santiam R.	Marion Forks	fry	04/02/85	--	106.7	19,105	Quartzville Creek	--
1984	S. Santiam R.	Marion Forks	fry	04/03/85	--	106.8	5,125	Puartzville Creek	07-32-12
1984	S. Santiam R.	Marion Forks	fry	04/01/85		107.0	10,486	Puartzville Creek	--
1984	N. Santiam R.	Marion Forks	smolt	04/07/86		5.5	4,739	Green Peter Reservoir	AD-RV-LM
1984	N. Santiam R.	Harion Forks	smolt	04/07/86		5.5	4,538	Green Peter Reservoir	AD-RV-RI
1984	N. Santiam R.	Harion Forks	smolt	04/07/86	--	5.5	3,957	Green Peter Reservoir	RM
1984	N. Santiam R.	Marion Forks	smolt	04/07/86	--	6.0	270	Green Peter Reservoir	AD-RV-RM
1984	N. Santiam R.	Marion Forks	smolt	04/07/86		6.0	4,773	Green Peter Reservoir	LM
1984	N., Santiam R.	Marion Forks	smolt	04107186	--	6.0	827	Green Peter Reservoir	RM
1984	N. Santiam R.	Marion Forks	smolt	03/10/86	--	5.0	11,690	Horn Crack	--
1984	N. Santiam R.	Marion Forks	smolt	04/14/86	--	5.3	4,903	MFk Santiam River	AD-LM
1984	N. Santiam R.	Marion Forks	smolt	04114186	--	5.4	1,092	MFk Santiam River	AD-LM
1984	N. Santiam R.	Marion Forks	smolt	04/14/86		5.4	6,133	MFk Santiam River	AD-LV-LM
1984	N. Santiam R.	Marion Forks	smolt	04/09/86	--	5.2	13,624	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	04109186	--	5.4	14,202	Santiam River and NFk-1	--
1984	N. Santiam R.	Harion Forks	smolt	04/08/86		5.5	16,995	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	04/09/86		7.9	3,239	Santiam River and NFk-1	--
1984	N. Santiam R.	Marion Forks	smolt	04/22/86		5.3	1,231	SFk Santiam River	--
1984	N. Santiam R.	Marion Forks	smolt	04/22/86	--	5.3	6,187	SFk Santiam River	AD-RM
1984	N. Santiam R.	Marion Forks	smolt	04/22/86	--	5.4	5,199	SFk Santiam River	AD-LV-RM
1985	Klaskanine R.	Roaring River	fing.	09/11/85	--	26.6	2,554	Crabtree Creek	--
1985	Klaskanine R.	Roaring River	fing.	09111/85	--	80.4	5,950	Crabtree Creek	--
1985	N. Santiam R.	Marion Forks	fing.	05/01/86	--	47.0	9,773	Green Peter Reservoir	07-36-37
1985	N. Santiam R.	Marion Forks	fing.	04/01/86	--	73.4	10,500	Green Peter Reservoir	07-36-39
1985	N. Santiam R.	Marion Forks	fing.	05/19/86		44.9	10,430	Pyramid Creek	07-36-40
1985	N. Santiam R.	Marion Forks	fing.	04/04/86		72.8	9,974	Pyramid Creek	07-36-42
1985	N. Santiam R.	Marion Forks	fing.	05/01/86	--	37.6	9,945	Puartzville Creek	07-36-38
1985	N. Santiam R.	Marion Forks	fing.	04/02/86	--	73.8	10,475	Quartzville Creek	07-36-41
1985	S. Santiam R.	Marion Forks	fing.	05/15/86		90.0	14,175	SFk Santiam River	--
1985	N. Santiam R.	Marion Forks	smolt	04/01/87	--	4.0	532	Green Peter Reservoir	--
1985	N. Santiam R.	Marion Forks	smolt	03/31/87	04/01/87	3.7	7,881	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	03/31/87	04/02/87	4.0	25,640	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	04102187	04/03/87	4.3	20,855	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	04/01/87	--	5.6	15,288	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	04/01/87	04/02/87	6.3	15,782	Santiam River and NFk-1	--
1985	N. Santiam R.	Marion Forks	smolt	04/01/87	--	6.7	24,656	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	fing.	11/10/86	--	61.8	11,024	Green Peter Reservoir	RV
1986	N. Santiam R.	Marion Forks	fing.	11111186		61.8	10,360	Quartzville Creek	AD-RV

Table 1 (TR). (cont.) Hatchery winter steelhead releases into the Santiam and Calapooia rivers subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1986	N. Santiam R.	Marion Forks	smolt	04/01/88	..	5.0	500	Green Peter Reservoir	RM
1986	N. Santiam R.	Marion Forks	smolt	04/04/88	--	4.8	28,483	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	04/04/88	--	4.9	18,277	Santiam River and NFk-1	—
1986	N. Santiam R.	Marion Forks	smolt	04/04/88	--	5.0	10,200	Santiam River and NFk-1	--
1986	N. Santiam R.	Marion Forks	smolt	04/04/88	..	5.1	28,254	Santiam River and NFk-1	—
1986	N. Santiam R.	Marion Forks	smolt	04/04/88	--	5.2	18,870	Santiam River and NFk-1	—
1986	N. Santiam R.	Marion Forks	smolt	04/04/88	..	5.3	12,661	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	04/05/89	--	4.8	8,901	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	04/04/89		5.6	12,124	Santiam River and NFk-1	--
1987	N. Santiem R.	Marion Forks	smolt	04/05/89	04/05/89	5.7	13,165	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	slnolt	04/04/89	—	5.8	12,876	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	04/05/89	--	5.9	17,050	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	04/05/89	--	6.3	11,970	Santiam River and NFk-1	--
1987	N. Santiam R.	Marion Forks	smolt	04/05/89	--	6.6	9,404	Santiam River and NFk-1	--
1988	N. Santiam R.	Marion Forks	slnolt	04/10/90	—	4.9	13,596	Santiam River and NFk-1	AD-RP
1988	N. Santiam R.	Marion Forks	slnolt	04/09/90	04/10/90	5.0	16,250	Santiam River and NFk-1	AD-RP
1988	N. Santiam R.	Marion Forks	smolt	04/10/90	..	5.1	8,874	Santiam River and NFk-1	AD
1988	N. Santiam R.	Marion Forks	smolt	04/10/90	--	5.1	9,231	Santiam River and NFk-1	AD-LP
1988	N. Santiam R.	Marion Forks	smolt	04/10/90	--	5.8	17,453	Santiam River and NFk-1	AD-LP
1988	N. Santiam R.	Marion Forks	smolt	04/09/90	--	6.5	18,070	Santiam River and NFL-I	AD-RP
1988	N. Santiam R.	Marion Forks	smolt	04/10/90	--	8.9	9,968	Santiam River and NFk-1	AD-LP
1989	N. Santiam R.	Marion Forks	smolt	04/10/91	--	4.9	17,144	Santiam River and NFk-1	RV-RH
1989	N. Santiam R.	Marion Forks	smolt	04/10/91	--	5.1	14,127	Santiam River and NFk-1	RV-RR
1989	N. Santiam R.	Marion Forks	smolt	04/10/91	--	5.4	16,470	Santiam River and NFk-1	RV-RW
1989	N. Santiam R.	Marion Forks	smolt	04/10/91	--	5.5	8,745	Santiam River and NFk-1	RV-LM
1989	N. Santiam R.	Marion Forks	smolt	04/10/91	--	5.5	7,755	Santiam River and NFk-1	RV-LP
1989	N. Santiam R.	Marion Forks	smolt	04/10/91	—	5.6	14,168	Santiam River and NFk-1	RV-LM
1989	N. Santiam R.	Marion Forks	smolt	04/10/91	--	5.9	16,225	Santiam River and NFk-1	RV-LM

a Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990); and Oregon Department of Fish and Wildlife's hatchery production database.

b RM = right maxillary fin clip: LM = Left maxillary fin clip: RV = right ventral fin clip: An = anal fin clip: AD = adipose fin clip: AD+ = adipose-fin clip plus coded wire tag; FB = freeze brand. The "AU" code has not been identified.

c Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.

d Big Creek Hatchery stock.

Table 2 (TD). Parasites and diseases of winter steelhead at hatcheries located in the Santiam River[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Marion Forks	*Gyrodactylus*
Parasite	Marion Forks	*Trichodina spp.*
Parasite	Marion Forks	*Epistylis sp.*
Parasite	Roaring River	*Trichodina*
Parasite	Roaring River	*Gyrodactylus,* spp.
Bacteria	Marion Forks	*Aeromonas*
Bacteria	Marion Forks	*Pseudomonas*
Bacteria	Marion Forks	Gill disease
Bacteria	Marion Forks	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Marion Forks	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	Marion Forks	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Roaring River	Gill disease *(Xyxobacteria spp.)*
Virus	Marion Forks	Infectious Hematopoietic Necrosis (IHN)

[a] Estimates at Marion Forks hatchery are from personal communication, 1991, A. Amandi, Oregon Department of Fish and Wildlife, Research and Development Section, Corvallis, Oregon and at Roaring River Hatchery from Oregon Department of Fish and Wildlife (1990b).

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McKENZIE RIVER SUBBASIN

Naturally Produced Spring Chinook Salmon

GEOGRAPHIC LOCATION

The McKenzie River subbasin originates on the west slope of the Cascade Mountains and flows about 90 miles to the southwest where it empties into the Willamette River at RM 175 (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The McKenzie River subbasin drains approximately 1,300 square miles of Lane and Linn counties with 1,040 miles of perennial streams (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990). Major tributaries of the McKenzie River include Lost, Horse, Quartz, Gate, and Camp creeks, the South Fork McKenzie River, and Smith, Blue and Mohawk rivers (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Spring chinook are indigenous to the McKenzie River subbasin (Oregon Department of Fish and Wildlife 1990). This subbasin is deemed "the most important remaining area for potential natural production of spring chinook in the Willamette Basin" (Smith and Zakel 1981, cited by Oregon Department of Fish and Wildlife 1990). Hatchery spring chinook were introduced into the subbasin in 1902 (Oregon Department of Fish and Wildlife 1990; see McKENZIE RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon), although releases of hatchery fish did not produce large numbers of returning adults until the mid-1950's (Wallis 1961, cited by Oregon Department of Fish and Wildlife 1990). The run of wild spring chinook in the McKenzie River subbasin numbers more than 300 adults, which is in compliance with the Oregon Department of Fish and Wildlife's Wild Fish Policy, with regard to population size. However, the ratio of hatchery to wild fish is greater than that required to be in total compliance with the Policy. The population of wild spring chinook in the McKenzie River subbasin is believed to be declining in numbers (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Spring chinook spawn in the mainstem McKenzie River below Trail Bridge Dam, the South Fork below Cougar Dam, the Blue River below Blue River Dam, and tributaries including Lost, Gate, and Horse creeks (Oregon Department of Fish and Wildlife 1990). Valuable spring chinook habitat was lost in the subbasin by the construction of Cougar, Blue River, and Trail Bridge dams (Oregon Department of Fish and Wildlife, 1990). There is an estimated 133 miles of available habitat considered suitable for spawning and rearing (Table 1) and an additional 5.3 miles of habitat that is considered suitable for rearing (Table 2). Spawning and rearing habitat is rated primarily as "excellent" quality (Table 1) and rearing habitat is rated as "fair" quality (Table 2).

Hatchery fish are released in the subbasin, and returning hatchery adults are allowed to spawn naturally. Lost Creek is not supplemented with hatchery fish in order to monitor wild fish production (Oregon Department of Fish and Wildlife, 1990).

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest of naturally produced spring chinook are not available, run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Spring chinook are observed at Leaburg Dam as early as April and as late as November with peak migration occurring in June (Oregon Department of Fish and Wildlife 1990). No stock specific estimates of run timing for naturally produced spring chinook are available.

Numbers: Although brood year specific estimates of run size for naturally produced spring chinook are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Timing: Historically, spring chinook spawned from August through late October (Oregon Department of Fish and Wildlife 1990). Currently, spawning primarily occurs in October (Oregon Department of Fish and Wildlife 1990). No stock specific estimates of the temporal distribution of spawning are available for either naturally or hatchery produced spring chinook.

Numbers: No brood year specific estimates of spawner escapement are available for naturally or hatchery produced fish. Spawning ground counts are available in graph form in Oregon Department of Fish and Wildlife (1990).

Strays

Coded wire tagged hatchery spring chinook recovered at hatchery facilities and during spawning ground surveys in the McKenzie River subbasin include fish that were released as juveniles in the Willamette River, Santiam and Calapooia rivers, and the Middle Fork subbasins (Table 3). Recoveries of subbasin hatchery production are also recorded in Table 3.

The Oregon Department of Fish and Wildlife (1990) reports that stray hatchery fish may constitute as much as 34% of the adult spring chinook collected at McKenzie Hatchery.

JUVENILE LIFE HISTORY

Migration Timing

Naturally produced fry were observed migrating through. the subbasin as early as January and as late as September (Zakel and Reed 1984, cited by Oregon Department of Fish and Wildlife 1990) and naturally produced fingerlings were observed migrating through the subbasin throughout the year (Oregon Department of Fish and Wildlife 1990).

Peak fry migration in Leaburg Canal (in 1948), the Carmen-Smith spawning channel (from 1963-68), and the South Fork of the McKenzie River (from 1959-60) was generally later than peak fry migration from 1980-83 in Leaburg trap. For the same time periods, peak fingerling migration in Leaburg Canal and the South Fork of the McKenzie River occurred from January through March and at Leaburg trap occurred in October and November (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of McKenzie River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	52.8	35.6	11.6	0.0	--	133.0	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of McKenzie River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	100.0	0.0	--	5.3	--
Acres (%)	--	--	--	--	--	--	--

a Modified from Northwest Power Planning Council's presence/absence database.

b Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 3 (AI). Non-harvest recoveries of coded wire tagged hatchery spring chinook salmon in the McKenzie River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Willamette River	McKenzie River	Hatchery Returns		
	1982		24	24
	1983	--	2	2
Santiam,Calapooia	McKenzie River	Hatchery Returns		
	1982		2	2
	1988	--	1	1
Middle Fork River	McKenzie River	Hatchery Returns		
	1982	--	24	24
	1983	--	3	3
	1984	--	2	2
	1985	--	5	5
McKenzie River	McKenzie River	Spawner Surveys		
	1984	--	1	1
McKenzie River	McKenzie River	Hatchery Returns		
	1982	--	135	1 3 5
	1983		244	246
	1984	--	298	298
	1985	--	681	692 ,
	1986	--	228	229
	1987	--	1	1
	1988		93	93

[a] Based on the following tag codes: 07-17-30, 07-17-39, 07-17-41, 07-19-22, 07-19-23, 07-19-29, 07-19-30, 07-19-44, 07-19-47, 07-19-48, 07-20-18, 07-20-19, 07-20-22, 07-20-40, 07-20-42, 07-20-44, 07-20-45,

(cont.)

Table 3 (AI). (cont.) Non-harvest recoveries of coded wire tagged hatchery spring chinook salmon in the McKenzie River subbasin[a,b].

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[a] (cont.) 07-20-46, 07-20-47, 07-20-48, 07-20-49, 07-20-50, 07-20-51, 07-20-52, 07-20-53, 07-20-54, 07-22-17, 07-22-18, 07-22-19, 07-22-20, 07-22-21, 07-22-22, 07-22-23, 07-22-25, 07-22-37, 07-23-07, 07-24-18, 07-24-19, 07-24-22, 07-25-13, 07-25-16, 07-25-17, 07-25-18, 07-25-19, 07-25-21, 07-25-22, 07-27-18, 07-27-19, 07-27-20, 07-27-21, 07-27-24, 07-36-60, 07-37-29, 07-37-30, 07-37-31, 07-37-32, 07-37-33, 07-37-34, 07-39-49, 07-39-51, 09-05-10.

[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

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McKENZIE RIVER SUBBASIN

Hatchery Produced Spring Chinook Salmon

ORIGIN

The subbasin hatchery production program began collecting broodstock and releasing hatchery spring chinook in the McKenzie River subbasin in 1902 (Oregon Department of Fish and Wildlife 1990). Prior to 1975, hatchery fish and eggs were transferred extensively among hatcheries located in the Willamette River Basin (Oregon Department of Fish and Wildlife 1990). Recently, however, McKenzie Hatchery has used only returning adults for hatchery broodstock (Oregon Department of Fish and Wildlife 1990). All hatchery spring chinook released in the subbasin have been from the Willarnette stock (Oregon Department of Fish and Wildlife 1990). The hatchery programs goals are to increase natural production and harvest opportunities and to mitigate for natural production lost due to the construction of Cougar and Blue Ridge dams (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery spring chinook are released into Blue River Reservoir, the mainstem McKenzie River from Hendricks State Park to Trail Bridge Dam, in the lower five miles of Horse Creek, and in the South Fork below Cougar Dam (Oregon Department of Fish and Wildlife 1990). No hatchery fish are released in Lost Creek, which is managed for natural production (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases into the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Willamette, Marion Forks, and McKenzie hatcheries (Table 1). Annual numbers released ranged from 31,112 to 728,240 fish (Table 1). Size at release ranged from 417.7 to 125.9 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Willamette and McKenzie hatcheries (Table 1). Annual numbers released ranged from 69,319 to 826,601 fish (Table 1). Size at release ranged from 116.3 to 55.0 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Oakridge and McKenzie hatcheries and Dexter Pond (Table 1). Annual numbers released ranged from 521,310 to 1,126,148 fish (Table 1). Size at release ranged from 14.6 to 4.0 fish per pound (Table 1).

Jack and Adult

There are no records of adult releases into the subbasin. However, Oregon Department of Fish and Wildlife (1990) reports that adults were transported and released above Cougar Dam from 196264; and that excess adults at McKenzie Hatchery were transported and released in the mainstem above Leaburg Darn and in the South Fork.

Harvest

Sport

Subbasin: Although no brood year specific estimates of sport harvest for hatchery produced spring chinook are available, run year specific estimates for the combined harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Spring chinook are observed at Leaburg Dam as early as April and as late as November with peak migration occurring in June (Oregon Department of Fish and Wildlife 1990). No stock specific estimates of run timing for hatchery produced spring chinook are available.

Numbers: Although no brood year specific estimates of escapement for hatchery produced spring chinook are available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Hatchery Facilities

Timing: Spring chinook return to McKenzie Hatchery from late May through October with median date of return in late June (Howell et al. 1985). Spring chinook are spawned at McKenzie Hatchery from late August through October with median date of spawning from mid to late September (Howell et al. 1985). No stock specific estimates of run timing or time of spawning for naturally or hatchery produced spring chinook are available.

Numbers: No brood year specific estimates of escapement are available for naturally and hatchery produced fish. Run year specific estimates for the combined escapement of naturally and hatchery produced fish to McKenzie Hatchery are available in Oregon Department of Fish and Wildlife and Washington Department of Fisheries (1991). Run

year specific information on the number of females spawned at McKenzie Hatchery is available in Howell et al. (1985).

Fecundity

Run year specific estimates of average fecundity at McKenzie Hatchery are available in Howell et al. (1985).

Mark Recoveries

Coded wire tagged hatchery spring chinook, released as juveniles in the McKenzie subbasin, were recovered in the Middle Fork, Santiam and Calapooia rivers, and Willamette River subbasins; a tributary of the lower Columbia River (either the Klaskanine River or Big, Gnat, or Tanner creek); and in the Elk River on the southern Oregon coast (Table 2).

BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile spring chinook were collected from McKenzie Hatchery in 1984 and 1985, and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele mobilities and allele frequencies were determined for 18 enzyme systems (Appendix Table 3). One rare allele was detected, at the isocitrate dehydrogenase locus in the 1984 sample.

Schreck et al. (1986) classified Columbia River Basin chinook into several clusters of similar stocks, based on biochemical, morphological, and life history characters. Columbia River Basin chinook stocks segregated into two primary groups. The first group contained spring chinook from east of the Cascade Mountains and summer chinook from Idaho. The second group contained spring chinook from west of the Cascades, summer chinook from the upper Columbia, and all fall chinook stocks. The second primary group was composed of 3 subgroups. At the subgroup level, hatchery Willamette spring chinook collected from McKenzie Hatchery were found to be most similar to other chinook stocks (wild and hatchery, fall and spring) found in the Willamette River subbasin. This subgroup was characterized by the highest average values for head length, gill rakers and pelvic fin rays, and the lowest average values for anal fin rays and pectoral fin rays. This group also had the lowest average frequencies of the common aconitate hydratase, malate dehydrogenase and mannose phosphate isomerase alleles. All stocks in this group are native to the Willamette River subbasin, with the possible exception of Clackamas River fall chinook.

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile spring chinook for subbasin hatchery production (Table 3). Parasites include ***Epistylis sp.,*** Costia ***(Ichthyobodo sp.),*** and ***Cerutomyxa Shasta. Bacterial*** diseases include ***Renibacterium salmoninarum*** (bacterial kidney disease), ***Cytophaga psychrophila*** (cold water disease), and ***Yersinia ruckeri*** (enteric redmouth disease). Viral diseases include Erythrocytic Inclusion Body Syndrome (EIBS). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see SANTIAM RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES and see MIDDLE FORK RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery releases of spring chinook salmon into the McKenzie River subbasin by brood year and if marked, by coded wire tag code[a,b].

Brood Year	Stock[c]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Nuder Released	Release Location	CWT/ Fin clip[d]
1978	McKenzie R.[e]	Oakridge	smolt	03/17/80	03/18/80	8.0	72,314	Horse Creek	--
1978	McKenzie R.[e]	Oakridge	smolt	03/17/80	--	7.9	47,980	McKenzie River (R-2)	--
1978	McKenzie R.[e]	Oakridge	smolt	03/18/80	--	8.0	50,400	McKenzie River (R-2)	--
1978	McKenzie R.[e]	McKenzie	smolt	03/15/80	--	5.9	79,327	McKenzie River (R-1)	--
1978	McKenzie R.[e]	McKenzie	smolt	03/15/80[f]	--	5.9	100,961	McKenzie River (R-1)	CWT
1978	Unknown	Unknown	smolt	11/15/80[f]	--	5.4-6.8	432,723	McKenzie River Subbasin	--
1978	Unknown	Oakridge	smolt	11/15/80[f]	--	6.9-7.0	26,562	McKenzie River Subbasin	--
1979	Willamette[g]	Oakridge	smolt	11/19/80	--	7.0	1,125	McKenzie River (R-2)	--
1979	Willamette[g]	Oakridge	smolt	11/12/80	--	7.7	2,248	McKenzie River (R-2)	--
1979	McKenzie R.[e]	Oakridge	smolt	03/16/81	--	12.0	15,960	Horse Creek	--
1979	McKenzie R.[e]	Oakridge	smolt	10/24/80	--	6.5	1,025	McKenzie River (R-1)	--
1979	McKenzie R.[e]	Oakridge	smolt	11/05/80	--	6.7	15,343	McKenzie River (R-2)	--
1979	McKenzie R.[e]	Oakridge	smolt	11/05/80	--	6.7	1,024	McKenzie River (R-1)	CD
1979	McKenzie R.[e]	Oakridge	smolt	03/16/81	--	12.0	35,400	McKenzie River (R-1)	--
1979	McKenzie R.[e]	Oakridge	smolt	02/26/81	--	12.3	15,665	McKenzie River (R-1)	--
1979	McKenzie R.[e]	Oakridge	smolt	02/26/81	--	12.3	1,740	McKenzie River (R-1)	RM
1979	McKenzie R.[e]	Oakridge	smolt	02/26/81	--	12.7	25,031	McKenzie River (R-1)	--
1979	McKenzie R.[e]	Oakridge	smolt	02/26/81	--	12.7	2,780	McKenzie River (R-I)	LM
1979	McKenzie R.[e]	Oakridge	smolt	02/26/81	--	12.8	29,262	McKenzie River (R-I)	--
1979	McKenzie R.[e]	Oakridge	smolt	02/26/81	--	12.8	3,250	McKenzie River (R-I)	LM
1979	McKenzie R.[e]	Oakridge	smolt	02/26/81	--	13.5	18,909	McKenzie River (R-I)	--
1979	McKenzie R.[e]	Oakridge	smolt	02/26/81	--	13.5	2,101	McKenzie River (R-1)	RM
1979	McKenzie R.[e]	Oakridge	smolt	02/26/81	--	14.1	17,907	McKenzie River (R-1)	--
1979	McKenzie R.[e]	Oakridge	smolt	11/05/80	--	6.7	7,906	SFk McKenzie River	--
1979	McKenzie R.[e]	McKenzie	smolt	03/16/81	--	5.4	165,668	McKenzie River (R-I)	--
1979	McKenzie R.[e]	McKenzie	smolt	03/16/81	--	5.4	10,762	McKenzie River (R-I)	CWT
1979	McKenzie R.[e]	McKenzie	smolt	11/05/80	--	6.7	170,000	McKenzie River (R-1)	--
1980	McKenzie R.[e]	Oakridge	smolt	11/05/81	--	6.8	6,253	Horse Creek	--
1980	McKenzie R.[e]	Oakridge	smolt	11/05/81	--	6.8	5,995	McKenzie River (R-I)	--
1980	McKenzie R.[e]	Oakridge	smolt	11/05/81	--	6.8	11,995	McKenzie River (R-2)	--
1980	McKenzie R.[e]	Oakridge	smolt	11/05/81	--	6.8	5,998	SFk McKenzie River	--
1980	McKenzie R.[e]	Willamette	smolt	03/15/82	--	11.1	14,429	Horse Creek	--
1980	McKenzie R.[e]	Willamette	smolt	03/29/82	--	10.1	17,958	McKenzie River (R-1)	--
1980	McKenzie R.[e]	Willamette	smolt	03/29/82	--	10.1	14,140	McKenzie River (R-2)	--
1980	McKenzie R.[e]	Willamette	smolt	03/29/82	--	10.7	32,132	McKenzie River (R-I)	--
1980	McKenzie R.[e]	Willamette	smolt	03/29/82	--	10.9	32,279	McKenzie River (R-I)	--
1980	McKenzie R.[e]	Willamette	smolt	03/29/82	--	11.0	32,226	McKenzie River (R-I)	--
1980	McKenzie R.[e]	Willamette	smolt	03/16/82	--	11.1	14,153	McKenzie River (R-2)	--
1980	McKenzie R.[e]	Willamette	smolt	03/29/82	--	12.6	32,163	McKenzie River (R-I)	--

Table 1 (TR). (cont.) Hatchery releases of spring chinook salmon into the McKenzie River subbssin by brood year and if msrked, by coded wire tag code[a,b].

Brood Year	Stock[c]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Nunber Released	Release Location	CWT/ Fin clip[d]
1980	McKenzie R.[e]	Willamette	smolt	03/16/82	--	11.1	5,217	SFk McKenzie River	--
1980	McKenzie R.[e]	McKenzie	smolt	11/05/81	--	6.1	362,809	McKenzie River (R-I)	--
1980	McKenzie R.[e]	McKenzie	smolt	11/05/81	--	6.1	11,220	McKenzie River (R-I)	AD-CWT
1980	McKenzie R.[e]	McKenzie	smolt	03/15/82	--	6.5	111,774	McKenzie River (R-I)	--
1980	McKenzie R.[e]	McKenzie	smolt	03/15/82	--	6.5	36,699	McKenzie River (R-I)	07-20-54
1980	McKenzie R.[e]	McKenzie	smolt	03/15/82	--	6.5	36,933	McKenzie River (R-I)	07-25-16
1980	McKenzie R.[e]	McKenzie	smolt	03/15/82	--	6.5	35,334	McKenzie River (R-I)	07-25-18
1981	McKenzie R.[e]	Willemette	smolt	03/14/83	--	9.9	12,553	Horse Creek	--
1981	McKenzie R.[e]	Willamette	smolt	03/14/83	--	12.4	18,104	Horse Creek	—
1981	McKenzie R.[e]	Willamette	smolt	03/14/83	--		19,727	McKenzie River (R-21	--
1981	McKenzie R.[e]	Willamette	smolt	03/14/83	--	8:X	12,474	McKenzie River (R-2)	--
1981	McKenzie R.[e]	Willemette	slnolt	03/14/83	--	11.0	17,910	McKenzie River (R-2)	--
1981	McKenzie R.[e]	Willamette	smolt	03/14/83	--	11.1	19,559	McKenzie River (R-2)	—
1981	McKenzie R.[e]	Willamette	smolt	03/15/83	--	12.1	22,012	McKenzie River (R-2)	--
1981	McKenzie R.[e]	Willamette	smolt	03/14/83	--	12.3	29,836	McKenzie River (R-2)	--
1981	McKenzie R.[e]	Willamette	smolt	03/14/83	--	12.4	11,408	McKenzie River (R-2)	--
1981	McKenzie R.[e]	Willamette	smolt	03/15/83	--	12.7	29,655	McKenzie River (R-2)	--
1981	McKenzie R.[e]	Willamette	slnolt	03/14/83	--	11.4	12,530	SFk McKenzie River	--
1981	McKenzie R.[e]	Willamette	smolt	03/15/83	--	12.1	12,826	SFk McKenzie River	--
1981	McKenzie R.[e]	McKenzie	smolt	03/14/83	--	4.0	36,532	McKenzie River (R-I)	07-27-18
1981	McKenzie R.[e]	McKenzie	smolt	11/08/82	--	6.7	4,801	McKenzie River (R-I)	--
1981	McKenzie R.[e]	McKenzie	smolt	11/08/82	--	6.7	32,123	McKenzie River (R-I)	07-27-19
1981	McKenzie R.[e]	McKenzie	smolt	03/14/83	--	7.1	36,018	McKenzie River (R-I)	07-25-22
1981	McKenzie R.[e]	McKenzie	smolt	03/14/83	--	7.1	30,786	McKenzie River (R-I)	07-27-24
1981	McKenzie R.[e]	McKenzie	smolt	03/14/83	--	9.3	32,662	McKenzie River (R-I)	07-27-20
1981	McKenzie R.[e]	McKenzie	smolt	11/08/82	--	9.7	35,997	McKenzie River (R-I)	07-25-21
1981	McKenzie R.[e]	McKenzie	smolt	03/14/83	--	10.3	84,779	McKenzie River (R-I)	--
1981	McKenzie R.[e]	McKenzie	smolt	11/08/82	--	14.6	32,952	McKenzie River (R-O	07-27-21
1982	MFk Will. R.[h]	Willamette	fing.	06/23/83	--	89.0	69,319	Blue River Reservoir	--
1982	MFk Will. R.[h]	Willamette	fry	06/23/83	--	126.0	31,112	Blue River Reservoir	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	7.2	8,636	Horse Creek	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	7.3	20,878	Horse Creek	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	9.0	10,890	Horse Creek	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	9.8	11,855	Horse Creek	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	5.7	7,068	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	6.4	8,118	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	6.7	5,896	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/21/84	--	7.2	11,232	McKenzie River (R-2)	--

Table 1 (TR). (cont.) Hatchery releases of spring chinook salmon into the McKenzie River s&basin by brood year and if marked, by coded wire tag code[a,b].

Brood Year	Stock[c]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[d]
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	03/21/84	7.3	15,466	NcKenzie River (R-2)	--
1982	NcKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	7.7	9,237	NcKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/21/84		7.8	59,642	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	03/21/84	8.1	46,520	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	8.5	21,585	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	8.6	9,804	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	8.8	12,476	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/21/84	--	9.1	12,285	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/21/84	--	9.2	11,194	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	9.3	11,695	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	9.4	13,724	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	9.6	4,790	McKenzie River (R-2)	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	8.5	13,855	SFk McKenzie River	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/21/84	--	8.8	13,980	SFk McKenzie River	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/20/84	--	9.4	14,565	SFk McKenzie River	--
1982	McKenzie R.[e]	Dexter Pond	smolt	03/19/84	--	10.5	16,003	SFk McKenzie River	--
1982	NcKenzie R.[e]	McKenzie	smolt	11/07/83	--	5.7	199,563	McKenzie River (R-1)	--
1982	McKenzie R.[e]	McKenzie	smolt	03/19/84	--	7.5	228,023	McKenzie River (R-1)	--
1983	MFk Will. R.[h]	Willamette	fry	04/12/84	--	412.0	100,086	Blue River Reservoir	--
1983	McKenzie R.[e]	Willamette	smolt	11/05/84	--	7.2	27,180	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Willamette	smolt	11/06/84	--	7.3	23,335	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Willamette	smolt	11/05/84	--	7.5	25,415	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Wi llamette	smolt	11/04/84	--		11,070	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Wi llamette	smolt	11/05/84	--	[illegible]	28,953	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Wi llamette	smolt	11/05/84	--	7.5	10,620	SFk McKenzie River	--
1983	MFk Will.[h]	McKenzie	fing.	06/27/84	--	55.0	111,650	Blue River Reservoir	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85	--	8.3	12,533	Horse Creek	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85	--	9.5	12,920	Horse Creek	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85	--	11.2	17,584	Horse Creek	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85	--	11.4	17,784	Horse Creek	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/19/85	--	7.3	8,906	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/19/85	--	7.4	11,914	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/19/85	--	7.9	22,515	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/19/85	--	8.0	12,800	NcKenzie River (R-2)	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85	--	8.1	11,014	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85	--	8.7	10,440	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85	--	9.0	22,167	McKenzie River (R-2)	--
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85		10.6	26,712	McKenzie River (R-2)	--

Table 1 (TR)-code[a,b] (cont.) Hatchery releases of spring chinook salmon into the McKenzie River subbesin by brood year and if marked, by coded wire tag.

Brood Year	Stock[c]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[d]
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85	--	11.0	13,750	McKenzie River (R-2)	··
1983	McKenzie R.[e]	Dexter Pod	smolt	03/18/85	--	11.1	13,098	McKenzie River (R-2)	··
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85	--	11.2	13,440	McKenzie River (R-2)	··
1983	McKenzie R.[e]	Dexter Pond	smolt	03/18/85	--	12.9	15,674	McKenzie River (R-2)	··
1983	McKenzie R.[e]	Dexter Pond	smolt	03/19/85	--	8.2	10,166	SFk McKenzie River	··
1983	McKenzie R.[e]	Dexter Pond	smolt	03/19/85	--	8.5	9,690	SFk McKenzie River	··
1983	McKenzie R.[e]	Dexter Pond	smolt	03/19/85	--	8.6	9,631	SFk McKenzie River	··
1983	McKenzie R.[e]	Dexter Pond	smolt	03/19/85	--	9.9	12,177	SFk McKenzie River	··
1983	McKenzie R.[e]	McKenzie	smolt	11/05/84	--	6.5	256,919	McKenzie River (R-2)	··
1983	McKenzie R.[e]	McKenzie	smolt	03/14/85	--	11.1	107,780	McKenzie River (R-I)	··
1984	McKenzie R.[e]	McKenzie	fing.	05/28/85	--	116.3	200,036	Blue River Reservoir	··
1984	McKenzie R.[e]	McKenzie	fing.	06/06/85	--	69.0	134,550	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	fing.	06/06/85	--	77.D	150,150	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	fing.	05/28/85	--	101.0	161,600	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	fing.	05/28/85	--	116.3	180,265	McKenzie River (R-2)	··
1984	McKenzie R.[e]	Marion Forks	fry	06/05/85	--	417.7	231,865	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	6.9	70,150	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	7.0	20,755	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	7.1	9,014	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	7.2	298,078	McKenzie River (R-I)	··
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	7.8	32,826	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	8.0	10,272	McKenzie River (R-I)	07-37-29
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	8.0	10,632	McKenzie River (R-I)	07-37-30
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	8.0	10,312	McKenzie River (R-I)	07-37-31
1984	McKenzie R.[e]	McKenzie	smolt	03/17/86	--	8.4	32,214	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	smolt	03/12/86	--	8.8	154,901	McKenzie River (R-1)	··
1984	McKenzie R.[e]	McKenzie	smolt	03/17/86	--	9.4	7,896	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	smolt	03/12/86	--	9.9	10,550	McKenzie River (R-I)	07-37-32
1984	McKenzie R.[e]	McKenzie	smolt	03/12/86	--	9.9	10,392	McKenzie River (R-I)	07-37-33
1984	McKenzie R.[e]	McKenzie	smolt	03/12/86	--	9.9	10,452	McKenzie River (R-I)	07-37-34
1984	McKenzie R.[e]	McKenzie	smolt	03/17/86	--	10.9	43,764	McKenzie River (R-2)	··
1984	McKenzie R.[e]	McKenzie	smolt	03/12/86	--	11.7	107,067	McKenzie River (R-I)	··
1984	McKenzie R.[e]	McKenzie	smolt	03/12/86	--	11.8	34,733	McKenzie River (R-I)	··
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	6.9	38,131	SFk McKenzie River	··
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	7.0	9,030	SFk McKenzie River	··
1984	McKenzie R.[e]	McKenzie	smolt	11/05/85	--	7.1	18,665	SFk McKenzie River	··
1984	McKenzie R.[e]	McKenzie	smolt	03/17/86	--	9.6	25,727	SFk McKenzie River	··
1985	McKenzie R.[e]	McKenzie	fry	04/04/86	--	280.0	200,195	Blue River Reservoir	··

Table 1 (TR). code[a,b] (cont.) Hatchery releases of spring chinook salmon into the McKenzie River subbasin by brood year and if marked, by coded wire tag

Brood Year	Stock[c]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[d]
1985	McKenzie R.[e]	McKenzie	fry	04/04/86	--	280.0	97,980	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	fry	04/18/86	--	300.0	218,665	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	fry	04/14/86	--	302.0	211,400	McKenzie River (R-l)	--
1985	McKenzie R.[e]	McKenzie	smolt	11/07/86	--	7.7	15,747	McKenzie River (R-1)	07-39-48
1985	McKenzie R.[e]	McKenzie	smolt	11/07/86	--	7.7	15,023	McKenzie River (R-1)	07-39-49
1985	McKenzie R.[e]	McKenzie	smolt	11/07/86	--	7.9	106,568	McKenzie River (R-1)	--
1985	McKenzie R.[e]	McKenzie	smolt	11/05/86	--	8.1	30,206	McKenzie River (R-1)	--
1985	McKenzie R.[e]	McKenzie	smolt	11/05/86	--	8.3	25,248	McKenzie River (R-l)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	--	8.8	16,456	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/13/87	--	9.1	167,715	McKenzie River (R-1)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	03/13/87	9.1	104,596	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/13/87	--	9.4	35,672	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	--	9.6	40,224	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	03/13/87	9.7	96,045	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	--	9.9	36,828	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/13/87	--	9.9	16,117	McKenzie River (R-l)	07-39-50
1985	McKenzie R.[e]	McKenzie	smolt	03/13/87	--	9.9	15,870	McKenzie River (R-l)	07-39-51
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	--	10.0	41,917	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	--	10.5	9,975	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/13/87	--	11.2	39,200	McKenzie River (R-2)	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	--	8.8	21,735	SFk McKenzie River	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	--	9.3	34,456	SFk McKenzie River	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	--	9.6	13,627	SFk McKenzie River	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	--	9.7	11,931	SFk McKenzie River	--
1985	McKenzie R.[e]	McKenzie	smolt	03/12/87	--	10.5	30,711	SFk McKenzie River	--
1986	McKenzie R.[e]	McKenzie	fry	04/09/87	--	252.0	262,072	Blue River Reservoir	--
1986	McKenzie R.[e]	McKenzie	smolt	11/10/87	--	7.2	30,312	McKenzie River (R-l)	07-50-02
1986	McKenzie R.[e]	McKenzie	smolt	11/10/87	--	7.4	136,013	McKenzie River (R-l)	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	7.6	31,136	McKenzie River (R-l)	07-50-04
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	7.8	429,937	McKenzie River (R-l)	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	8.8	31,184	McKenzie River (R-2)	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	9.8	32,435	McKenzie River (R-2)	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	10.0	47,587	McKenzie River (R-2)	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	10.2	13,260	McKenzie River (R-2)	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	10.3	16,686	McKenzie River (R-2)	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	10.4	39,000	McKenzie River (R-2)	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	10.7	27,392	McKenzie River (R-2)	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	14.0	37,646	McKenzie River (R-2)	--

Table 1 (TR). code[a,b] (cont.) Hatchery releases of spring chinook salmon into the McKenzie River subbasin by brood year and if marked, by coded uire tag

Brood Year	Stock'	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT/ Fin clip[d]
1986	McKenzie R.[e]	HcKenzie	smolt	03/07/88	--	9.8	10,221	SFk McKenzie River	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	10.2	22,072	SFk McKenzie River	--
1986	McKenzie R.[e]	McKenzie	smolt	03/07/88	--	10.3	29,756	SFk McKenzie River	--
1987	McKenzie R.[e]	McKenzie	fry	05/03/88	--	156.0	204,036	Blue River Reservoir	--
1987	McKenzie R.[e]	McKenzie	smolt	11/10/88	--	7.7	326,449	McKenzie River (R-I)	—
1987	McKenzie R.[e]	McKenzie	smolt	11/10/88	--	7.9	31,387	McKenzie River (R-I)	07-50-49
1987	McKenzie R.[e]	McKenzie	smolt	03/09/89	--	8.9	32,170	McKenzie River (R-2)	—
1987	McKenzie R.[e]	McKenzie	smolt	03/09/89	--	9.4	1,878	McKenzie River (R-2)	--
1987	McKenzie R.[e]	McKenzie	smolt	03/10/89	--	9.6	31,306	McKenzie River (R-1)	07-50-50
1987	McKenzie R.[e]	McKenzie	smolt	03/09/89	--	9.7	72,988	McKenzie River (R-2)	—
1987	McKenzie R.[e]	McKenzie	smolt	03/10/89	--	10.2	332,038	McKenzie River (R-I)	--
1987	McKenzie R.[e]	McKenzie	smolt	03/09/89	--	10.4	37,596	McKenzie River (R-2)	--
1987	McKenzie R.[e]	McKenzie	smolt	03/09/89	--	10.8	80,350	McKenzie River (R-2)	--
1988	McKenzie R.[e]	McKenzie	fing.	05/03/89	--	105.8	124,303	glue River Reservoir	--
1988	McKenzie R.[e]	McKenzie	fry	05/03/89	--	125.9	61,052	Blue River Reservoir	--
1988	McKenzie R.[e]	McKenzie	fry	05/04/89	--	183.0	14,658	Blue River Reservoir	--
1988	McKenzie R.[e]	McKenzie	smolt	03/08/90	—	9.6	23,178	Horse Creek	--
1988	McKenzie R.[e]	McKenzie	smolt	03/08/90	03/09/90	10.5	37,580	Horse Creek	--
1988	McKenzie R.[e]	McKenzie	smolt	03/08/90	--	8.0	17,600	McKenzie River (R-2)	—
1988	McKenzie R.[e]	McKenzie	smolt	11/09/89	—	8.1	181,945	McKenzie River (R-1)	--
1988	HcKenzie R.[e]	McKenzie	smolt	11/09/89	--	8.1	15,599	McKenzie River (R-I)	07-51-58
1988	McKenzie R.[e]	McKenzie	smolt	11/09/89		8.2	15,903	McKenzie River (R-I)	07-51-59
1988	McKenzie R.[e]	McKenzie	smolt	03/09/90	--	8.9	21,583	McKenzie River (R-2)	--
1988	McKenzie R.[e]	HcKenzie	smolt	03/08/90	--	9.2	15,583	McKenzie River (R-1)	07-51-60
1988	McKenzie R.[e]	McKenzie	smolt	03/08/90		9.2	16,081	McKenzie River (R-I)	07-51-61
1988	McKenzie R.[e]	HcKenzie	smolt	03/08/90	--	9.6	86,974	McKenzie River (R-2)	--
1988	McKenzie R.[e]	McKenzie	smolt	03/08/90	—	9.7	403,781	McKenzie River (R-1)	--
1988	McKenzie R.[e]	McKenzie	smolt	03/08/90	--	10.0	37,655	McKenzie River (R-2)	--
1989	HcKenzie R.[e]	Research	smolt	03/21/91	--	7.9	4,118	McKenzie River (R-I)	—
1989	McKenzie R.[e]	McKenzie	fry	04/17/90	--	168.0	200,254	Blue River Reservoir	--
1989	McKenzie R.[e]	HcKenzie	smolt	10/15/90	--	9.1	2,545	Blue River Reservoir	RV
1989	McKenzie R.[e]	McKenzie	smolt	11/16/90	--	7.0	18,004	McKenzie River (R-I)	07-55-24
1989	McKenzie R.[e]	McKenzie	smolt	11/16/90	--	7.2	17,892	McKenzie River (R-I)	07-55-22
1989	McKenzie R.[e]	HcKenzie	smolt	11/16/90	--	7.2	16,322	McKenzie River (R-I)	07-55-23
1989	McKenzie R.[e]	McKenzie	smolt	11/16/90	--	7.5	138,741	McKenzie River (R-I)	--
1989	McKenzie R.[e]	McKenzie	smolt	03/26/91	--	7.9	15,954	McKenzie River (R-I)	--
1989	McKenzie R.[e]	McKenzie	smolt	03/07/91	--	8.0	17,778	McKenzie River (R-I)	07-55-25
1989	McKenzie R.[e]	McKenzie	smolt	03/07/91		8:0	17,778	McKenzie River (R-I)	07-55-26

Table 1 (TR). (cont.) Hatchery releases of spring chinook salmon into the McKenzie River subbasin by brood year and if marked, by coded wire tag code[a,b].

Brood Year	Stock[c]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT/ Fin clip[d]
1989	McKenzie R.[e]	McKenzie	smolt	03/07/91	-	8.5	618,532	McKenzie River (R-l)	--
1990	McKenzie R.[e]	McKenzie	fry	04/17/91	-	286.0	52,900	Blue River Reservoir	--
1990	McKenzie R.[e]	McKenzie	smolt	11/15/91	-	7.7	236,510	McKenzie River (R-l)	07-56-52

a Modified from Oregon Department of Fish and Wildlife's hatchery production database; and Oregon Department of Fish and Uildlife (unpublished data).

b Data for the 1960-77 brood years is available in graph form in Oregon Department of Fish and Wildlife (1990). Records dating from the 1902 brood year are available in Oregon Department of Fish and Uildlife (unpublished data).

c North Santiam, South Santiam, Clackamas, McKenzie, and Middle Fork Uillamette rivers stocks, and Eagle Creek stock are all considered part of the Uillamette River stock.

d D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknoun); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

e McKenzie Fish Hatchery stock.

f Day(s) of release unknown; standardized to the 15th of the month.

g Fall Creek Reservoir stock.

h Uillamette Fish Hatchery stock.

Table 2 (AE). Emigration of coded wire tagged hatchery spring chinook salmon released into the McKenzie River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
McKenzie River	Elk River, OR	Hatchery Returns		
	1988	--	1	1
McKenzie River	Columbia R. Trib.[c]	Hatchery Returns		
	1985		1	1
McKenzie River	Middle Fork River	Hatchery Returns		
	1982	--	5	5
	1983	--	8	8
	1985	--	6	6
McKenzie River	Santiam,Calapooia	Hatchery Returns		
	1983		2	2
McKenzie River	Willamette River	Trap Returns		
	1982	--	1	1
	1983	--	3	3
	1984		1	1
	1985		1	1

a Based on the following tag codes: 07-20-49, 07-20-50, 07-20-54, 07-22-17, 07-22-20, 07-22-21, 07-22-22, 07-25-21, 07-25-22, 07-27-18, 07-27-20, 07-27-21, 07-27-24, 07-39-51.

b Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

c Klaskanine River, Big Creek, Gnat Creek, or Tanner Creek.

Table 3 (TD). Parasites and diseases of spring chinook at hatcheries located in the McKenzie River subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	McKenzie	*Epistylis sp.*
Parasite	McKenzie	blood flukes
Parasite	McKenzie	*Ceratomyxa shasta*
Parasite	McKenzie	Gill amoeba
Parasite	McKenzie	Gill trematodes
Parasite	McKenzie	Costia *(Ichthyobodo sp.)*
Parasite	McKenzie	*Trichodina spp.*
Parasite	McKenzie	*Tetrahymena*
Parasite	McKenzie	*Hexamita*
Parasite	McKenzie	*Nanophyetus salmincola*
Parasite	McKenzie	*Colponema*
Parasite	McKenzie	*Scyphidia*
Parasite	McKenzie	*Myxobolus insidiosus*
Parasite	McKenzie	*Myxobolus sp.*
Parasite	McKenzie	*Henneguya salminicola*
Bacteria	McKenzie	*Ichthyophthirius sp.* (ICH)
Bacteria	McKenzie	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	McKenzie	Furunculosis *(Aeromonas salmonicida)*
Bacteria	McKenzie	*Pseudomonas spp.*
Bacteria	McKenzie	Enteric redmouth *(Yersinia ruckeri)*
Bacteria	McKenzie	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	McKenzie	*Lactobacilli*
Bacteria	McKenzie	*Aeromonas spp.*
Bacteria	McKenzie	*Ichthyophthirius sp.* (ICH)
Bacteria	McKenzie	*Aeromonas hydrophila*
Bacteria	Leaburg	*Aeromonas spp.*
Bacteria	Leaburg	*Pseudomonas spp.*
Virus	McKenzie	Erythrocytic Inclusion Body Syndrome (EIBS)

Table 3 (TD). (cont.) Parasitea and diseases of spring chinook at hatcheries located in the McKenzie River subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Fungi	McKenzie	External fungi
Fungi	McKenzie	Internal fungi

[a] Data are from Oregon Department of Fish and Wildlife (unpublished data).

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Howell, P.J., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

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McKENZIE RIVER SUBBASIN

Naturally Produced Fall Chinook Salmon

GEOGRAPHIC LOCATION

The McKenzie River subbasin originates on the west slope of the Cascade Mountains and flows about 90 miles to the southwest where it empties into the Willamette River at RM 175 (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The McKenzie River subbasin drains approximately 1,300 square miles of Lane and Linn counties with 1,040 miles of perennial streams (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990). Major tributaries of the McKenzie River include Lost, Horse, Quartz, Gate, and Camp creeks, the South Fork McKenzie River, and Smith, Blue and Mohawk rivers (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Fall chinook are not indigenous to the McKenzie River subbasin (Oregon Department of Fish and Wildlife 1990). However, the subbasin was supplemented with hatchery fish in the late 1960's (see McKENZIE RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon). It is believed that returning hatchery adults spawned in the lower McKenzie River (Oregon Department of Fish and Wildlife 1990). Also, adult hatchery fall chinook, released as juveniles in the mainstem Willamette River, may spawn in the lower McKenzie River (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Fall chinook were observed spawning in the lower McKenzie River in the 1970's (Oregon Department of Fish and Wildlife 1990). There is an estimated 13.7 miles of habitat considered suitable for spawning and rearing in the subbasin (Tables 1 and 2). The habitat is rated as "poor" quality (Tables 1 and 2).

ADULT LIFE HISTORY

Sex Ratio

Although brood year specific estimates of sex ratio for naturally produced fall chinook are not available, run year specific estimates are available for combined samples of naturally and hatchery produced fish in Hansen and Williams (1979).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of McKenzie River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	O*O	0.0	0.0	100.0	--	13.7	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of McKenzie River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

REFERENCES

Hansen, H.L., and R.H. Williams. 1979. Stock assessment and enhancement of fall salmon species in the Willamette River system. Oregon Department of Fish and Wildlife, Federal Aid Progress Report, Fisheries, Portland, Oregon.

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McKENZIE RIVER SUBBASIN

Hatchery Produced Fall Chinook Salmon

ORIGIN

Hatchery fall chinook were released in the McKenzie River subbasin from 1966-68 in order to establish a self-sustaining population in the subbasin (Oregon Department of Fish and Wildlife 1990). LRH (Lower River Hatchery) stock fall chinook, informally called tules (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, ORIGIN), were the only stock of fall chinook released in the subbasin (Table 1).

DISTRIBUTION

Subbasin

Hatchery fall chinook were released primarily in the mainstem McKenzie River, with occasional releases into the Mohawk River, and Parsons Creek (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases into the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Bonneville and Cascade hatcheries (Table 1). Annual numbers released ranged from 1,300,425 to 2,331,600 fish (Table 1). Size at release ranged from 1,273 to 1,030 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Cascade, Big Creek, and McKenzie hatcheries (Table 1). Annual numbers released ranged from 650,454 to 827,891 fish (Table 1). Size at release ranged from 449 to 183 fish per pound (Table 1).

Smelt

There are no records of releases into the subbasin.

Jack and Adult

There are no records of releases into the subbasin.

DISEASES

There are no hatchery facilities in the McKenzie River subbasin that currently hold or rear hatchery fall chinook prior to release in the subbasin. For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, DISEASES.

Table 1 (IR). Hatchery fall chinook releases into the McKenzie River subbasin by brood year and, if marked, coded wire tag c

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code Fin	Clip
..	LRH	Cascade	fing.	05/05/66	..	357	650,454	McKenzie River	..	
..	LRH	Bonneville	fry	02117167	..	1,273	100,000	Parsons Creek	..	
..	LRH	Cascade	fry	02/ 15/67	..	1,200	912,000	McKenzie River	..	
..	LRH	Cascade	fry	02/16/67	.-	1,200	1,319,600	Mohawk River	--	
..	LRH	Bonneville	fry	02/20/68	..	1,030	167,445	McKenzie River	..	
..	LRH	Bonneville	fry	02/20/68	..	1,030	167,100	McKenzie River	--	
..	LRH	Bonneville	fry	03/13/68	.-	1,030	336,600	McKenzie River	..	
..	LRH	Cascade	fry	03/05/68	..	1,054	313,200	Mohawk River	--	
--	LRH	Cascade	fry	03/13/68	--	1,054	316,080	McKenzie River	..	
..	LRH	Big Creek	fing.	03127168	..	183	128,832	McKenzie River	..	
--	LRH	Cascade	fing.	04/02/68	--	420	252,000	McKenzie River	..	
..	LRH	Cascade	fing.	04/03/68	..	449	226,745	McKenzie River	--	
--	LRH	McKenzie	fing.	04/05/68	--	438	220,314	McKenzie River	--	

a Modified from Oregon Department of Fish and Wildlife (1990).
b LRH refers to Lower River Hatchery Stock, which are informally called tules (along with Bonneville Pool Hatchery Stock).

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (McKenzie River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

McKENZIE RIVER SUBBASIN

Naturally Produced Summer Steelhead

GEOGRAPHIC LOCATION

The McKenzie River subbasin originates on the west slope of the Cascade Mountains and flows about 90 miles to the southwest where it empties into the Willamette River at RM 175 (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The McKenzie River subbasin drains approximately 1,300 square miles of Lane and Lim counties with 1,040 miles of perennial streams (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990). Major tributaries of the McKenzie River include Lost, Horse, Quartz, Gate, and Camp creeks, the South Fork McKenzie River, and Smith, Blue and Mohawk rivers (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Summer steelhead are not indigenous to the McKenzie River subbasin (Oregon Department of Fish and Wildlife 1990). However, the subbasin has been supplemented with hatchery stocks since 1968 (see McKENZIE RIVER SUBBASIN, Hatchery Produced Summer Steelhead). A self-sustaining population exists as a result of hatchery releases into the subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Summer steelhead spawn in the mainstem McKenzie and in tributaries which include Horse, Trout, Cedar Flat, Camp, and Gate creeks and the Walterville Canal. There are and estimated 61.5 miles of habitat considered suitable for spawning and rearing in the subbasin (Table 1) and 145 miles of habitat considered suitable for rearing (Table 2). The spawning and rearing habitat is rated primarily as "good" quality (Table 1) and the rearing habitat is rated primarily as "excellent" quality (Table 2). Subbasin goals are to confine steelhead populations below Leaburg Dam to lessen the effect of steelhead competition on the native trout population above the dam (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Harvest

sport

Subbasin: Al'though brood year specific estimates of sport harvest for naturally produced summer steelhead are not available, run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Summer steelhead are observed at Leaburg Dam throughout the-year with peak migration occurring in June and July (Oregon Department of Fish and Wildlife 1990). No stock specific estimates of run timing for naturally produced summer steelhead are available.

Numbers: Although brood year specific estimates of escapement for naturally produced summer steelhead are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Timing: Summer steelhead primarily spawn during February and March (Oregon Department of Fish and Wildlife 1990). No stock specific estimates of the temporal distribution of spawning are available for either naturally or hatchery produced summer steelhead.

JUVENILE LIFE HISTORY

Migration Timing

Naturally produced summer steelhead smelts are observed migrating from the McKenzie River subbasin from early May through June with peak migration in mid-May (Zakel and Reed 1984, cited by Oregon Department of Fish and Wildlife 1990).

BIOCHEMICAL-GENETIC CHARACTERISTICS

Wild juvenile summer steelhead from the McKenzie River were analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele nobilities and allele frequencies were determined for 21 enzyme systems (Appendix Table 4). No rare alleles were detected.

Schreck et al. (1986) classified Columbia River Basin steelhead into several clusters of similar stocks based on biochemical, morphological and life history characters. Columbia River Basin steelhead stocks segregated into two primary groups, those from west of the Cascade Mountains and those from east of the Cascades. As expected, wild steelhead from the McKenzie River clustered with other stocks from west of the Cascades. This primary group was composed of 3 subgroups. At the subgroup level, wild summer steelhead from the McKenzie River were found to be most similar to 2 other wild summer steelhead stocks, six stocks of wild winter steelhead from the Columbia River Basin, and 2 hatchery winter steelhead stocks. This subgroup was characterized by the greatest head width, highest number of anal fin rays and branchiostegal rays, and the lowest average frequencies of the common malate dehydrogenase and glucose phosphate isomerase alleles.

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of McKenzie River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	8.0	77.3	14.7	0.0	--	61.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of McKenzie River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	77.2	0.0	6.3	16.4	--	144.9	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

REFERENCES

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McKENZIE RIVER SUBBASIN

Hatchery Produced Summer Steelhead

ORIGIN

Beginning in 1968, hatchery summer steelhead were released in the McKenzie River subbasin to create recreational fishing opportunities (Oregon Department of Fish and Wildlife 1990a). Siletz and Skamania stocks are the only summer steelhead stocks that have been released in the subbasin (Oregon Department of Fish and Wildlife 1990a). The Siletz stock experienced low survival rates due to susceptibility to *Ceratomyxa dusts* and has not been utilized for hatchery broodstock since 1971 (Oregon Department of Fish and Wildlife 1990a). The Skamania stock of summer steelhead was originally developed from hatchery broodstock collected from the Skamania River located in the state of Washington (Oregon Department of Fish and Wildlife 1990a). McKenzie and Leaburg hatcheries are currently utilizing returning summer steelhead derived from the original Skamania stock releases to develop hatchery broodstock for subbasin hatchery production (Oregon Department of Fish and Wildlife 1990a).

DISTRIBUTION

Subbasin

Summer steelhead have been released into the mainstem McKenzie River, the South Fork below Cougar Dam, and Horse Creek (Table 1). Recently, the majority of hatchery fish have been released below Leaburg Dam (Oregon Department of Fish and Wildlife 1990a).

PRODUCTION

Releases

Egg

There are no records of egg releases into the subbasin.

Fry

There are no records of fry releases into the subbasin.

Fingerling

There are no records of fingerling releases into the subbasin.

Smelt

Hatchery facilities in which smelts were reared or acclimated prior to release in the subbasin include McKenzie, Leaburg, Oak Springs, South Santiam, and Willamette hatcheries (Table 1). Annual numbers released ranged from 46,703 to 167,293 fish (Table 1). Size at release ranged from 6.8 to 3.3 fish per pound (Table 1).

Adult

There are no records of adult releases into the subbasin.

Harvest

sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery produced summer steelhead are not available, run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990a).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Summer steelhead are observed at Leaburg Dam throughout the year with peak migration occurring in June and July (Oregon Department of Fish and Wildlife 1990). No stock specific estimates of run timing for hatchery produced summer steelhead are available.

Numbers: Although brood year specific estimates of escapement for hatchery produced summer steelhead are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990a).

Hatchery Facilities

Numbers: Although brood year specific estimates of escapement for either naturally or hatchery produced summer steelhead to hatcheries facilities in the subbasin are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990b).

Fecundity

Although brood year specific estimates of fecundity for hatchery produced summer steelhead are not available, run year specific estimates of fecundity for the combined samples of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990b).

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile summer steelhead for subbasin hatchery production (Table 2). Parasites include *Epistylis sp.*, Costia (*Ichthyobodo sp.*), and *Ceratomyxa shasta*. *Bacterial diseases* include *Renibacterium salmoninarum* (bacterial kidney disease), *Cytophaga psychrophila* (cold water disease), and *Yersinia ruckeri* (enteric redmouth disease). Viral

diseases include Erythrocytic Inclusion Body Syndrome (EIBS). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see SANTIAM RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES and see MIDDLE FORK RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES.

Table 1 (TR). Hatchery summer steelhead releases into the McKenzie River subbasin by brood year and, if marked, coded wire tag Codes.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
--	Siletz	Unknown	smolt	01/01/68	12/31/68[c]	--	50,016	McKenzie mainstem	--
--	Siletz	Unknown	smolt	01/01/69	12/31/69[c]	--	49,525	McKenzie mainstem	--
--	Skamania	Leaburg, McKenzie	smolt	01/01/69	12/31/69[c]	--	19,002	McKenzie mainstem	--
--	Siletz	Unknown	smolt	01/01/71	12/31/71[c]	--	46,709	McKenzie mainstem	--
--	Skamania	Leaburg, McKenzie	molt	01/01/72	12/31/72[c]	--	63,232	main. McKenzie and Horse Cr	--
--	Skamania	Leaburg, McKenzie	smolt	01/01/73	12/31/73[c]	--	139,600	main. McKenzie and Horse Cr	--
--	Skamania	Leaburg, McKenzie	smolt	01/01/74	12/31/74[c]	--	111,389	main. McKenzie and Horse Cr	--
--	Skamania	Leaburg, McKenzie	smolt	01/01/75	12/31/75[c]	--	107,282	McKenzie mainstem	--
--	Skamania	Leaburg, McKenzie	smolt	01/01/76	12/31/76[c]	--	150,221	McKenzie mainstem	--
--	Skamania	Leaburg, McKenzie	smolt	01/01/77	12/31/77[c]	--	125,948	McKenzie mainstem	--
--	Skamania	Leaburg, McKenzie	smolt	01/01/78	12/31/78[c]	--	167,223	McKenzie mainstem	--
--	Skamania	Leaburg, McKenzie	molt	01/01/79	12/31/79[c]	--	156,453	McKenzie mainstem	--
1979	Skamania R.	Oak Springs	smolt	05/12/80	--	3.3	4,158	McKenzie River (R-1)	--
1979	Skamania R.	Oak Springs	smolt	05/08/80	--	3.3	16,049	McKenzie River (R-2)	--
1979	Skamania R.	Oak Springs	smolt	05/12/80	--	3.8	14,895	McKenzie River (R-1)	--
1979	Skamania R.	Oak Springs	smolt	05/12/80	--	3.8	4,864	McKenzie River (R-2)	--
1979	Skamania R.	Oak Springs	Smelt	05/13/80	05/14/80	4.6	17,869	McKenzie River (R-1)	--
1979	Skamania R.	Oak Springs	smolt	05/12/80	05/13/80	4.8	29,222	McKenzie River (R-1)	--
1979	Skamania R.	Leaburg	smolt	05/09/80	--	4.5	11,919	McKenzie River (R-1)	--
1979	Skamania R.	Leaburg	Smelt	05/09/80	--	4.5	20,140	McKenzie River (R-2)	--
1979	Skamania R.	Leaburg	smolt	05/09/80	--	4.6	14,172	McKenzie River (R-1)	--
1979	Skamania R.	Leaburg	smolt	05/09/80	--	4.6	13,754	McKenzie River (R-2)	--
1979	Skamania R.	Leaburg	smolt	05/09/80	--	4.7	14,169	McKenzie River (R-1)	--
1979	Skamania R.	Leaburg	smolt	05/09/80	--	4.7	6,082	McKenzie River (R-2)	--
1980	Skamania R.	Oak Springs	smolt	05/07/81	--	4.3	3,440	McKenzie River (R-1)	--
1980	McKenzie R.[d]	Leaburg	smelt	05/06/81	--	4.8	10,386	McKenzie River (R-1)	--
1980	McKenzie R.[d]	Leaburg	Smelt	05/06/81	--	4.8	1,153	McKenzie River (R-1)	RV
1980	McKenzie R.[d]	Leaburg	Smelt	04/27/81	--	5.1	18,003	McKenzie River (R-1)	--
1980	McKenzie R.[d]	Leaburg	smolt	04/27/81	--	5.1	1,999	McKenzie River (R-1)	RV
1980	McKenzie R.[d]	Leaburg	Smelt	04/27/81	--	6.7	3,003	McKenzie River (R-1)	--
1980	McKenzie R.[d]	Leaburg	smolt	04/27/81	--	6.7	333	McKenzie River (R-1)	RV
1980	McKenzie R.[d]	Leaburg	smolt	04/28/81	--	6.8	6,592	McKenzie River (R-1)	--
1980	McKenzie R.[d]	Leaburg	smolt	04/28/81	--	6.8	732	McKenzie River (R-1)	RV
1980	Skamania R.	Leaburg	smolt	05/06/81	--	4.6	23,798	McKenzie River (R-1)	--
1980	Skamania R.	Leaburg	Smelt	05/06/81	--	4.8	9,778	McKenzie River (R-1)	--
1980	Skamania R.	Leaburg	Smelt	05/06/81	--	4.8	1,085	McKenzie River (R-1)	LV
1980	Skamania R.	Leaburg	Smelt	04/27/81	--	5.2	18,002	McKenzie River (R-1)	--
1980	Skamania R.	Leaburg	smolt	04/27/81	--	5.2	1,998	McKenzie River (R-1)	LV
1980	Skamania R.	Leaburg	smelt	04/27/81	--	6.7	6,331	McKenzie River (R-1)	--

Table 1 (IR). (cont.) Hatchery sinner steelhead releases into the McKenzie River subbasin by brood Year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1980	Skamania R.	Leaburg	smolt	04/27/81	--	6.7	333	McKenzie River (R-1)	LV
1980	Skamania R.	Leaburg	smolt	04128/81	--	6.8	13,916	McKenzie River (R-1)	--
1980	Skamania R.	Leaburg	Smelt	04/28/81	..	6.8	731	McKenzie River (R-1)	LV
	Skamania R.	Leaburg	Smelt	04/28/81	..	4.9	10,006	SFk McKenzie River	--
1980	Skamania R.	South Santiam	smolt	04/13/81	..	5.3	18,174	McKenzie River (R-1)	--
1980	Skamania R.[d]	South Santiam	smolt	04/13/81	..	5.3	2,019	McKenzie River (R-1)	LV-LM
1981	McKenzie R.[d]	Leaburg	smolt	05/10/82	--	4.5	4,928	McKenzie River (R-2)	RM
1981	McKenzie R.[d]	Leaburg	smolt	05/10/82	..	4.7	24,225	McKenzie River (R-2)	RM
1981	McKenzie R.[d]	Leaburg	smolt	05/10/82	--	4.5	5,000	SFk McKenzie River	RM
1981	Skamania R.	Leaburg	smolt	05/10/82	--	4.8	4,992	McKenzie River (R-1)	LM
1981	Skamania R.	Leaburg	Smelt	05/10/82	--	4.8	24,746	McKenzie River (R-2)	LM
1981	Skamania R.	Leaburg	smelt	05/10/82	--	4.8	4,999	SFk McKenzie River	LM
1981	Skamania R.	McKenzie	Smelt	05/10/82	..	4.7	19,284	McKenzie River (R-1)	..
1981	Skamania R.	McKenzie	Smelt	05/1 0/82	--	4.7	4,959	McKenzie River (R-2)	..
1981	Skamania R.	McKenzie	smolt	05/1 0/82	..	4.8	16,078	McKenzie River (R-1)	--
1981	Skamania R.[d]	McKenzie	smolt	05/1 0/82	..	4.9	33,310	McKenzie River (R-1)	..
1982	McKenzie R.[d]	Leaburg	smolt	05/02/83	--	4.4	4,921	McKenzie River (R-1)	..
1982	McKenzie R.[d]	Leaburg	Smelt	05/02/83	--	4.4	11,897	McKenzie River (R-2)	--
1982	McKenzie R.	McKenzie	smolt	05/01/83	--	4.7	20,201	McKenzie River (R-1)	--
1982	Skamania R.	Leaburg	smolt	05/02/83	..	4.1	18,904	McKenzie River (R-1)	--
1982	Skamania R.	Leaburg	Smelt	05/02/83	--	4.1	50,574	McKenzie River (R-2)	..
1982	Skamania R.	Leaburg	Smelt	05/02/83	--	4.4	5,900	McKenzie River (R-1)	..
1982	Skamania R.	Leaburg	smolt	05/02/83	..	4.4	14,250	McKenzie River (R-2)	..
1983	Skamania R.[d]	Willamette	smolt	05/07/84	--	5.2	13,879	McKenzie River (R-1)	AD
1983	McKenzie R.[d]	Leaburg	smolt	05/07/84	..	4.3	28,531	McKenzie River (R-1)	AO
1983	McKenzie R.[d]	Leaburg	smolt	05/07/84	..	4.4	29,220	McKenzie River (R-1)	AD
1983	McKenzie R.	McKenzie	smolt	05/07/84	..	4.3	20,021	McKenzie River (R-1)	AD-RV
1983	Skamania R.	Leaburg	smolt	05/07/84	--	4.0	30,080	McKenzie River (R-1)	AD
1983	Skamania R.[d]	Leaburg	Smelt	05/07/84	--	4.3	31,517	McKenzie River (R-1)	AD
1984	McKenzie R.[d]	Leaburg	Smelt	05/06/85	..	5.0	66,984	McKenzie River (R-1)	AD
1984	McKenzie R.[d]	Leaburg	smelt	05/06/85	--	5.0	27,023	McKenzie River (R-2)	AD
1984	McKenzie R.	McKenzie	smolt	05/06/85	--	5.2	20,285	McKenzie River (R-1)	AD -RV
1984	Skamania R.	Leaburg	smolt	05/06/85	05/08/85	4.4	26,961	McKenzie River (R-1)	AD
1984	Skamania R.[d]	McKenzie	smolt	05/06185	--	5.5	17,490	McKenzie River (R-2)	AO
1985	McKenzie R.[d]	Leaburg	Smelt	05/05/86	--	4.2	29,379	McKenzie River (R-1)	AD
1985	McKenzie R.[d]	Leaburg	Smelt	05/05/86	--	4.2	28,746	McKenzie River (R-2)	AD
1985	McKenzie R.[d]	Leaburg	smolt	05/05/86	--	4.3	19,032	McKenzie River (R-1)	AD
1985	McKenzie R.[d]	Leaburg	smolt	05/05/86	--	4.3	11,253	McKenzie River (R-2)	AD
1985	McKenzie R.	Leaburg	smolt	05/05/86	--	4.4	31,112	McKenzie River (R-1)	AD

Table 1 (IR). (cont.) Hatchery sinner steelhead releases into the McKenzie River subbasin by brood year and, if marked, coded wire tag codes.

Brood Yeer	Stock	Hatchery	Life Stage	Releese Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code Fin Clip[6]
1985	McKenzie R.[d]	McKenzie	Smelt	05/05/86	--	4.8	21,600	McKenzie River (R-2)	AD
1985	McKenzie R.[d]	McKenzie	molt	05/05/86	··	4.8	22,118	McKenzie River (R-1)	AD-RV
1986	McKenzie R.[d]	Leaburg	molt	05/04/87	--	5.0	42,467	McKenzie River (R-1)	AD
1986	McKenzie R.[d]	Leaburg	molt	05/04/87	05/05/87	5.1	43,675	McKenzie River (R-1)	AD
1986	McKenzie R.[d]	Leaburg	Smelt	05/04/87	··	5.2	30,480	McKenzie River (R-1)	AD
1986	McKenzie R.[d]	McKenzie	Smelt	05/04/87	--	4.7	19,506	McKenzie River (R-1)	AD
1986	McKenzie R.[d]	McKenzie	smolt	05/04/87	··	5.0	20,775	McKenzie River (R-1)	AD-RV
1987	McKenzie R.[d]	Leaburg	Smelt	05/02/88	··	4.0	5,760	McKenzie River (R-1)	AD
1987	McKenzie R.[d]	Leaburg	Smelt	05/02/88	--	4.1	4,033	McKenzie River (R-1)	AD
1987	McKenzie R.[d]	Leaburg	smolt	05102/88	··	4.5	41,394	McKenzie River (R-1)	AD
1987	McKenzie R.[d]	Leaburg	Smelt	05/02/88	--	4.6	18,629	McKenzie River (R-1)	AO
1987	McKenzie R.[d]	Leaburg	smolt	05/02/88	--	4.7	30,360	McKenzie River (R-1)	AD
1987	McKenzie R.[d]	McKenzie	Smelt	05/02/88	··	3.7	19,555	McKenzie River (R-1)	AD
1988	McKenzie R.[d]	Leaburg	Smelt	05/01/89	--	4.5	52,619	McKenzie River (R-1)	AD
1988	McKenzie R.[d]	Leaburg	Smelt	05/01/89	··	4.6	53,758	McKenzie River (R-1)	AD
1988	McKenzie R.[d]	McKenzie	Smelt	05/01/89	··	4.9	12,510	McKenzie River (R-1)	AD
1989	McKenzie R.[d]	Leaburg	smolt	05/01/90	--	4.4	30,255	McKenzie River (R-1)	AD
1989	McKenzie R.[d]	Leaburg	Smelt	05/01/90	--	4.6	27,837	McKenzie River (R-1)	AD
1989	McKenzie R.[d]	Leaburg	Smelt	04/19/90	··	4.8	31,171	McKenzie River (R-1)	AD
1989	McKenzie R.[d]	McKenzie	Smelt	05/01/90	··	4.5	29,880	McKenzie River (R-1)	AD
1990	McKenzie R.[d]	Leaburg	Smelt	04/15/91	--	4.7	27,420	McKenzie River (R-1)	AD
1990	McKenzie R.[d]	Leaburg	Smelt	04/15/91	04/16/91	5.0	46,600	McKenzie River (R-1)	AD
1990	McKenzie R.[d]	Leaburg	Smelt	04/15/91	04/16/91	5.1	21,900	McKenzie River (R-1)	AD
1990	McKenzie R.[d]	McKenzie	Smelt	04/15/91	·-	4.8	12,691	McKenzie River (R-1)	AD

[a] Modified from Oregon Department of Fish and Wildlife (1990a); and Oregon Department of Fish snd Wildlife's hatchery production database.

[b] D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand f ol lows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was appl ied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

[c] Month(s) and day(s) of release unknown; standardized to the first and last day of the year.

[d] McKenzie Fish Hatchery stock; derived from the Skamania River stock and referred to as Skamania stock.

Table 2 (TD). Parasites and diseases of summer steelhead at hatcheries located in the McKenzie River subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Leaburg	*Ceratomyxa shasta*
Parasite	Leaburg	*Epistylis sp.*
Parasite	Leaburg	blood flukes
Paraeite	Leaburg	*Gyrodactylus*
Parasite	Leaburg	Gill trematodes
Parasite	Leaburg	Costia (*Ichthyobodo sp.*)
Parasite	Leaburg	*Trichodina spp.*
Parasite	Leaburg	*Hexamita*
Parasite	Leaburg	*Nanophyetus salmincola*
Parasite	Leaburg	*Scyphidia*
Parasite	Leaburg	*Myxosoma squamalis*
Parasite	McKenzie	*Epistylis sp.*
Parasite	McKenzie	*Trichodina spp.*
Parasite	McKenzie	*Gyrodactylus*
Parasite	McKenzie	*Nanophyetus salmincola*
Parasite	McKenzie	*Trematodes*
Parasite	McKenzie	blood flukes
Parasite	McKenzie	Costia (*Ichthyobodo sp.*)
Parasite	McKenzie	*Scyphidia*
Parasite	McKenzie	*Myxobolus squamalis*
Bacteria	Leaburg	*Ichthyophthirius sp.* (ICH)
Bacteria	Leaburg	Coldwater disease (*Cytophaga psychrophila*)
Bacteria	Leaburg	Furunculosis (*Aeromonas salmonicida*)
Bacteria	Leaburg	Enteric redmouth (*Yersinia ruckeri*)
Bacteria	Leaburg	Bacterial kidney disease (*Renibacterium salmoninarum*)
Bacteria	Leaburg	*Carnynebacterium piscicola*
Bacteria	Leaburg	*Flexibacter columnaris*

Table 2 (TD). (cont.) Parasites and diseases of summer steelhead at hatcheries located in the McKenzie River subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Bacteria	Leaburg	*Aeromonas spp.*
Bacteria	Leaburg	*Pseudomonas spp.*
Bacteria	McKenzie	*Ichthyophthirius sp.* (ICH)
Bacteria	McKenzie	Bacterial kidney disease (*Renibacterium salmoninarum*)
Bacteria	McKenzie	Coldwater disease (*Cytophaga psychrophila*)
Bacteria	McKenzie	*Pseudomonas spp.*
Bacteria	McKenzie	*Aeromonas spp.*
Bacteria	McKenzie	Furunculosis (*Aeromonas salmonicida*)
Virus	Leaburg	Erythrocytic Inclusion Body Syndrome (EIBS)
Fungi	Leaburg	External fungi

[a] Data are from Oregon Department of Fish and Wildlife (unpublished data).

REFERENCES

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McKENZIE RIVER SUBBASIN

Naturally Produced Winter Steelhead

GEOGRAPHIC LOCATION

The McKenzie River subbasin originates on the west slope of the Cascade Mountains and flows about 90 miles to the southwest where it empties into the Willamette River at RM 175 (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETT'E RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The McKenzie River subbasin drains approximately 1,300 square miles of Lane and Linn counties with 1,040 miles of perennial streams (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990). Major tributaries of the McKenzie River include Lost, Horse, Quartz, Gate, and Camp creeks, the South Fork McKenzie River, and Smith, Blue and Mohawk rivers (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Winter steelhead are not native to the McKenzie River subbasin. The only recorded release of hatchery fish into the subbasin is a 1967 release of Alsea stock fish (see McKENZIE RIVER SUBBASIN, Hatchery Produced Winter Steelhead).

DISTRIBUTION

Subbasin

There are an estimated 7 miles of habitat considered suitable for spawning and rearing (Table 1) and an additional 43.9 miles of habitat considered suitable for rearing (Table 2). Streams that contain either suitable spawning or rearing habitat include the mainstem McKenzie River, the Mohawk River, and Camp Creek. Spawning and rearing habitat is rated as 'good" quality (Table 1) and half of the rearing habitat is rated as "excellent" quality and half as "poor" quality (Table 2).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of McKenzie River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	100.0	0.0	0.0	--	7.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of McKenzie River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	52.2	0.0	0.0	47.8	--	43.9	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (McKenzie River). Columbia Basin System P-lanning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

State Water Resources Board. 1961. Upper Willamette River basin. Salem, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

McKENZIE RIVER SUBBASIN

Hatchery Produced Winter Steelhead

ORIGIN

The only recorded release of juvenile hatchery fish into the subbasin is the 1967 release of the Alsea stock (Table 1). There is currently no hatchery supplementation program in the McKenzie River subbasin.

DISTRIBUTION

Subbasin

Winter steelhead were released into the McKenzie River (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases into the subbasin.

Fry

There are no records of releases into the subbasin.

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin are unknown (Table 1). Only one recorded release of 100,076 fish was made in 1967 (Table 1). Size at release was estimated at 227 fish per pound (Table 1).

Smelt

There are no records of releases into the subbasin.

Adult

There are no records of releases into the subbasin.

Table 1 (TR). Hatchery winter steelhead releases into the McKenzie River subbasin by brood year and, if marked, coded wire

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Cod Fin Cli
..	Alsea	Unknown	fry	01/01/67	12/31/67[b]	227.0	100,076	McKenzie River	..

a Estimates are from Buchanan end Uade (1978).
b Month(s) and day(s) of release unknown; standardized to the first and last day of the year.

REFERENCES

Buchanan, D.V. and M.G. Wade. 1978. Willamette River steelhead. Annual Report of Oregon Department of Fish and Wildlife, Federal Aid Progress Reports (Proj. No. 88E25045, Contr. No. 03-08-M02-43), Portland, Oregon.

COAST FORK AND LONG TOM RIVERS SUBBASIN

Naturally Produced Spring Chinook Salmon

GEOGRAPHIC LOCATION

The Coast Fork originates in the Calapooya Mountains as the Big River and Saroute Creek (Oregon Department of Fish and Wildlife 1990). The mainstem Coast Fork flows 40 miles in a northerly direction to meet the Middle Fork and form the Willamette River (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). A major tributary of the Coast Fork is the Row River (Willamette Basin Task Force 1969, cited by Oregon Department of Fish and Wildlife 1990). The Coast Fork watershed contains about 600 perennial streams and drains approximately 665 square miles of Lane and Douglas counties (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990).

The Long Tom River drainage originates in the Coast Range Mountains and enters the Willamette River at RM 149 (CBIC 1963, cited by Oregon Department of Fish and Wildlife 1990). The mainstem Long Tom River flows northwest 55 miles, and there are approximately 650 miles of tributaries (Willamette Basin Task Force 1969, cited by Oregon Department of Fish and Wildlife 1990). The Long Tom River subbasin drains approximately 410 square miles of Benton and Lane counties (Willis et al. 1960, cited by Oregon Department of Fish and Wildlife 1990; and Oregon Department of Fish and Wildlife 1990).

ORIGIN

Spring chinook are native to the upper Willamette River, but are not believed to have existed in large numbers, if at all, in the Coast Fork subbasin (Willis et al. 1960, cited by Oregon Department of Fish and Wildlife 1990). Historically, the majority of spring chinook in the subbasin probably spawned in the Row River (Dimick and Merryfield 1945, cited by Oregon Department of Fish and Wildlife 1990; and Willis et al. 1960, cited by Oregon Department of Fish and Wildlife 1990). Since the construction of Cottage Grove and Dorena dams, completed in 1942 and 1949, respectively, fish passage has been obstructed (Oregon Department of Fish and Wildlife 1990). Spring chinook do spawn in the Coast Fork subbasin, but these fish are believed to be strays from other nearby subbasins (Oregon Department of Fish and Wildlife 1990). It is believed that a native population of spring chinook does not exist in the subbasin (Oregon Department of Fish and Wildlife 1990).

The Long Tom River subbasin has probably never supported a native spring chinook run (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

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Redds believed to be from spring chinook (E. Smith, personal communication, Oregon Department of Fish and Wildlife, cited by Oregon Department of Fish and Wildlife 1990)

were counted during fall chinook surveys in the mainstem Coast Fork below Cottage Grove Dam and in the Row River below Dorena Dam (Hansen 1977, cited by Oregon Department of Fish and Wildlife 1990; Hansen 1978, Oregon Department of Fish and Wildlife 1990; Hansen and Williams 1979, cited by Oregon Department of Fish and Wildlife 1990; Smith et al. 1982, cited by Oregon Department of Fish and Wildlife 1990; Smith et al. 1983, cited by Oregon Department of Fish and Wildlife 1990; and Smith et al. 1985, cited by Oregon Department of Fish and Wildlife 1990).

Hansen (1978, cited by Oregon Department of Fish and Wildlife 1990) reported juvenile chinook in the Row River. He surmised that these were progeny of spring chinook that had been released as fry into Cottage Grove Reservoir.

PRODUCTION

Harvest

sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced spring chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

REFERENCES

CBIC. 1963. (As reported in Oregon Department of Fish and Wildlife 1990).

Dimick, R. E., and F. Merryfield. 1945. The fishes of the Willamette River system in relation to pollution. Engineering Experiment Station, Oregon State College, Corvallis, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

Hansen, H.L. 1977. Stock assessment and enhancement of fall salmon species in the Willamette River system. Oregon Department of Fish and Wildlife, Federal Aid Progress Report, Fisheries, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

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Smith, E. M., R.H. Williams, and J.C. Zakel. 1982. Willamette River salmon studies. Oregon Department of Fish and Wildlife, Annual Progress Report, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

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Willamette Basin Task Force. 1969. The Willamette basin, comprehensive study of water and related land resources. Pacific Northwest River Basins Commission. (As reported in Oregon Department of Fish and Wildlife 1990.)

Willis, R. A., M.D. Collins, and R.A. Sams. 1960. Environmental survey report pertaining to salmon and steelhead in certain rivers of eastern Oregon and the Willamette River and its tributaries, Part II. Survey reports of the Willamette River and its tributaries. Research Division, Fish Commission of Oregon, Clackamas, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

COAST FORK AND LONG TOM RIVERS SUBBASIN

Hatchery Produced Spring Chinook Salmon

ORIGIN

Juvenile spring chinook were released into the subbasin in the early 1950's to assess the feasibility of using water from Dorena reservoir for hatchery purposes; and from 1969-76 as part of a reservoir rearing study in Cottage Grove Reservoir (Oregon Department of Fish and Wildlife 1990). The Coast Fork subbasin has been supplemented with two stocks, Willamette and Carson (Table 1). The last year that hatchery spring chinook were released into the subbasin was in 1983 (Table 1). Releases were discontinued primarily as a result of illegal fishing activity (Oregon Department of Fish and Wildlife 1990). Low survival rates for juvenile and adult fish were also cited as a problem. Predation and high mercury levels contributed in lowering juvenile survival and poor water quality contributed in lowering pre-spawning survival (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

In the Coast Fork subbasin, spring chinook were released into the Big River, Cottage Grove Reservoir, and the mainstem Coast Fork (Table 1). The Long Tom River subbasin has never been supplemented with hatchery spring chinook (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Willamette, Marion Forks, Carson, Oxbow, and South Santiam hatcheries, and Aumsville Pond (Table 1). Annual numbers released ranged from 146,366 to 1,675,403 fish (Table 1). Size at release for the 1982 brood year was 711 fish per pound (Table 1).

Fingerling

There are no records of releases in the subbasin.

Smelt

Willamette Hatchery supplied 5,100 smelts for release into Cottage Grove Reservoir in 1969 (Table 1).

Jack and Adult

There are no records of releases in the subbasin.

Harvest

sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery produced spring chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

JUVENILE LIFE HISTORY

Survival Rate

Fry to smelt survival rates ranged from 0.1 % to 31.0%, and averaged 7%, for the 1968-74 brood releases into Cottage Grove Reservoir (Oregon Department of Fish and Wildlife 1990). Smelt to adult survival rate, for a 1971 brood release into Cottage Grove Reservoir, was estimated at 0.11 % (Smith 1976, cited by Oregon Department of Fish and Wildlife 1990).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see SANDY RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES and see SANTIAM RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery releases of spring chinook salmon into the Coast Fork and Long Tom River subbasin by brood year and i
tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT code/ Fin Clip
1968	Willamette	Willamette	fry	04/15/69[c]	--	--	661,040	Big River	--
1968	Willamette	Willamette	smolt	10/15/69[c]	--	--	5,100	Cottage Grove Reservoir	--
1969	Willamette	Willamette	fry	03/15/70[c]	--	--	1,078,920	Cottage Grove Reservoir	--
1969	Willamette	Willamette	fry	04/15/70[c]	--	--	282,986	Cottage Grove Reservoir	--
1969	Willamette	Marion Forks	fry	05/15/70[c]	--	--	313,497	Cottage Grove Reservoir	--
1970	Carson[d]	Carson	fry	03/15/71[c]	--	--	359,280	Cottage Grove Reservoir	--
1971	Fall Creek	Willamette	fry	05/15/72[c]	--	--	536,870	Cottage Grove Reservoir	--
1971	N. Santiam	Oxbow	fry	05/15/72[c]	--	--	581,361	Cottage Grove Reservoir	--
1972	Carson[d]	Carson	fry	05/15/73[c]	--	--	1,001,918	Cottage Grove Reservoir	--
1972	Carson	Carson	fry	05/15/73[c]	--	--	117,935	Cottage Grove Reservoir	--
1973	Willamette	South Santiam	fry	04/15/74[c]	--	--	1,096,680	Cottage Grove Reservoir	--
1974	Willamette	Aumsville Ponds	fry	04/15/75[c]	--	--	1,113,600	Cottage Grove Reservoir	--
1975	Carson[d]	Willamette	fry	04/15/76[c]	--	--	854,596	Cottage Grove Reservoir	--
1982	MFkWill.[e]	Willamette	fry	03/23/83	--	711.0	146,366	Willamette R. (Coast Fk)	--

a Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife
Department of Fish and Wildlife's hatchery production database.

b North Santiam, South Santiam, Clackamas, McKenzie, and Middle Fork Willamette rivers stocks, and Eagle and Fall creeks st
part of the Willamette River stock.

c Day(s) of release unknown; standardized to the 15th of the month.

d Adult brood collection site was the Wind River, Washington; identified as Carson stock (E. Smith, Oregon Department of Fi
personal communication).

e Willamette Fish Hatchery stock.

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COAST FORK AND LONG TOM RIVERS SUBBASIN

Naturally Produced Fall Chinook Salmon

GEOGRAPHIC LOCATION

The Coast Fork originates in the Calapooya Mountains as the Big River and Saroute Creek (Oregon Department of Fish and Wildlife 1990). The mainstem Coast Fork flows 40 miles in a northerly direction to meet the Middle Fork and form the Willamette River (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). A major tributary of the Coast Fork is the Row River (Willamette Basin Task Force 1969, cited by Oregon Department of Fish and Wildlife 1990). The Coast Fork watershed contains about 600 perennial streams and drains approximately 665 square miles of Lane and Douglas counties (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990).

The Long Tom River drainage originates in the Coast Range Mountains and enters the Willamette River at RM 149 (CBIC 1963, cited by Oregon Department of Fish and Wildlife 1990). The mainstem Long Tom River flows northwest 55 miles, and there are approximately 650 miles of tributaries (Willamette Basin Task Force 1969, cited by Oregon Department of Fish and Wildlife 1990). The Long Tom River subbasin drains approximately 410 square miles of Benton and Lane counties (Willis et al. 1960, cited by. Oregon Department of Fish and Wildlife 1990; and Oregon Department of Fish and Wildlife 1990).

ORIGIN

Wild fall chinook are not indigenous to either the Coast Fork or Long Tom River subbasins. However, the Coast Fork subbasin was supplemented with hatchery fish to establish a self-sustaining population (see COAST FORK AND LONG TOM RIVERS SUBBASIN, Hatchery Produced Fall Chinook Salmon, PRODUCTION). Spawning ground surveys and juvenile sampling indicate that some natural production occurred in the subbasin but it does not appear that the subbasin currently supports a self-sustaining population (Oregon Department of Fish and Wildlife 1990). All natural production in the Coast Fork subbasin is currently believed to be the result of stray fish spawning in the subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Information from spawning ground surveys conducted in the Coast Fork subbasin indicates that fall chinook spawn in the mainstem Coast Fork River, Row River, and Mosby Creek (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Harvest

sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced fall chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Spawning Area

Numbers: No brood year specific estimates of spawner escapement are available. Spawning ground counts are available in Hansen (1977, cited by Oregon Department of Fish and Wildlife 1990), Hansen (1978, Oregon Department of Fish and Wildlife 1990), Hansen and Williams (1979, cited by Oregon Department of Fish and Wildlife 1990), Smith et al. (1982, cited by Oregon Department of Fish and Wildlife 1990), Smith et al. (1983, cited by Oregon Department of Fish and Wildlife 1990), and Smith et al. (1985, cited by Oregon Department of Fish and Wildlife 1990).

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COAST FORK AND LONG TOM RIVERS SUBBASIN

Hatchery Produced Fall Chinook Salmon

ORIGIN

Hatchery fall chinook were released into the Coast Fork subbasin in 1967 and from 1972-74 (Table 1). Hatchery fish were released in an unsuccessful attempt to establish a self-sustaining population in the subbasin (Oregon Department of Fish and Wildlife 1990). The subbasin was supplemented with LRH (Lower River Hatchery) stock fall chinook (Table 1; see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, ORIGIN). The LRH stock is a mixed stock group resulting from stock transfers among hatcheries in lower Columbia River tributaries (Howell et al. 1985). LRH stock fall chinook are informally called "tule" fall chinook (Howell et al. 1985). Within the LRH stock group, three distinct substocks are identified: the Willamette River, Kalama River, and Cowlitz Hatchery substocks (Howell et al. 1985). The late spawning Cowlitz substock and an early spawning component of the LRH stock were released in the Coast Fork subbasin (Table 1).

DISTRIBUTION

Subbasin

Hatchery fall chinook have been released into the mainstem Coast Fork, Big River, and Row River (’Table 1). The Long Tom River subbasin has not been supplemented with hatchery fall chinook (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

The only hatchery facility in which fry were reared or acclimated prior to release in the subbasin was Bonneville Hatchery (Table 1). In 1967, 426,425 fry were released into the mainstem Coast Fork River and Big River.

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include the Elk River and South Santiam hatcheries, and Aumsville Pond (Table 1). Annual numbers released ranged from 495,675 to 2,314,665 fish (Table 1).

Smelt

There are no records of releases in the subbasin.

Jack and Adult

There are no records of releases in the subbasin.

Harvest

sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery produced fall chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Mark Recoveries

Coded wire tagged hatchery fall chinook, released as juveniles into the Coast Fork subbasin, were recovered in the Willamette and Elokomin rivers (Table 2).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, DISEASES.

Table 1 (IR). Hatchery releases of fall chinook salmon into the Coast Fork and Long Tom River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release LoCation	CWT Code/ Fin Clip[c]
1966	LRH	Bonneville	fry	03/15/67[d]	--	--	241,638	Mainstem Coast Fork	--
1966	LRH	Bonneville	fry	03/15/67[d]	--	--	184,797	Big River	--
1971	LRH (Cowlitz)	Elk River	fing.	06/15/72[d]	--	--	2,314,665	Row River	--
1972	LRH (Cowlitz)	Aumsville Ponds	fing.	05/15/73[d]	--	--	495,675	Row River	--
1973	LRH (Cowlitz)	Aumsville Ponds	fing.	05115/74:	--	--	1,976,005	Row River	--
1973	LRH (Cowlitz)	south Santiam	fing.	05/15/74	--	--	202,824	Row River	--

a Modified from Hansen (1978, cited by Oregon Department of Fish and Wildlife 1990); and Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

b LRH refers to Lower Columbia River Hatchery Stock, which are informally called tules (along with Bonneville Pool Hatchery stock). Cowlitz is a substock of the LRH stock.

c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; Lp = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus ceded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

d Day(s) of release unknown; standardized to the 15th of the month.

Table 2 (AE). Emigration of coded wire tagged hatchery fall chinook salmon released into the Coast Fork and Long Tom River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Coast Fork[c]	Elokomin River	Hatchery Returns		
	1985	--	1	1
Coast Fork[c]	Willamette River	Trap Returns		
	1982	--	297	308
	1983	--	92	93
	1984	--	201	201
	1985	--	142	159
	1986	--	78	78
	1987	--	9	15

[a] Based on the following tag codes: 07-18-41, 07-20-55, 07-23-35, 07-26-62, 07-28-30, 07-31-44, 07-31-45, 07-31-46, 07-31-47, 07-31-48.

[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

[c] Coast Fork and Long Tom River rivers subbasin.

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COAST FORK AND LONG TOM RIVERS SUBBASIN

Naturally Produced Coho Salmon

GEOGRAPHIC LOCATION

The Coast Fork originates in the Calapooya Mountains as the Big River and Saroute Creek (Oregon Department of Fish and Wildlife 1990). The mainstem Coast Fork flows 40 miles in a northerly direction to meet the Middle Fork and form the Willamette River (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). A major tributary of the Coast Fork is the Row River (Willamette Basin Task Force 1969, cited by Oregon Department of Fish and Wildlife 1990). The Coast Fork watershed contains about 600 perennial streams and drains approximately 665 square miles of Lane and Douglas counties (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990).

The Long Tom River drainage originates in the Coast Range Mountains and enters the Willamette River at RM 149 (CBIC 1963, cited by Oregon Department of Fish and Wildlife 1990). The mainstem Long Tom River flows northwest 55 miles, and there are approximately 650 miles of tributaries (Willamette Basin Task Force 1969, cited by Oregon Department of Fish and Wildlife 1990). The Long Tom River subbasin drains approximately 410 square miles of Benton and Lane counties (Willis et al. 1960, cited by Oregon Department of Fish and Wildlife 1990; and Oregon Department of Fish and Wildlife 1990).

ORIGIN

Coho are not indigenous to the Willamette River basin above Willamette Falls (Oregon Department of Fish and Wildlife 1990). However, hatchery coho have been released in areas upstream from the falls, including the Coast Fork and the Long Tom River (see COAST FORK AND LONG TOM RIVERS SUBBASIN, Hatchery Produced Coho Salmon). Currently, it is believed that coho are absent from the Coast Fork and Long Tom River subbasin (Oregon Department of Fish and Wildlife 1990).

REFERENCES

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COAST FORK AND LONG TOM RIVERS SUBBASIN

Hatchery Produced Coho Salmon

ORIGIN

Hatchery coho were first released into the Coast Fork and Long Tom rivers subbasin in 1963 (Table 1). The subbasin has been supplemented with LCER (Lower Columbia Early Run; see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, ORIGIN), late run (also known as Cowlitz), and coastal stocks. Hatchery coho were released into the subbasin to establish a self-sustaining population (Oregon Department of Fish and Wildlife 1990). Adult returns were low due to high rates of harvest in the ocean and Columbia River fisheries, upstream passage problems at Willamette Falls, and the susceptibility of coastal stocks to the parasite *Ceratomyxa shasta* (Oregon Department of Fish and Wildlife 1990). Hatchery coho have not been released into the Coast Fork and Long Tom rivers subbasin since 1976 (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery coho were released in various tributaries of the Long Tom River subbasin (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases into the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Bonneville, Nehalem, and Sandy hatcheries (Table 1). Annual numbers released ranged from 300,000 to 1,744,827 fish (Table 1).

Fingerling

The only hatchery facility in which fingerlings were reared or acclimated prior to release in the subbasin was Sandy Hatchery (Table 1). In 1967, 123,944 fingerlings were released into Sharps Creek (Table 1).

Smelt

Hatchery facilities in which smelts were reared or acclimated prior to release in the subbasin include Bonneville, Cascade, and Sandy hatcheries (Table 1). Annual numbers released ranged from 20,446 to 96,160 fish (Table 1).

Jack and Adult

Hatchery facilities in which adults were held prior to release in the subbasin include Bonneville, Cascade, Klaskanine, Big Creek, Siletz, Alsea, and Sandy hatcheries (Table 1). Annual numbers released ranged from 400 to 841 adult fish (Table 1).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES and see SANDY RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES.

Table 1 (TR). Hatchery releases of coho salmon into the Coast Fork and Long Tom River subbasin by brood year end if marked, by coded wire tag code[5].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
--	LCER	Bonneville	fry	01/01/63	12/31 /63[c]	--	300,000	Mosby Creek	--
--	LCER	Cascade	adult	01/01/64	12/31/64[c]	--	252	Allen Creek	--
--	LCER	Cascade	adult	01/01/64	12/31/64[c]	--	148	Mosby Creek	--
--	LCER	Sandy	fry	01/01/65	12/31/65[c]	--	129,944	Brice Creek	--
--	LCER	Sandy	fry	01/01/65	12/31/65[c]	--	129,944	Laying Creek	--
--	LCER	Sandy	fry	01/01/65	12/31/65[c]	--	226,200	Sharps Creek	--
--	LCER	Bonnevi lle	fry	01/01/66	12/31/66[c]	--	401,310	Bear Creek	--
--	LCER	Bonneville	fry	01/01/66	12/31/66[c]	--	191,931	Junetta Creek	--
--	LCER	Bonneville	fry	01/01/66	12/31/66[c]	--	87,241	Laying Creek	--
--	LCER	Bonnevi lle	fry	01/01/66	12/ 31/66[c]	--	296,621	Mosby Creek	--
--	LCER	Bonneville	fry	01/01/66	12/31/66[c]	--	244,276	Sharps Creek	--
--	LCER	Bonneville	fry	01/01/66	12/31/66[c]	--	523,448	Coast Fork Subbasin	--
--	LCER	Bonneville	fry	01/01/67	12/31/67[c]	--	99,708	Bear Creek	--
--	LCER	Bonneville	fry	01/01/67	12/31/67[c]	--	997,080	Cottage Grove Reservoir	--
--	LCER	Bonneville	fry	01/01/67	12/31/67[c]	--	327,612	Mosby Creek	--
--	Coastal	Nehalem	fry	01/01/67	12/31/67[c]	--	12,563	Elk Creek	--
--	Coastal	Nehalem	fry	01/01/67	12/31/67[c]	--	15,703	Hayes Creek	--
--	Coastal	Nehalem	fry	01/01/67	12/31/67[c]	--	103,642	Mainstem Long Tom	--
--	Coastal	Nehalem	fry	01/01/67	12/31/67[c]	--	26,696	Booker Creek	--
--	LCER	Sandy	fing.	01/01/67	12/31/67[c]	--	123,944	Sharps Creek	--
--	LCER	Cascade	adult	01/01/67	12/31/67[c]	--	102	Mosby Creek	--
--	LCER		adult	01/01/67	12/31/67[c]	--	147	Row River	--
--	LCER	Cascade	adult	01/01/67	12/31/67[c]	--	102	Sharps Creek	--
--	LCER	Bonneville	adult	01/01/67	12/31/67[c]	--	490	Row River	--
--	LCER	Bonnevi lle	fry	01/01/68	12/31/68[c]	--	893,640	Cottage Grove Reservoir	--
--	LCER	Bonnevi lle	fry	01/01/69	12/31/69[c]	--	88,415	Bear Creek	--
--	LCER	Bonneville	fry	01/01/69	12/31 /69[c]	--	332,608	Mosby Creek	--
--	LCER	Bonneville	fry	01/01/70	12/31/70[c]	--	73,081	Bear Creek	--
--	LCER	Bonneville	fry	01/01/70	12/31/70[c]	--	73,081	Gett ings Creek	--
--	LCER	Bonneville	fry	01/01/70	12 /31/70[c]	--	259,842	Mosby Creek	--
--	LCER	Sandy	smolt	01101/70	12/31/70[c]	--	19,382	Bear Creek	--
--	LCER	Sandy	smolt	01/01/70	12f31170C	--	45,224	Mosby Creek	--
--	LCER	Sandy	Smelt	01/01/70	12/31/70[c]	--	16,330	Ferguson Creek	--
--	LCER	Cascade	Smelt	01/01/71	12 /31/71[c]	--	18,854	Bear Creek	--
--	LCER	Cascade	smolt	01/01/71	12/31/71[c]	--	59,706	Mosby Creek	--
--	LCER	Cascade	smolt	01/01/71	12/31/71[c]	--	17,600	Ferguson Creek	--
--	LCER	Cascade	smolt	01/01/72	12/31/72[c]	--	25,394	Bear Creek	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the Coast Fork and Long Tom River subbasin by brood year and if m
tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Coda/ Fin Clip
..	LCER	Cascade	smelt	01/01/72	12/31/72[c]	--	45,146	Mosby Creek	--
--	LCER	Cascade	smelt	01/01/72	12/31/72[c]	--	14,550	Ferguson Creek	--
..	LCER	Bonneville	smolt	01/01/73	12/31/73[c]	--	20,446	Gett i ngs Creek	--
--	LCER	Sandy	smelt	01/01/74	12/31/74[c]	--	24,892	Gett i ngs Creek	--
..	Cowlitz	Cascade	smolt	01/01/76	12/31/76[c]	--	24,680	Bear Creek	..

a Modified from Williams (1983, cited by Oregon Department of Fish and Wildlife 1990).

b LCER refers to Lower Columbia Early Run Stock, a "catchal 1" name for early run hatchery stock that have been released prir Bonnevi 1 le, Cascade, Klaskanine, Sandy and Oxbow state hatcheries, and Eagle Creek National Fish Hatchery. These stocks h grouped as early run Toutle stock, or just early run coho. The Cowlitz stock is a late run stock.

c Month(s) and day(s) of release unknown; Standardized to the first and last day of the year.

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MIDDLE FORK SUBBASIN

Naturally Produced Spring Chinook Salmon

GEOGRAPHIC LOCATION

The Middle Fork of the Willamette River originates on the west slope of the Cascade Mountains and flows approximately 84 miles to the northwest, where it joins the Coast Fork to form the Willamette River (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The Middle Fork subbasin drains 1,350 square miles of Lane and Douglas counties, and is composed of "about 1,460 perennial streams that stretch for 1,910 stream miles" (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990).

ORIGIN

Spring chinook are indigenous to the Middle Fork subbasin (Oregon Department of Fish and Wildlife 1990). It is believed that the historic spring chinook run in the Middle Fork subbasin may have been one of the largest in the Willamette River subbasin above Willamette Falls (Hutchison et al. 1966, cited by Oregon Department of Fish and Wildlife 1990; and U.S. Army Corps of Engineers 1982, cited by Oregon Department of Fish and Wildlife 1990). Currently, the number of naturally produced spring chinook in the subbasin is considered minimal; the majority of the adults returning to the subbasin are the result of hatchery production (see MIDDLE FORK SUBBASIN, Hatchery Produced Spring Chinook Salmon; Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Historically, spring chinook spawning areas included the North Fork of the Middle Fork, and Salt, Salmon, and Fall creeks (Mattson 1948, cited by Oregon Department of Fish and Wildlife 1990). There are an estimated 66.8 miles of potential habitat considered suitable for spawning and rearing in the subbasin (Tables 1 and 2). The habitat is primarily rated as "excellent" quality.

Dams currently block access to more than 80 percent of the historic spawning habitat in the subbasin (Oregon Department of Fish and Wildlife 1990). Potential spawning and rearing habitat is currently restricted to the mainstem Middle Fork, Fall Creek below Fall Creek Dam, and in Little Fall, Brook, and Lost creeks. Spring chinook are observed spawning below Dexter Dam but survival is believed to be very low due to the warm water temperatures resulting from dam operations (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Harvest

sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced spring chinook are not available, run year specific estimates for the combined harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1989, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Spawning Area

Timing: Historically, spring chinook spawned in Fall Creek from early to mid-September through mid-October (personal communication, E. Smith, ODFW, cited by Oregon Department of Fish and Wildlife 1990). Spawning was delayed to early October through mid-November as a result of Lookout Point and Dexter dams (Mattson 1962, cited by Oregon Department of Fish and Wildlife 1990).

Strays

Coded wire tags were recovered from hatchery spring chinook released as juveniles in the Middle Fork, Santiam and Calapooia rivers, Willamette River, and McKenzie River subbasins (Table 3). In addition, one coded wire tag was recovered from a spring chinook that was released as a juvenile in the Umpqua River subbasin; located on the southern Oregon coast (Table 3).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Middle Fork subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	63.7	15.9	20.4	0.0	--	66.8	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Middle Fork subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.
[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 3 (AI). Non-harvest recoveries of coded wire tagged hatchery spring chinook salmon in the Middle Fork subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Middle Fork	Middle Fork	Hatchery Returns		
	1982	--	970	979
	1983	--	987	1,005
	1984	--	1,591	1,606
	1985	--	355	358
	1986	--	12	12
	1987	--	4	4
	1988	--	250	254
Umpqua River	Middle Fork	Hatchery Returns		
	1983	--	1	1
Santiam,Calapooia	Middle Fork	Hatchery Returns		
	1982	--	15	15
	1983	--	1	1
	1984	--	.-	--
	1985	--	1	1
Willamette River	Middle Fork	Hatchery Returns		
	1982	--	3	3
McKenzie River	Middle Fork	Hatchery Returns		
	1982	--	5	5
	1983	--	8	8
	1984	--	--	.-
	1985	--	6	6

[a] Based on the following tag codes: 07-17-37, 07-17-38, 07-17-39, 07-17-40, 07-17-41, 07-17-42, 07-17-43,

(cent.)

Table 3 (AI). (cont.) Non-harvest recoveries of coded wire tagged hatchery spring chinook salmon in the Middle Fork subbasin[a,b].

[a] (cont.) 07-17-44, 07-19-20, 07-19-21, 07-19-25, 07-19-27, 07-19-29, 07-19-30, 07-19-43, 07-19-45, 07-19-46, 07-20-18, 07-20-20, 07-20-21, 07-20-22, 07-20-40, 07-20-41, 07-20-42, 07-20-43, 07-20-44, 07-20-45, 07-20-46, 07-20-47, 07-20-49, 07-20-50, 07-22-17, 07-22-20, 07-22-21, 07-22-22, 07-22-24, 07-22-25, 07-22-26, 07-22-37, 07-23-02, 07-23-03, 07-23-04, 07-23-05, 07-23-06, 07-23-07, 07-23-08, 07-24-18, 07-24-19, 07-24-20, 07-24-21, 07-24-22, 07-24-23, 07-25-01, 07-25-13, 07-25-21, 07-25-22, 07-25-30, 07-27-18, 07-27-20, 07-27-21, 07-34-26, 07-34-27, 07-34-28, 07-34-29, 07-36-55, 07-36-56, 07-37-35, 07-37-36, 07-37-37, 07-37-38, 07-37-39, 07-37-40, 07-37-41, 07-37-42, 07-38-63, 07-39-03, 07-39-05, 09-16-21.

[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

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MIDDLE FORK SUBBASIN

Hatchery Produced Spring Chinook Salmon

ORIGIN

The first reported release of hatchery spring chinook into the subbasin occurred in 1919 (Wallis 1962, cited by Oregon Department of Fish and Wildlife 1990). However, records of hatchery releases prior to 1971 are not available. The hatchery program in the Middle Fork River subbasin was originally implemented to supplement the natural run and to increase harvest opportunities in the lower Columbia and Willamette rivers fisheries. Currently, the hatchery program is also intended to mitigate for production lost as a result of the construction of Dexter and Fall Creek dams (Oregon Department of Fish and Wildlife 1990). Juvenile spring chinook released into Fall Creek Reservoir are part of an ongoing program to assess rearing capacities of the reservoir (Oregon Department of Fish and Wildlife 1990). The majority of the spring chinook released in the subbasin have been Willamette stock, although Carson stock was released on an experimental basis in the 1970's (Table 1; Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery spring chinook have been released at various locations in the Middle Fork subbasin, including Fall Creek, Dexter, Lookout Point, and Hills Creek reservoirs, and below Dexter and Fall Creek dams (Table 1).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. Estimates are for hatchery Willamette spring chinook that spawn and rear in the wild. The methodology used to generate these approximations is unknown.

PRODUCTION

Releases

Egg

There are no records of releases into the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Willamette, Oakridge, South Santiam, Marion Forks, Aumsville, McKenzie, and Metolius hatcheries and Dexter Pond (Table 1). Annual numbers released ranged from 435,881 to 2,710,831 fish (Table 1). Size at release ranged from 741 to 137 fish per pound (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Willamette, Oakridge, and McKenzie hatcheries (Table 1). Annual numbers released ranged from 31,581 to 889,366 fish (Table 1). Size at release ranged from 122.7 to 19.3 fish per pound (Table 1).

Smelt

Hatchery facilities in which smelts were reared or acclimated prior to release in the subbasin include Willamette, Oakridge, and McKenzie hatcheries and Dexter Pond (Table 1). Annual numbers released ranged from 329,229 to 2,633,662 fish (Table 1). Size at release ranged from 15.7 to 3.8 fish per pound (Table 1).

Jack and Adult

There are no records of releases into the subbasin.

Harvest

sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery produced spring chinook are not available, run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1989, Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapem

Hatchery Facilities

Timing: Spring chinook return to Dexter Hatchery from late mid-June through late December with median date of return in early to late July (Howell et al. 1985). Spring chinook are spawned at Dexter Hatchery from mid-September through mid to late October with median date of spawning from late September through early October (Howell et al. 1985). No stock specific estimates of run timing or time of spawning for naturally or hatchery produced spring chinook are available.

Numbers: Although brood year specific estimates of escapement for either naturally or hatchery produced fish to hatchery facilities in the subbasin are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990), Hutchison and Irish (1988, cited by Oregon Department of Fish and Wildlife 1990), King (1988, cited by Oregon Department of Fish and Wildlife 1990), and Oregon Department of Fish and Wildlife and Washington Department of Fisheries (1991).

Fork Length

Although brood year specific estimates of fork length for hatchery produced spring chinook are not available, estimates derived from a sample comprised of returns from the 1977-80 broods are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Age Structure

A study of adult spring chinook returning to Fall Creek Dam provides a comparison of age composition for Willamette and Carson stocks. The average age structure for the Willamette stock, from the 1972 and 1974 brood years, was 1%, 46%, and 53% for 3-, 4- and 5-year old fish, respectively (Table 2). For Carson stock from the same brood years, the average age structure was 9%, 80%, and 11% for 3-, 4- and 5-year old fish (Table 3).

Fecundity

Although brood year specific estimates of fecundity for hatchery produced spring chinook are not available, run year specific estimates of average fecundity at Dexter Pond are available in Howell et al. (1985).

Mark Recoveries

Coded wire tagged hatchery spring chinook, released as juveniles into the Middle Fork subbasin, were recovered in the lower Columbia River, McKenzie River, Cowlitz River, Elk River, Salmon River, Santiam and Calapooia rivers, and Willamette River subbasins and in Coos Bay on the southern Oregon coast (Table 4).

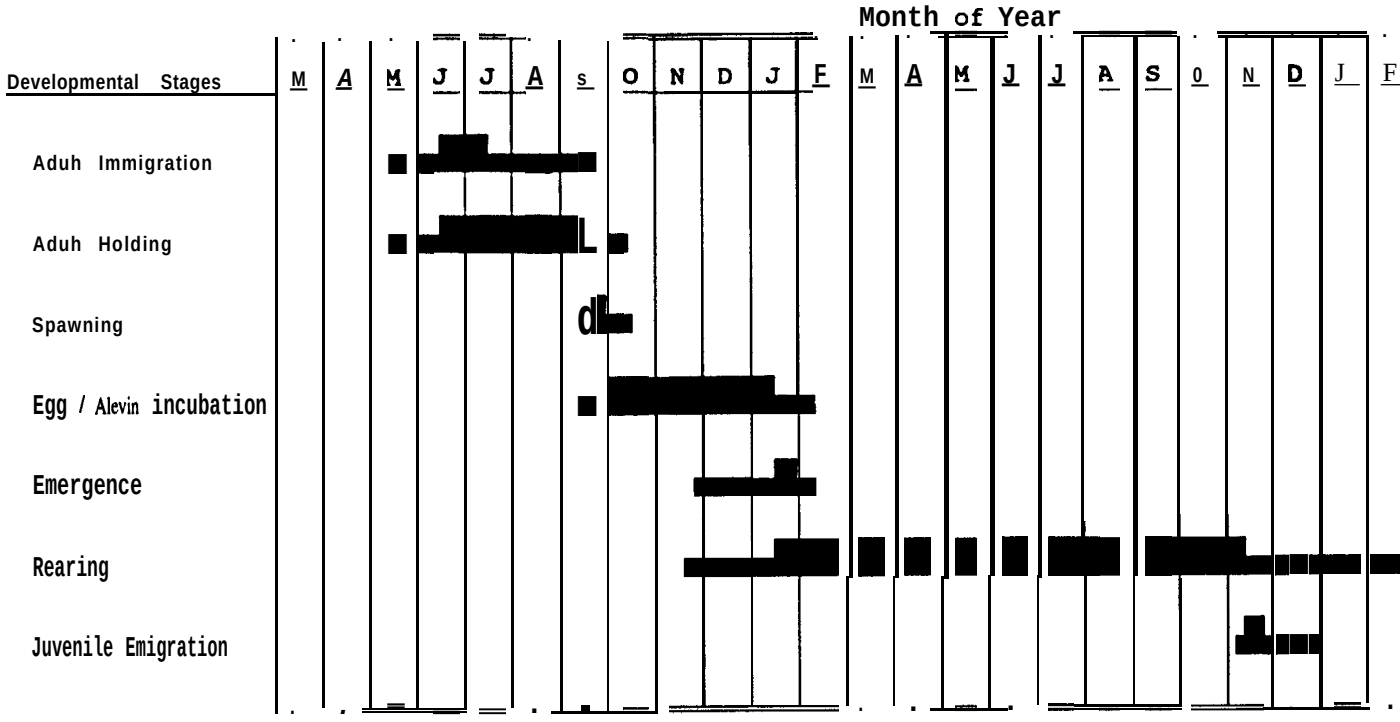
BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile hatchery spring chinook were sampled from Dexter Hatchery, and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele nobilities and allele frequencies were determined for 18 enzyme systems (Appendix Table 3). No rare alleles were detected.

Schreck et al. (1986) classified Columbia River Basin chinook into several clusters of similar stocks, based on biochemical, morphological, and life history characters. Columbia River Basin chinook stocks segregated into two primary groups. The first group contained spring chinook from east of the Cascade Mountains and summer chinook from Idaho. The second group contained spring chinook from west of the Cascades, summer chinook from the upper Columbia, and all fall chinook stocks. The second primary group was composed of 3 subgroups. At the subgroup level, hatchery Willamette spring chinook collected from Dexter Hatchery were found to be most similar to other chinook stocks (wild and hatchery, fall and spring) found in the Willamette River subbasin than to those from outside of the Willamette River subbasin. This subgroup was characterized by the highest average values for head length, gill rakers and pelvic fin rays, and the lowest average values for anal fin rays and pectoral fin rays. This group also had the lowest average frequencies of the common aconitate hydratase, malate dehydrogenase and mannose phosphate isomerase alleles. All stocks in this group are native to the Willamette River subbasin, with the possible exception of Clackamas River fall chinook.

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile spring chinook for subbasin hatchery production (Tables 5 and 6). Parasites include *Epistylis sp.*, Costia (*Ichthyobodo sp.*), and *Heximata sp.* Bacterial diseases include *Renibacterium salmoninarum* (bacterial kidney disease], *Cytophaga psychrophila* (cold water disease), and *Yersinia ruckeri* (enteric redmouth disease). Viral diseases include Erythrocytic Inclusion Body Syndrome (EIBS). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see MCKENZIE RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES and see SANTIAM RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variabilit
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicat

Figure 1 (TT). Freshwater life history of hatchery Willamette spring chinook in the Mid (personal communication, E. Smith, ODFW, cited by Oregon Department of Fish and Wildli

Table 1 (TR). Hatchery spring chinook releases into the Middle Fork subbasin by brood year and, i f marked, coded wi re tag coc

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Re 1 eaae Locat ion	CWT Code/ Fin Clip[c]
1970	Carson	Wi1lamette	fry	02/15/71; --		..	364,200	Fall Creek Reservoir	..
1970	Carson	Wi1lamette	fry	04/15/71[d]	--	--	2,346,631	Fall Creek Reservoir	--
1970	Wil'lamette	Willamette	smolt	11/15/71[d]	--	--	329,229	Below Dexter	--
1970	Willamette	Willamette	Smelt	03/15/72;	04/15/72[d]	..	1,162,035	Below Dexter	--
1971	Willamette	South Santiam	fry	04/15/72[d]	--	..	511,232	Fall Creek Reservoir	--
1971	Willamette	Willamette	fry	05/15/72[d]	--	--	1,235,019	Upper Fal 1 Creek	..
1971	Willamette	Wi1lamette	fing.	07/15/72[d]	--	--	163,430	Fal 1 Creek Reservoir	--
1971	Wi1lamette	Willamette	Smelt	01,03,	04/15/73[d]	--	1,378,041	Below Dexter	--
1972	Carson	Metolius	fry	04/15/73[d]	05/15/73[d]	..	2,300,025	Fall Creek Reservoir	--
1972	Ca son	Willamette	fing.	06/15/73[d]	--	--	43,281	Fall Creek Reservoir	..
1972	Wi[lamette	Wi1lamette	Smelt	12/15/73[d]	--	--	176,417	Below Fal 1 Creek Dam	..
1972	Carson	Willamette	smolt	12/15/73[d]	--	..	176,417	Below Fall Creek Dam	--
1973	Willamette	South Sant i am	fry	04/15/74[d]	--	..	369,427	Fall Creek Reservoir	..
1973	Willamette	Willamette	fry	04/15/74;	--	..	601,364	Fall Creek Reservoir	--
1973	Wil layette	Willamette	Smelt	03/15/75[d]	--	..	1,640,802	Below Dexter	--
1974	Willamette	Aumsville	fry	04/15/75[d]	--	..	1,108,920	Fall Creek Reservoir	..
1974	Willamette	Willamette	Smelt	11/15/75[d]	--	..	193,331	BelowFall Creek Dam	..
1974	Carson	Willamette	smolt	11/15/75[d]	--	..	193,331	Below Fall Creek Dam	--
1974	Unknown	Dexter	smelt	10/15/75[d]	--	--	606,198	Below Dexter	--
1974	Unknown	Dexter	Smelt	03/15/76[d]	--	..	1,457,197	Below Dexter	--
1975	Carson	Oakridge	fry	04/15/76[d]	--	..	612,074	Fall Creek Reservoir	--
1975	Willamette	Oakridge	fry	04/15/76[d]	--	--	226,383	Fal 1 Creek Reservoir	.-
1975	Unknown	Dexter	Smelt	12/15/76[d]	--	--	601,043	Below Dexter	..
1975	Unknown	Oakridge	Smelt	03/15/77[d]	--	--	562,482	Below Dexter	--
1976	Carson	Oakridge	fry	04/15/77[d]	--	--	240,093	Fall Creek Reservoir	--
1976	Carson	McKenzie	fry	04/15/77[d]	--	..	758,970	Fall Creek Reservoir	--
1976	Unknown	Dexter	Smelt	02/15/78[d]	--	..	460,872	Below Dexter	--
1976	Unknown	Oakridge	Smelt	03/15/78[d];	--	--	388,844	Below Dexter	..
1976	Unknown	McKenzie	Smelt	03/15/78;	--	--	530,422	Below Oexter	--
1977	Unknown	Oakridge	fry	05/15/78[d]	06/15/78[d]	--	569,607	Below Oexter	--
1977	Carson	Oakridge	fing.	04/15/78[d]	--	--	207,861	Fall Creek Reservoir	..
1977	Unknown	Oakridge	fing.	04/15/78[d]	06/15/78[d]	..	114,968	Fall Creek Reservoir	..
1977	Unknown	Dexter	Smelt	11/15/78[d]	--	--	313,677	Below Dexter	--
1977	Unknown	Dexter	smolt	03/15/79[d]	--	--	707,242	Below Dexter	..
1977	Unknown	Oakridge	smolt	11/15/78[d]	--	--	157,377	Below Dexter	--
1977	Unknown	Oakridge	smolt	11/15/78[d]	--	--	63,304	Below Dexter	--
197?	Unknown	Oskridge	Smelt	03/15/79[d]	--	..	132,257	Below Dexter	--
1977	Unknown	McKenzie	Smelt	03/15/79[d]	--	--	139,380	Below Dexter	..
1978	Carson	Marion Forks	fry	05/15/79[d]	--	--	691,906	Fall Creek Reservoir	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Middle Fork subbasin by brood year and, if marked, coded w

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Cod / Fin Cli
1978	Willamette	Oakridge	fing.	07/15/79;	08/15/79[d]	--	889,366	Below Oexter	··
1978	Willamette	Dexter	molt	11/15/79[d]	--	--	401,659	Below Dexter	··
1978	Willamette	Dexter	smolt	03/15/80[d]	--	--	716,723	Below Oexter	··
1978	Willamette	McKenzie	smolt	11/15/79[d]	--	--	158,077	Below Dexter	--
1978	Willamette	Oakridge	smolt	11/15/79[d]	--	··	162,599	Below Dexter	--
1978	MFk Will.[e]	Oakridge	smolt	03/10/80	--	3.8	29,189	MFk-1Willamette River	AD-CUT
1978	MFk Will.[e]	Oakridge	smolt	03/10/80	--	6.0	31,721	MFk-1Willamette River	AD-CUT
1978	MFk Will.[e]	Oakridge	smolt	03/11/80	--	7.9	15,948	MFk-1Willamette River	··
1978	MFk Will.[e]	Oakridge	smolt	03/11/80	--	9.2	45,515	MFk-1Willamette River	··
1979	Carson[f]	Oakridge	fry	04/11/80	--	208.0	228,702	Fall Creek Reservoir	--
1979	Carson[f]	Oakridge	fry	04/11/80	--	211.0	207,179	Fall Creek Reservoir	--
1979	MFk Will.[e]	Oakridge	fing.	11/06/80	--	20.8	31,581	MFk-1Willamette River	AO-CUT
1979	Willamette	Dexter	smolt	11/15/80[d]	--	--	426,943	Below Dexter	--
1979	Willamette	Oexter	smolt	03/15/81[d]	--	--	748,166	Below Dexter	--
1979	MFk Will.[e]	Oakridge	Smelt	03/16/81	--	3.9	11,057	MFk-1Willamette River	--
1979	MFk Will.[e]	Oak ridge	smolt	03/16/81	--	3.9	1,228	MFk-1Willamette River	CUT
1979	MFk Will.[e]	Oakridge	smolt	03/16/81	--	4.1	16,321	MFk-1Willamette River	··
1979	MFk Will.[e]	Oakridge	smolt	03/16/81	--	4.1	1,311	MFk-1Willamette River	AD-CUT
1979	MFk Will.[e]	Oakridge	Smelt	03/16/81	--	4.1	501	MFk-1Willamette River	CUT
1979	MFk Will.[e]	Oakridge	smolt	11/05/80	--	5.4	384,249	MFk-1Willamette River	··
1979	MFk Will.[e]	Oakridge	smolt	11/05/80	--	5.4	42,694	MFk-1Willamette River	AD-CUT
1979	MFk Will.[e]	Oakridge	smolt	11/05/80	--	5.8	32,176	MFk-1Willamette River	AD-CUT
1979	MFk Will.[e]	Oakridge	smolt	03/16/81	--	7.5	31,189	MFk-1Willamette River	··
1979	MFk Will.[e]	Oakridge	smolt	03/16/81	--	7.5	2,031	MFk-1Willamette River	AO-CUT
1979	MFk Will.[e]	Oakridge	smolt	03/16/81	--	7.5	1,433	MFk-1Willamette River	CWT
1979	MFk Will.[e]	Oakridge	Smelt	11/06/80	--	9.6	32,374	MFk-1Willamette River	AD-CWT
1979	MFk Will.[e]	Oakridge	smolt	11/05/80	--	11.5	31,633	MFk-1Willamette River	AD-CWT
1980	MFk Will.[e]	Oakridge	fry	05/11/81	--	156.5	172,143	Fall Creek Reservoir	··
1980	MFk Will.[e]	Oakridge	fry	05/11/81	--	157.6	171,779	Fall Creek Reservoir	--
1980	MFk Will.[e]	Oakridge	fry	05/11/81	--	164.0	176,292	Fall Creek Reservoir	--
1980	MFk Will.[e]	Oakridge	fry	05/11/81	--	173.4	171,661	Fall Creek Reservoir	--
1980	MFk Will.[e]	Oakridge	fry	05/11/81	--	206.7	160,193	Fall Creek Reservoir	··
	MFk Will.[e]	Oakridge	fing.	05/11/81	--	122.7	162,576	Fall Creek Reservoir	··
1980	MFk Will.[e]	Oakridge	fing.	11/05/81	--	19.3	57,752	MFk-1Willamette River	--
1980	MFk Will.[e]	Oakridge	fing.	11/05/81	--	19.3	6,416	MFk-1Willamette River	CUT
1980	MFk Will.[e]	Oakridge	smolt	11/05/81	--	6.8	29,130	MFk-1Willamette River	--
1980	MFk Will.[e]	Oakridge	smolt	11/05/81	--	6.8	3,235	MFk-1Willamette River	CUT
1980	MFk Will.[e]	Oakridge	smolt	11/05/81	--	7.3	18,988	MFk-1Willamette River	--
1980	MFk Will.[e]	Oakridge	smolt	11/05/81	--	7.3	2,109	MFk-1Willamette River	CUT

Table 1 (IR). (cent.) Hatchery spring chinook releases into the Middle Fork subbasin by brood year and, if marked, coded

Brood Year	Stock[b]	Hatchery	Lifa Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release LoCat ion	CWT Code/ Fin Clip[c]
1980	MFk Will.[e]	Oakridge	molt	11/05/81	--	8.3	11,952	MFk-1Willamette River	--
1980	MFk Will.[e]	Oakridge	smolt	11/05/81	--	8.3	1,327	MFk-1Willamette River	CUT
1980	MFK Will.[e]	Willamette	Smelt	03/15/82	--	4.8	31,728	MFk-1Willamette River	07-24-19
1980	MFk Will.[e]	Willamette	smolt	03/15/82	--	6.0	31,200	MFk-1Willamette River	07-25-13
1980	Willamette	Dexter	smelt	11/15/81[d]	--	--	716,374	Below Dexter	--
1980	MFk Will.[e]	Dexter Pond	Smelt	03/15/82	--	9.7	52,390	MFk-1Willamette River	--
1980	MFk Will.[e]	Dexter Pond	smolt	03/15/82	--	9.7	30,768	MFk-1Willamette River	07-24-22
	MFk Will.[e]	Dexter Pond	smolt	03/15/82	--	13.8	31,022	MFk-1Willamette River	07-24-20
1981	MFk Will.[e]	Willamette	fry	04/29/82	--	583.0	341,010	Fall Creek Reservoir	--
1981	MFk Will.[e]	Willamette	fry	04/29/82	--	623.0	302,115	Fall Creek Reservoir	--
1981	MFk Will.[e]	Willamette	fry	04/29/82	--	685.0	160,955	Fall Creek Reservoir	--
1981	MFk Will.[e]	Willamette	fry	04/29/82	--	741.0	197,081	Fall Creek Reservoir	--
1981	MFk Will.[e]	Willamette	Smelt	11/09/82	--	6.6	31,594	MFk-1Willamette River	--
1981	MFk Will.[e]	Willamette	Smelt	11/08/82	--	6.8	26,935	MFk-1Willamette River	--
1981	MFk Will.[e]	Dexter Pond	smolt	1 1/08/82	--	7.2	707,875	MFk-1Willamette River	--
1981	MFk Will.[e]	Dexter Pond	smolt	03/ 15/83	--	10.0	117,630	MFk-1Willamette River	--
1981	MFk Will.[e]	McKenzie	Smelt	03/15/83	--	5.1	17,177	MFk-1Willamette River	--
1981	MFk Will.[e]	McKenzie	Smelt	03/15/83	--	7.5	18,150	MFk-1Willamette River	--
1981	MFk Will.[e]	McKenzie	Smelt	03/15183	--	9.8	24,108	MFk-1Willamette River	--
1981	MFk Will.[e]	McKenzie	smelt	03/15/83	--	10.8	21,114	MFk-1Willamette River	--
1981	MFk Will.[e]	McKenzie	smolt	03/15/83	03/16/83	11.0	19,795	MFk-1Willamette River	--
1981	MFk Will.[e]	McKenzie	smolt	03/15/83	--	11.5	31,165	MFk-1Willamette River	--
1981	MFk Will.[e]	McKenzie	smolt	03/15/83	--	11.8	14,489	MFk-1Willamette River	--
1981	MFk Will.[e]	McKenzie	smolt	03/1 5/83	--	12.5	13,000	MFk-1Willamette River	--
1982	MFk Will.[e]	Willamette	fry	03/23/83	--	656.0	249,886	Dexter Reservoir	--
1982	MFk Will.[e]	Willamette	fry	03/23/83	--	656.0	45,239	Fall Creek	--
1982	MFk Will.[e]	Willamette	fry	03/23/83	--	711.0	44,768	Fall Creek	--
1982	MFk Will.[e]	Willamette	fry	04/21/83	--	321.0	368,508	Fall Creek Reservoir	--
1982	MFk Will.[e]	Willamette	fry	04/21/83	--	340.0	306,240	Fall Creek Reservoir	--
1982	MFk Will.[e]	Willamette	fry	03/10/83	--	450.0	144,000	Fall Creek Reservoir	--
1982	MFk Will.[e]	Willamette	fry	03/10/83	--	523.0	181,481	Fall Creek Reservoir	--
1982	MFk Will.[e]	Willamette	fry	03/23/83	--	594.0	249,822	Lookout Point Reservoir	--
1982	MFk Will.[e]	Marion Forks	fry	06/15/83	--	378.0	93,744	MFk-1Willamette Rivar	--
1982	MFk Will.[e]	McKenzie	fing.	08/23/83	--	33.0	33,000	MFk-1Willamette River	--
1982	MFk Will.[e]	Willamette	fing.	08/30/83	--	25.5	11,220	MFk-1Willamette River	--
1982	MFk Will.[e]	Willamette	fing.	08/30/83	--	26.8	27,229	MFk-1Willamette River	--
1982	MFk Will.[e]	Willamette	fing.	08/30/83	--	49.4	10,325	MFk-1Willamette River	--
1982	MFk Will.[e]	Willamette	fing.	07/07/83	--	90.0	117,180	MFk-1Willamette River	--
1982	MFk Will.[e]	Willamette	fing.	07/07/83	--	109.0	164,907	MFk-1Willamette River	--

Table 1 (TR). (cent.) Hatchery spring chinook releases into the Middle Fork subbasin by brood year and, if marked, coded wi

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code Fin Cli
1982	MFk Will.[e]	Dexter Pond	smolt	11/07/83	..	6.8	626,940	MFk-1Willamette River	--
1982	MFk Will.[e]	Dexter Pond	smolt	03/19/84	--	7.2	641,578	MFk-1Willamette River	..
1982	N. Santiam R.[e]	Dexter Pond	smelt	11/08/83	.-	7.2	16,841	MFk-1Willamette River	..
1983	MFk Will.[e]	Willamette	fry	04/13/84	..	412.0	209,611	Fall Creek Reservoir	--
1983	MFk Will.[e]	Willamette	fry	04/13/84	..	424.0	68,632	Fall Creek Reservoir	--
1983	F4Fk Will.[e]	Willamette	fry	04/12/84	--	439.0	355,051	Fall Creek Reservoir	..
1983	MFk Will.[e]	Willamette	fry	04/12/84	.-	446.0	366,945	Fall Creek Reservoir	..
1983	MFk Will.[e]	Willamette	fry	05/15/84	..	186.0	96,087	Lookout Point Reservoir	--
1983	MFk Will.[e]	Willamette	fry	05/14/84	..	311.0	154,181	Lookout Point Reservoir	--
1983	McKenzie R.[g]	Willamette	smolt	11/05/84	--	7.2	8,712	MFk-1Willamette River	--
1983	MFk Will.[e]	Willamette	smolt	11/12/84	11/13/84	5.0	18,745	MFk-1Willamette River	..
1983	MFk Will.[e]	Willamette	Smelt	11/12/84	..	7.4	17,750	MFk-1Willamette River	..
1983	MFk Will.[e]	Dexter Pond	smolt	11/06/84	..	6.8	656,771	MFk-1Willamette River	..
1983	MFk Will.[e]	Dexter Pond	smolt	03/11185	--	8.0	219,344	MFk-1Willamette River	--
1983	MFk Will.[e]	McKenzie	smolt	11/06/84	--	8.1	9,923	MFk-1Willamette River	--
1983	MFk Will.[e]	McKenzie	smolt	03/11/85	..	9.3	10,881	MFk-1Willamette River	--
1983	MFk Will.[e]	McKenzie	smolt	03/11/85	..	9.5	19,475	MFk-1Willamette River	..
1983	MFk Will.[e]	McKenzie	smolt	03/11/85	--	9.7	9,894	MFk-1Willamette River	--
1983	MFk Will.[e]	McKenzie	smolt	03/11/85	--	10.0	10,000	MFk-1Willamette River	..
1983	MFk Will.[e]	McKenzie	smolt	03/11/85	..	10.1	3,535	MFk-1Willamette River	--
1983	MFk Will.[e]	McKenzie	smolt	03/11/85	..	10.2	12,443	MFk-1Willamette River	..
1983	MFk Will.[e]	McKenzie	Smelt	03/11/85	--	10.3	28,829	MFk-1Willamette River	--
1983	MFk Will.[e]	McKenzie	smolt	03/11/85	--	10.5	12,913	MFk-1Willamette River	..
1983	MFk Will.[e]	McKenzie	smolt	03/11/85	..	10.9	14,170	MFk-1Willamette River	--
1984	MFk Will.[e]	Willamette	fry	05/01185	..	370.0	339,043	Fall Creek Reservoir	..
1984	MFk Will.[e]	Willamette	fry	05/01/85	--	373.0	110,756	Fall Creek Reservoir	..
1984	MFk Will.[e]	Willamette	fry	05101/85	--	376.0	339,277	Fall Creek Reservoir	--
1984	MFk Will.[e]	Wi lamette	fry	05/01/85	..	411.0	211,277	Fall Creek Reservoir	..
1984	MFk Will.[e]	Wi lamette	fry	05/03/85	..	345.0	249,997	Lookout Point Reservoir	--
1984	MFk Will.[e]	Wi lamette	smolt	11/04/85	--	6.8	17,880	MFk-1Willamette River	..
1984	MFk Will.[e]	Wi lamette	smolt	11/04/85	--	7.3	13,810	MFk-1Willamette River	..
1984	MFk Will.[e]	Wi lamette	smolt	05/13/86	..	9.5	9,738	MFk-1Willamette River	07-37-3
1984	MFk Will.[e]	Wi lamette	smolt	05/13/86	..	9.5	9,737	MFk-1Willamette River	07-37-3
1984	MFk Will.[e]	Wi lamette	smolt	04/10/86	--	10.4	9,490	MFk-1Willamette River	07-37-3
1984	MFk Will.[e]	Wi lamette	Smelt	04/10/86	--	10.4	9,490	MFk-1Willamette River	07-37-4
1984	F4Fk Will.[e]	Wi lamette	smelt	03/12/86	--	10.7	10,402	MFk-1Willamette River	07-37-3
1984	MFk Will.[e]	Wi lamette	Smelt	03/12/86	--	10.7	10,402	MFk-1 Willamette River	07-37-3
1984	MFk Will.[e]	Wi lamette	Smelt	02/10/86	..	11.1	7,293	MFk-1Willamette River	07-37-4
1984	MFk Will.[e]	Wi lamette	Smelt	02/ 1 of 86	..	11.1	7,293	MFk-1Willamette River	07-37-4

Table 1 (TR). (cent.) Hatchery spring chinook releases into the Middle Fork subbasin by brood year and, if marked, coded wire

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Releaae Location	CWT Code/ Fin Clip[c]
1984	MFk Will.[e]	Dexter Pond	molt	11/04/85	··	7.0	637,277	MFk-1 Willamette River	--
1984	MFk Will.[e]	Dexter Pond	smolt	11/04/85	--	7.0	13,139	MFk-1 Willamette River	07-36-55
1984	MFk Will.[e]	Dexter Pond	molt	11/04/85	--	7.0	13,716	MFk-1 Willamette River	07-36-56
1984	MFk Will.[e]	Dexter Pond	molt	03/1 1 /86	··	7.7	561,584	MFk-1 Willamette River	--
1985	Willamette[f]	McKenzie	fry	04/04/86	··	326.0	365,100	Fall Creek Reservoir	··
1985	Willamette[f]	McKenzie	fry	04/14/86	··	478.0	239,000	Fall Creek Reservoir	··
1985	MFk Will.[e]	McKenzie	fry	04/14/86	·-	287.0	252,560	Dexter Reservoir	--
1985	MFk Will.[e]	McKenzie	fry	04/1'4/86	··	231.0	71,610	Fall Creek Reservoir	··
1985	MFk Will.[e]	McKenzie	fry	04/04/86	--	284.0	326,580	Fall Creek Reservoir	··
1985	MFk Will.[e]	Willamette	fry	05/09/86	··	269.0	250,145	Lookout Point Reservoir	--
1985	MFk Will.[e]	Willamette	fry	04/11/86	··	354.0	194,680	Lookout Point Reservoir	--
1985	MFk Will.[e]	Wi1lamette	fry	04/1 2/86	--	637.0	328,055	Lookout Point Reservoir	··
1985	MFk Will.[e]	Willamette	molt	11/05/86	··	7.6	35,756	MFk-1 Willamette River	--
1985	MFk Will.[e]	Willamette	molt	05/05/87	··	9.0	9,045	MFk-1 Willamette River	07-34-32
1985	MFk Will.[e]	Willamette	molt	05/05/87	··	9.0	9,044	MFk-1 Willamette River	07-34-33
1985	MFk Will.[e]	Willamette	molt	02/1 0/87	·-	10.5	9,188	MFk-2 Willamette R.	07-34-26
1985	MFk Will.[e]	Willamette	smolt	02/10/87	··	10.5	9,188	MFk-2 Willamette R.	07-34-27
1985	MFk Will.[e]	Dexter Pond	Smelt	11/03/86	··	7.9	356,844	MFk-1 Willamette River	··
1985	MFk Will.[e]	Dexter Pond	Smelt	11 /03/86	··	7.9	15,261	MFk-1 Willamette River	07-39-02
1985	MFk Will.[e]	Dexter Pond	Smelt	1 1/03/86	··	7.9	15,185	MFk-1 Willamette River	07-39-03
1985	MFk Will.[e]	Dexter Pond	smol t	03/09/87	··	8.3	759,806	MFk-1 Willamette River	··
1985	MFk Will.[e]	Dexter Pond	Smelt	03/09/87	--	8.3	10,541	MFk-1 Willamette River	07-34-28
1985	MFk Will.[e]	Dexter Pond	Smelt	03/09/87	··	8.3	10,541	MFk-1 Willamette River	07-34-29
1986	Willamette[f]	McKenzie	fry	04/03/87	--	340.0	365,500	Fall Creek Reservoir	··
1986	MFk Will.[e]	Wi1lamette	fry	05/15/87	--	238.0	196,310	Dexter Reservoir	--
1986	MFk Will.[e]	Willamette	fry	04/02/87	··	410.0	150,060	Fall Creek Reservoir	··
1986	MFk Will.[e]	Willamette	fry	04/03/87	--	440.0	286,000	Fall Creek Reservoir	··
1986	MFk Will.[e]	Willamette	fry	04/02/87	··	521.0	104,200	Fall Creek Reservoir	··
1986	MFk Will.[e]	Willamette	fry	04/03/87	··	584.0	131,400	Fall Creek Reservoir	--
1986	MFk Will.[e]	Willamette	fry	05/07/87	--	267.0	249,615	Lookout Point Reservoir	··
1986	MFk Will.[e]	Willamette	smolt	11/11/87	11/12/87	6.6	24,550	MFk-1 Willamette River	--
1986	MFk Wilt.[e]	Willamette	Smelt	05/12/88	··	9.0	19,350	MFk-1 Willamette River	07-50-11
1986	MFk Will.[e]	Willamette	smolt	04/11/88		9.3	17,663	MFk-1 Willamette River	07-50-14
1986	MFk Will.[e]	Willamette	smolt	10/08/87	·-	10.0	3,248	MFk-1 Willamette River	--
1986	MFk Will.[e]	Willamette	Smelt	10/08/87	··	10.0	10,380	MFk-1 Wi lamette River	07-38-53
1986	MFk Will.[e]	Willamette	smolt	10/08/87		10.0	10,200	MFk-1 Wi lamette River	07-38-54
1986	MFk Will.[e]	Willamette	smolt	10/08/87	--	10.0	10,370	MFk-1 Wi lamette River	07-38-55
1986	MFk Will.[e]	Willamette	smolt	09/14/87	--	11.7	30,794	MFk-1 Wi lamette River	07-47-16
1986	MFk Will.[e]	Willamette	smolt	03/04/88	·-	9.9	20,129	MFk-2 Wi lamette R.	07-50-13

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Middle Fork subbasin by brood year and, if marked, coded wi

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code Fin Cli
1986	MFk Will.[e]	Willamette	smolt	02/09/88	..	11.0	20,295	MFk-2 Willamette R.	07-50-16
1986	MFk Will.[e]	Dexter Pond	smolt	11/11/87	..	5.6	323,970	MFk-1 Willamette River	--
1986	MFk Will.[e]	Dexter Pond	smolt	11/11/87	..	5.6	29,709	MFk-1 Willamette River	07-47-14
1986	MFk Will.[e]	Dexter Pond	smolt	03/11/88	--	8.8	470,412	MFk-1 Willamette River	--
1987	MFk Hill.[e]	Willamette	fry	05/17/88	.-	191.0	180,495	Fall Creek Reservoir	--
1987	F4Fk Will.[e]	Willamette	fry	05/12/88	..	227.0	261,050	Fall Creek Reservoir	--
1987	MFk Will.[e]	Willamette	fry	05/12/88	--	234.0	152,100	Fall Creek Reservoir	--
1987	McKenzie R.[g]	McKenzie	fry	04/25/88	..	183.0	73,378	Fall Creek Reservoir	..
1987	McKenzie R.[g]	McKenzie	fry	04/25/88	..	290.0	69,653	Fall Creek Reservoir	..
1987	MFk Will.[e]	Dexter Pond	smolt	11/14/88	--	8.3	298,379	MFk-1 Willamette River	--
1987	MFk Will.[e]	Dexter Pond	smolt	11/14/88	--	8.3	29,509	MFk-1 Willamette River	07-50-28
1987	MFk Will.[e]	Dexter Pond	smolt	03/06/89	..	8.9	586,271	MFk-1 Willamette River	..
1987	MFk Will.[e]	Dexter Pond	smolt	03/06/89	..	8.9	23,158	MFk-1 Willamette River	07-50-38
1987	MFk Will.[e]	Willamette	smolt	11/18/88	.-	7.1	5,183	MFk-1 Willamette River	--
1987	MFk Will.[e]	Willamette	smelt	10/12/88	10/13/88	9.5	32,348	MFk-1 Willamette River	07-50-31
1987	MFk Will.[e]	Willamette	smolt	05/04/89	..	10.0	19,397	MFk-1 Willamette River	07-50-35
1987	MFk Hill.[e]	Willamette	smolt	04/15/89	..	11.2	21,336	F4Fk-1 Willamette River	07-50-32
1987	MFk Will.[e]	Willamette	Smelt	02/ 15/89	..	12.0	22,800	MFk-1 Willamette River	07-50-3
1987	MFk Will.[e]	Willamette	Smelt	09/09/88	..	9.7	29,972	MFk-2 Willamette R.	07-50-2
1988	Willamette[f]	McKenzie	fry	04/ 19/89	..	199.0	180,294	Fall Creek Reservoir	..
1988	MFk Will.[e]	Dexter Pond	fry	05/09/89	..	184.0	29,992	MFk-1 Willamette River	..
1988	MFk Will.[e]	Willamette	fing.	08/23/89	--	21.1	31,650	MFk-1 Willamette River	07-52-04
1988	MFk Will.[e]	Willamette	fry	05/04/89	--	279.0	210,087	Fall Creek Reservoir	..
1988	MFk Will.[e]	Willamette	fry	04/04/89	..	479.0	239,500	Fall Creek Reservoir	..
1988	MFk Will.[e]	Willamette	fry	04/04/89	..	507.0	134,355	Fall Creek Reservoir	..
1988	MFk Will.[e]	Willamette	fry	04/04/89	--	524.0	260,940	Fall Creek Reservoir	..
1988	MFk Mill.[e]	Willamette	fry	04/03/89	--	522.0	250,548	Lookout Point Reservoir	..
1988	MFk Will.[e]	Wi1lamette	fry	05/08/89	..	227.0	88,757	MFk-1 Willamette River	..
1988	MFk Will.[e]	Willamette	fry	05/04189	--	240.0	52,697	MFk-1 Willamette River	--
1988	MFk Will.[e]	Willamette	fry	05/08/89	--	274.0	86,310	MFk-1 Willamette River	..
1988	MFk Will.[e]	Willamette	fry	05/04/89	..	279.0	54,963	MFk-1 Willamette River	..
1988	MFk Will.[e]	Willamette	smolt	03/ 12/90	..	12.5	17,625	MFk-1 Willamette River	..
1988	MFk Will.[e]	Dexter Pond	smolt	11/13/89	--	6.8	375,445	MFk-1 Willamette River	--
1988	MFk Will.[e]	Dexter Pond	smolt	11/13/89	--	6.8	33,091	MFk-1 Willamette River	07-52-0
1988	MFk Will.[e]	Dexter Pond	smolt	03/07/90	..	11.3	785,862	MFk-1 Willamette River	--
1988	MFk Will.[e]	Dexter Pond	smolt	03/07/90	..	11.3	14,897	MFk-1 Willamette River	07-51-62
1988	MFk Will.[e]	Dexter Pond	smolt	03/07/90	..	11.3	15,209	MFk-1 Willamette River	07-51-63
1989	McKenzie R.[g]	McKenzie	fry	04/17/90	--	162.0	251,079	Fall Creek Reservoir	--
1989	McKenzie R.[g]	McKenzie	fry	04/17/90	--	168.0	109,196	Fall Creek Reservoir	..

Table 1 (TR). (cent.) Hatchery spring chinook releases into the Middle Fork subbasin by brood year and, if marked, coded wire tag codes.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1989	McKenzie R.9	McKenzie	fry	04/17/90	04/18190	243.0	379,062	Fall Creek Reservoir	--
1989	N. Santiam R.	McKenzie	fry	04/ 18/90	--	353.0	162,360	Fall Creek Reservoir	--
1989	N. Santiam R.	McKenzie	fry	04/18/90	--	358.0	110,973	Fall Creek Reservoir	--
1989	MFk Willamette	Willamette	fing.	08/14/90	--	27.0	25,342	MFk-1 Willamette River	07-54-34
1989	MFk Willamette	Willamette	fing.	08/14/90	--	30.0	23,250	MFk-1 Willamette River	07-54-33
1989	McKenzie R.[g]	McKenzie	smolt	10/15/ 90	--	9.1	7,899	Fall Creek Reservoir	RV
1989	MFk Willamette	Dexter Pond	smolt	11/16/90	--	7.2	354,904	MFk-1 Willamette River	--
1989	MFk Willamette	Dexter Pond	Smelt	11/16/90	--	7.2	7,973	MFk-1 Willamette River	07-53-47
1989	MFk Willamette	Dextar Pond	Smelt	11/16/90	--	7.2	7,9?3	MFk-1 Willamette River	07-53-48
1989	MFk Willamette	Dexter Pond	Smelt	03/03/91	--	9.6	79,843	MFk-1 Willamette River	--
1989	MFk Willamette	Dexter Pond	smelt	03/03/91	--	9.6	34,008	MFk-1 Willamette River	07-55-15
1989	MFk Willamette	Dexter Pond	smolt	03/03/ 91	--	9.6	34,008	MFk-1 Willamette River	07-55-16
1989	MFk Willamette	Willamette	smolt	02/28/91	--	9.8	19,595	MFk-1 Willamette River	07-55-17
1989	MFk Willamette	Willamette	smolt	03/01/91	--	10.7	7,010	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	Smelt	03/01/91	--	10.7	31,928	MFk-1 Willamette River	07-55-03
1989	MFk Willamette	Willamette	smolt	02/28/91	--	10.8	6,027	MFk-1 Willamette River	--
1989	F4Fk Willamette	Willamette	Smelt	02/28/91	--	10.8	31,637	MFk-1 Willamette River	07-54-63
1989	F4Fk Willamette	Willamette	Smelt	03/01/91	--	11.0	18,255	MFk-1 Willamette River	07-55-18
1989	MFk Willamette	Willamette	Smelt	02/28/91	--	11.1	5,688	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	Smelt	02/28/91	--	11.1	32,219	MFk-1 Willamette River	07-55-14
1989	MFk Willamette	Willamette	Smelt	03/01/91	--	11.8	5,324	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	smolt	03/01/91	--	11.8	27,947	MFk-1 Willamette River	07-55-06
1989	MFk Willamette	Willamette	Smelt	03/01/91	--	12.1	71,553	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	smolt	03/01/91	--	12.1	29,223	MFk-1 Willamette River	07-55-08
1989	MFk Willamette	Willamette	smolt	02/28/91	--	13.6	37,588	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	Smelt	02/28/91	--	13.6	17,341	MFk-1 Willamette River	07-55-12
1989	MFk Willamette	Willamette	smolt	02/28/91	--	13.7	21,943	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	smolt	02/28/91	--	13.7	27,925	MFk-1 Willamette River	07-55-11
1989	MFk Willamette	Willamette	smolt	02/28/91	--	14.2	21,646	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	Smelt	02/28/91	--	14.2	27,546	MFk-1 Willamette River	07-55-05
1989	MFk Willamette	Willamette	smolt	02/28/91	--	14.4	96,812	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	Smelt	02/28/91	--	14.4	28,513	MFk-1 Willamette River	07-55-07
1989	MFk Willamette	Willamette	smolt	02/28/91	--	14.9	20,977	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	smolt	02/28/91	--	14.9	26,694	MFk-1 Willamette River	07-55-13
1989	MFk Willamette	Willamette	smolt	02/28/91	03/01/91	15.3	23,429	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	smolt	02/28/91	03/01/91	15.3	29,040	MFk-1 Willamette River	07-55-10
1989	MFk Willamette	Willamette	smolt	02/28/91	--	15.7	21,263	MFk-1 Willamette River	--
1989	MFk Willamette	Willamette	smolt	02/28/91	--	15.7	25,984	MFk-1 Willamette River	07-55-09
1990	MFk Willamette	Willamette	fry	05/28/91	--	139.0	50,035	Fall Creek Reservoir	--

Table 1 (TR). (cont.) Hatchery spring chinook releases into the Middle Fork subbasin by brood year and, if marked, coded wire tag codes.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1990	MFk Will.[e]	Willamette	fry	05/28/91	..	165.0	103,948	Fall Creek Reservoir	..
1990	MFk Will.[e]	Willamette	fry	05/21/91	--	170.0	173,400	Fall Creek Reservoir	..
1990	MFk Will.[e]	Willamette	fry	05/28/91	--	189.0	188,050	Fall Creek Reservoir	--
1990	MFk Will.[e]	Willamette	fry	05/22/91	.-	203.0	306,530	Fall Creek Reservoir	--
1990	MFk Will.[e]	Willamette	fry	05/31/91	..	325.0	65,650	Fall Creek Reservoir	--
1990	MFk Will.[e]	Willamette	fry	05/31/91	--	331.0	33,431	Fall Creek Reservoir	..
1990	MFk Will.[e]	Willamette	fry	05/31/91	--	338.0	32,110	Fall Creek Reservoir	..
1990	S Santiam R.	Willamette	fry	05/30/91	.-	262.0	100,084	Hills Creek Reservoir	--
1990	S Santiam R.	Willamette	fry	06/ 14/91	..	137.0	271,257	Lookout Point Reservoir	--
1990	S. Santiam R.	McKenzie	fry	05/28/91	--	245.0	142,073	Lookout Point Reservoir	..
1990	MFk Will.[e]	Willamette	fing.	08/20/91	--	19.9	25,268	MFk-1 Willamette River	07-57-22
1990	F4Fk Will.[e]	Willamette	fing.	08/20/91	--	19.9	26,661	MFk-1 Willamette River	07-57-23
1990	S Santiam R.	Willamette	fing.	06/24/91	--	122.0	256,200	Lookout Point Reservoir	--
1990	MFk Will.[e]	Dexter Pond	Smelt	11/14/91	--	7.1	313,885	MFk-1 Willamette River	..
1990	MFk Will.[e]	Dexter Pond	Smelt	11/14/91	--	7.1	42,802	MFk-1 Willamette River	07-50-21

a Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990); and Oregon Department of Fish and Wildlife's hatchery production database.

b North Santiam, South Santiam, Clackamas, McKenzie, and Middle Fork Willamette rivers stocks, and Eagle Creek stock are all considered part of the Willamette River stock.

c D = dorsal fin clip; AO = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

d Release dates unknown (only the month and year known). Standardized to the 15th of the month.

e Willamette Fish Hatchery stock.

f Fall Creek Reservoir stock.

9 McKenzie Fish Hatchery stock.

Table 2 (AC-l). Age composition (% at freshwater.ocean[a,b]) by run year for hatchery spring chinook[c] released in the Middle Fork subbasin[d].

Brood Year	N	Age Composition (%) 1.1	1.2	1.3	2.1	2.2	2.3	2.4
1972	28	--	--	--	0	36	64	--
1974	199	--	--	--	2	55	43	--

[a] Data available by total age only; freshwater water age was determined based on the assumption that hatchery fish migrate as age 1+ smelts.

[b] Data on 2 year old "mini-jacks" is not included in this table, but is available in Smith (1979, cited by Oregon Department of Fish and Wildlife 1990).

[c] Willamette stock.

[d] Modified from Smith (1979, cited by Oregon Department of Fish and Wildlife 1990).

Table 3 (AC-2). Age composition (% at freshwater.ocean[a,b]) by run year for hatchery spring chinook[c] released in the Middle Fork subbasin[d].

Brood Year	N	Age Composition (%) 1.1	1.2	1.3	2.1	2.2	2.3	2.4
1972	118	--	--	--	3	84	13	--
1974	310	--	--	--	16	74	9	--

[a] Data available by total age only; freshwater water age was determined based on the assumption that hatchery fish migrate as age 1+ smelts.

[b] Data on 2 year old "mini-jacks" is not included in this table, but is available in Smith (1979, cited by Oregon Department of Fish and Wildlife 1990) .

[c] Carson stock.

[d] Modified from Smith (1979, cited by Oregon Department of Fish and Wildlife 1990).

Table 4 (AE). Emigration of coded wire tagged hatchery spring chinook salmon released into the Middle Fork subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Middle Fork	lower Columbia R.[c]	Hatchery Returns		
	1987	--	1	1
Middle Fork	Coos Bay	Hatchery Returns		
	1982	--	1	1
Middle Fork	Cowlitz River	Hatchery Returns		
	1987	--	1	1
Middle Fork	Elk River, OR	Hatchery Returns		
	1989	--	1	1
Middle Fork	McKenzie River	Hatchery Returns		
	1982	--	24	24
	1983	--	3	3
	1984	--	2	2
	1985	--	5	5
Middle Fork	Salmon River	Hatchery Returns		
	1982	--	1	1
Middle Fork	Santiam,Calapooia	Hatchery Returns		
	1982	--	1	1
	1983	--	--	--
	1984	--	1	1
Middle Fork	Willamette River	Trap Returns		
	1984	--	1	1
	1985	--	1	1
	1986	--	--	--
	1987	--	1	2

(cent.)

Table 4 (AE). (cont.) Emigration of coded wire tagged hatchery spring chinook salmon released into the Middle Fork subbasin[a,b].

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[a] Based on the following tag codes: 07-17-39, 07-17-41, 07-17-43, 07-20-40, 07-20-42, 07-20-44, 07-20-45, 07-20-46, 07-20-47, 07-22-25, 07-22-37, 07-23-03, 07-23-07, 07-24-18, 07-24-19, 07-24-20, 07-24-22, 07-25-13, 07-34-28, 07-34-29, 07-34-31, 07-37-35

[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

[c] Mainstem from the mouth to Bonneville Dam.

Table 5 (TD-1). Parasites and diseases of juvenile spring chinook at hatcheries located in the Middle Fork subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Oakridge	*Epistylis sp.*
Parasite	Oakridge	Costia (*Ichthyobodo sp.)*
Parasite	Oakridge	*Trichodina spp.*
Parasite	Oakridge	Gill trematodes
Parasite	Oakridge	Gill amoeba
Parasite	Oakridge	*Colponema*
Parasite	Oakridge	*Hexamita spp.*
Parasite	Dexter	*Hexamita spp.*
Parasite	Dexter	*Epistylis sp.*
Parasite	Dexter	*Scyphidia*
Parasite	Dexter	Microsporidans (*Loma sp.*)
Parasite	Dexter	*Colponema*
Parasite	Dexter	*Trichophrya*
Parasite	Dexter	*Pleistophora salmonis*
Bacteria	Oakridge	*Aeromonas spp.*
Bacteria	Oakridge	*Pseudomonas spp.*
Bacteria	Oakridge	Coldwater disease (*Cytophaga psychrophila*)
Bacteria	Oakridge	*Flexibacter columnaris*
Bacteria	Oakridge	Enteric redmouth (*Yersinia ruckeri*)
Bacteria	Oakridge	Bacterial kidney disease (*Renibacterium salmoninarum*)
Bacteria	Dexter	Furunculosis (*Aeromonas salmonicida*)
Bacteria	Dexter	*Cytophaga spp.*
Bacteria	Dexter	Enteric redmouth (*Yersinia ruckeri*)
Bacteria	Dexter	*Aeromonas spp.*
Bacteria	Dexter	*Pseudomonas spp.*
Bacteria	Dexter	Bacterial kidney disease (*Renibacterium salmoninarum*)
Bacteria	Dexter	*Flexibacter columnaris*
Virus	Dexter	Erythrocytic inclusion Body Syndrome (EIBS)

Table 5 (TD-1). (cont.) Parasites and diseases of juvenile spring chinook at hatcheries located in the Middle Fork subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Fungi	Oakridge	External fungi
Fungi	Oakridge	Internal fungi
Fungi	Dexter	Gill fungi

[a] Data are from Oregon Department of Fish and Wildlife (unpublished data).

Table 6 (TD-2). Parasites and diseases of adult spring chinook at hatcheries located in the Middle Fork subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Oakridge	*Myxobolus insidious*
Parasite	Oakridge	*Ceratomyxa shasta*
Parasite	Dexter	*Ceratomyxa shasta*
Bacteria	Oakridge	Enteric redmouth (*Yersinia ruckeri*)
Bacteria	Oakridge	*Aeromonas spp.*
Bacteria	Oakridge	*Pseudomonas spp.*
Bacteria	Oakridge	Bacterial kidney disease (*Renibacterium salmoninarum*)
Bacteria	Oakridge	Furunculosis (*Aeromonas salmonicida*)
Bacteria	Dexter	Furunculosis (*Aeromonas salmonicida*)
Bacteria	Dexter	Bacterial kidney disease (*Renibacterium salmoninarum*)
Virus	Dexter	Erythrocytic Inclusion Body Syndrome (EIBS)
Virus	Dexter	*Sphaeromyxa spp.*
Fungi	Oakridge	Internal fungi
Fungi	Oakridge	External fungi

[a] Data are from Oregon Department of Fish and Wildlife (unpublished data).

REFERENCES

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MIDDLE FORK SUBBASIN

Naturally Produced Fall Chinook Salmon

GEOGRAPHIC LOCATION

The Middle Fork of the Willamette River originates on the west slope of the Cascade Mountains and flows approximately 84 miles to the northwest, where it joins the Coast Fork to form the Willamette River (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The Middle Fork subbasin drains 1,350 square miles of Lane and Douglas counties, and is composed of "about 1,460 perennial streams that stretch for 1,910 stream miles" (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990).

ORIGIN

Fall chinook are not indigenous to the Middle Fork subbasin (Oregon Department of Fish and Wildlife 1990). The subbasin was supplemented with hatchery fish in the late 1960's and early 1980's (see MIDDLE FORK SUBBASIN, Hatchery Produced Fall Chinook Salmon), but a self-sustaining run was not established (Oregon Department of Fish and Wildlife 1990). Currently, natural production of fall chinook in the Middle Fork subbasin may be non-existent (Oregon Department of Fish and Wildlife 1990). If natural production does occur, it is limited to a small remnant run, or else strays from releases of hatchery fish in the mainstem Willamette River (Oregon Department of Fish and Wildlife 1990).

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Middle Fork). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

State Water Resources Board. 1961. Upper Willamette River basin. Salem, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990).

MIDDLE FORK SUBBASIN

Hatchery Produced Fall Chinook Salmon

ORIGIN

Hatchery fall chinook were released in the Middle Fork subbasin in the late 1960's and early 1980's (Table 1). Hatchery fish were released to establish a self-sustaining population in the subbasin and to increase harvest opportunities in sport and commercial fisheries (Oregon Department of Fish and Wildlife 1990). The only stock of fall chinook that was released in the subbasin was the LRH (Lower River Hatchery) stock (Table 1; see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, ORIGIN).

DISTRIBUTION

Subbasin

Hatchery fall chinook have been released in the Middle Fork, Little Fall Creek, and in Norton and Sturdy creeks in the Fall Creek drainage (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases into the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Bonneville and Cascade hatcheries (Table 1). Annual numbers released were 1,000,000 and 864,920 fish for the 1967 and 1968 release years, respectively (Table 1).

Fingerling

Fingerlings were reared or acclimated prior to release in the subbasin in Stayton Pond (Table 1). Annual numbers released were 271,002 and 579,590 fish for the 1981 and 1982 release years, respectively (Table 1). Size at release ranged from 87.0 to 70.8 fish per pound (Table 1).

Smolt

There are no records of releases into the subbasin.

Jack and Adult

There are no records of releases into the subbasin.

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, DISEASES.

fable 1 (TR). Hatchery fall chinook releases into the Middle Fork subbasin by broodyear and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1966	LRH	Bonneville	fry	02/15/67[d]	--	..	166,680	Little Fall Creek	..
1966	LRH	Bonneville	fry	02/15/67[d]	--	..	333,320	Norton Creek (Fall Creek)	--
1966	LRH	Bonneville	fry	02/15/67[d]	--	..	500,000	Sturdy Creek (Fall Creek)	--
1967	LRH	Bonneville	fry	02/15/68[d]	..	..	567,920	Little Fall Creek	..
1967	LRH	Cascade	fry	02/15/68[d]	--	..	297,000	Little Fall Creek	..
1980	Tanner Creek	Stayton Pond	f ing.	04/29/81	--	70.8	67,000	MFk-1 Uillamette River	--
1980	Tanner Creek	Stayton Pond	fing.	04/29/81	--	70.8	336	MFk-1 Uillamette River	CUT
1980	Tanner Creek	Stayton Pond	fing.	04/27/81	- -	71.8	203,056	MFk-1 Uillamette River	--
1980	Tanner Creek	Stayton Pond	f ing.	04/27/81	- -	71.8	610	MFk-1 Willamette River	AD-CUT
1981	Tanner Creek	Stayton Pond	fing.	05/03/82	05/13/82	87.0	558,725	MFk-1 Uillamette River	--
1981	Tanner Creek	Stayton Pond	f ing.	05/03/82	05/13/82	87.0	20,865	MFk-1 Uillamette River	07-26-62[e]

a Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990); and Oregon Department of Fish and Wildlife's hatchery production database.

b LRH refers to Lower Columbia River Hatchery Stock, which are informally called tules (along uith Bonneville Pool Hatchery Stock). Tanner Creek stock is part of the LRH stock group.

c D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

d Day(s) of release unknown; standardized to the 15th of the month.

e Juveniles with this tag group were also released into the Molalla and Pudding rivers, Santiam and Calapooia rivers, and mainstem Uillamette River subbasins.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Middle Fork). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

MIDDLE FORK SUBBASIN

Naturally Produced Coho Salmon

GEOGRAPHIC LOCATION

The Middle Fork of the Willamette River originates on the west slope of the Cascade Mountains and flows approximately 84 miles to the northwest, where it joins the Coast Fork to form the Willamette River (Oregon Department of Fish and Wildlife 1990, see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The Middle Fork subbasin drains 1,350 square miles of Lane and Douglas counties, and is composed of "about 1,460 perennial streams that stretch for 1,910 stream miles" (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990).

ORIGIN

Coho are not indigenous to the Middle Fork subbasin (Oregon Department of Fish and Wildlife 1990). Hatchery coho were released in the subbasin from the early 1920's through the mid-1970's (see MIDDLE FORK SUBBASIN, Hatchery Produced Coho Salmon). Natural spawning was documented in the subbasin but smolt to returning adult survival was low and it is currently believed that coho are either absent from the subbasin or exist only as a remnant population (Oregon Department of Fish and Wildlife 1990).

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Middle Fork). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

State Water Resources Board. 1961. Upper Willamette River basin. Salem, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990).

MIDDLE FORK SUBBASIN

Hatchery Produced Coho Salmon

ORIGIN

The first recorded release of hatchery coho in the Middle Fork subbasin was in 1921 (Wallis 1962, cited by Oregon Department of Fish and Wildlife 1990). Releases were sporadic until 1956, when a regular program of coho releases was implemented (Oregon Department of Fish and Wildlife 1990). The subbasin has been supplemented with Lower Columbia Early Run (LCER; also known as Toutle; see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, ORIGIN), late run (also known as Cowlitz), and coastal stocks. Hatchery coho were released to establish a self-sustaining run (Oregon Department of Fish and Wildlife 1990). Adult returns were low due to high rates of harvest in the ocean and Columbia River fisheries, upstream passage problems at Willamette Falls, and the susceptibility of coastal stocks to the parasite *Ceratomyxa shasta* (Oregon Department of Fish and Wildlife 1990). Releases of hatchery coho in the subbasin were discontinued after 1976, due to concern about potential negative impacts on native fish species (Oregon Department of Fish and Wildlife 1990; Hutchison and Hooton 1983, cited by Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery coho were released at various locations in the Middle Fork subbasin, including the mainstem Middle Fork, and Fall, Little Fall, Gosage, Winberry, Portland, Anthony, Gurley, Hills, Lost, Norton, and Sturdy creeks (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Bonneville, Klaskanine, Sandy, Cascade, McKenzie, and Nehalem hatcheries (Table 1). Annual numbers released ranged from 24,549 to 868,044 fish (Table 1).

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Sandy and Klaskanine hatcheries (Table 1). Annual numbers released ranged from 41,492 to 80,000 fish (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the

subbasin include Bonneville, Klaskanine, Sandy, Cascade, Willamette, Alsea, and Siletz hatcheries (Table 1). Annual numbers released ranged from 22,074 to 258,366 fish (Table 1).

Jack and Adult

Hatchery facilities which held adults prior to release into the subbasin include Bonneville, Cascade, and Sandy hatcheries (Table 1). Annual numbers released ranged from 158 to 640 fish (Table 1).

DISEASES

For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES and see SANDY RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES.

Table 1 (TR). Hatchery coho releases into the Middle Fork subbasin by broodyear and, if marked, coded uire tag code[a].

Brood Year	Stock[b]	Hatchery	life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CUT Code/ Fin Clip
--	Coastal Stock	Nehalem	fry	01/01/57	12/31/57[c]	--	24,549	Above Lookout Point	--
--	LCER	Sandy	fing.	01/01/56	12/31/56[c]	--	80,000	Above Lookout Point	--
--	LCER	Klaskanine	fing.	01/01/57	12/31/57[c]	--	41,942	Below Dexter	--
--	LCER	Klaskanine	smolt	01/01/58	12/31/58[c]	--	28,094	Below Dexter	--
--	Coastal Stock	Siletz	smolt	01/01/58	12/31/58[c]	--	62,222	Below Dexter	--
--	LCER	Bonneville	fry	01/01/63	12/31/63[c]	--	224,000	Fall Creek	--
--	LCER	Bonneville	fry	01/01/63	12/31/63[c]	--	126;000	Little Fall Creek	--
--	LCER	Willamette	smolt	01/01/62	12/31/62[c]	--	42,559	Mainstem Middle Fork	--
--	LCER	Willamette	smolt	01/01/63	12/31/63[c]	--	93,339	Mainstem Middle Fork	--
--	LCER	Bonneville	fry	01/01/65	12/31/65[c]	--	158,600	Fall Creek	--
--	LCER	Bonneville	fry	01/01/65	12/31/65[c]	--	201,300	Hills Creek	--
--	LCER	Bonneville	fry	01/01/65	12/31/65[c]	--	128,100	Little Fall Creek	--
--	LCER	Bonneville	fry	01/01/65	12/31/65[c]	--	91,500	Uinberry Creek	--
--	LCER	Bonneville	fry	01/01/65	12/31/65[c]	--	30.500	Middle Fork Subbasin	--
--	LCER	Klaskanine	fry	01/01/66	12/31/66[c]	--	68,756	Anthony Creek	--
--	LCER	Klaskanine	fry	01/01/66	12/31/66[c]	--	206,268	Fall Creek	--
--	LCER	Klaskanine	fry	01/01/66	12/31/66[c]	--	171,890	Gosage Creek	--
--	LCER	Klaskanine	fry	01/01/66	12/31/66[c]	--	34,378	Gurley Creek	--
--	LCER	Klaskanine	fry	01/01/66	12/31/66[c]	--	249,240	Hills Creek	--
--	LCER	Klaskanine	fry	01/01/66	12/31/66[c]	--	34,378	Middle Creek	--
--	LCER	Klaskanine	fry	01/01/66	12/31/66[c]	--	34,378	Norton Creek	--
--	LCER	Klaskanine	fry	01/01/66	12/31/66[c]	--	68,756	Sturdy Creek	--
--	LCER	Sandy	smolt	01/01/65	12/31/65[c]	--	30,264	Lost Creek	--
--	Coastal Stock	Nehalem	fry	01/01/67	12/31/67[c]	--	39,007	Anthony Creek	--
--	Coastal Stock	Nehalem	fry	01/01/67	12/31/67[c]	--	49,646	Gurley Creek	--
--	Coastal Stock	Nehalem	fry	01/01/67	12/31/67[c]	--	159,576	Hills Creek	--
--	Coastal Stock	Nehalem	fry	01/01/67	12/31/67[c]	--	106,384	Lost Creek	--
--	LCER	Sandy	fry	01/01/67	12/31/67[c]	--	204,120	Fall Creek	--
--	LCER	Sandy	fry	01/01/67	12/31/67[c]	--	106,920	Portland Creek	--
--	LCER	Sandy	fry	01/01/67	12/31/67[c]	--	174,960	Uinberry Creek	--
--	LCER	Bonneville	adult	01/01/66	12/31/66[c]	--	142	Little Fall Creek	--
--	LCER	Cascade	adult	01/01/66	12/31/66[c]	--	357	Little Fall Creek	--
--	LCER	Bonneville	adult	01/01/67	12/31/67[c]	--	99	Fall Creek	--
--	LCER	Bonneville	adult	01/01/67	12/31/67[c]	--	241	Little Fall Creek	--
--	LCER	Cascade	adult	01/01/67	12/31/67[c]	--	300	Lost Creek	--
--	LCER	Sandy	fry	01/01/69	12/31/69[c]	--	31,213	Norton Creek	--
--	LCER	Sandy	fry	01/01/69	12/31/69[c]	--	315,596	Sturdy Creek	--
--	LCER	Bonneville	adult	01/01/69	12/31/69[c]	--	306	Little Fall Creek	--
--	LCER	Cascade	fry	01/01/70	12/31/70[c]	--	183,859	Hills Creek	--

Table 1 (TR). (cont.) Hatchery coho releases into the Middle Fork s&basin by broodyear and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
--	LCER	Cascade	fry	01/01/70	12/31/70[c]	- -	243,721	Lost Creek	--
--	LCER	McKenzie	fry	01/01/70	12/31/70[c]	- -	352,640	little Fall Creek	--
--	LCER	Sandy	adult	01/01/69	12/31/69[c]	--	16	little Fall Creek	--
--	LCER	Cascade	smolt	01/01/70	12/31/70[c]	- -	32,917	Little Fall Creek	--
--	Coastal	Alsea	smolt	01/01/70	12/31/70[c]	- -	14,580	little Fall Creek	--
--	LCER	Bonneville	adult	01/01/70	12/31/70[c]	--	400	little Fall Creek	--
--	LCER	Cascade	smolt	01/01/72	12/31/72[c]	--	14,460	Little Fall Creek	--
--	Coastal	Alsea	smolt	01/01/72	12/31/72[c]	--	12,672	little Fall Creek	--
--	LCER	Sandy	adult	01/01/72	12/31/72[c]	--	158	Little Fall Creek	--
--	LCER	Bonneville	smolt	01/01/73	12/31/73[c]	--	18,864	Hills Creek	--
--	LCER	Bonneville	smolt	01/01/73	12/31/73[c]	--	70,966	Lost Creek	--
--	LCER	Sandy	smolt	01/01/74	12/31/74[c]	--	258,366	Little Fall Creek	--
--	Cowlitz	Cascade	smolt	01/01/76	12/31/76[c]	--	22,074	lost Creek	--

a Modified from William (1983, cited by Oregon Department of Fish and Wildlife 1990).

b LCER refers to Lower Columbia Early Run stock, a "catchall" name for early run hatchery stocks, including Eagle Creek, Clackamas River, Sandy River, Big Creek, and fanner Creek stocks. These stocks have been previously grouped as early run Toutle stock, or just early run coho. Cowlitz stock is part of a late run stock group.

c Month(s) and day(s) of release unknoun; standardized to the first and last day of the year.

REFERENCES

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MIDDLE FORK SUBBASIN

Naturally Produced Summer Steelhead

GEOGRAPHIC LOCATION

The Middle Fork of the Willamette River originates on the west slope of the Cascade Mountains and flows approximately 84 miles to the northwest, where it joins the Coast Fork to form the Willamette River (Oregon Department of Fish and Wildlife 1990.; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chmook Salmon, Figure 1). The Middle Fork subbasin drains 1,350 square miles of Lane and Douglas counties, and is composed of "about 1,460 perennial streams that stretch for 1,910 stream miles" (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990).

ORIGIN

Summer steelhead are not indigenous to the Middle Fork River subbasin (Buchanan and Wade 1982, cited by Oregon Department of Fish and Wildlife 1990). Natural production may occur as a result of releases of hatchery fish into the subbasin (see MIDDLE FORK SUBBASIN, Hatchery Produced Summer Steelhead; Oregon Department of Fish and Wildlife 1990). The majority, if not all, of the summer steelhead returning to the subbasin are considered to be hatchery fish (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

There are an estimated 67.5 miles of potential habitat considered suitable for spawning and rearing in the Middle Fork subbasin (Tables 1 and 2). The habitat is primarily rated as "excellent" quality (Tables 1 and 2). Potential spawning and rearing habitat is found in areas below Dexter and Fall Creek dams, including the mainstem Middle Fork, Hills Creek, Little Fall Creek., Lost Creek, Brook Creek, Fall Creek, and Rattlesnake Creek. Habitat currently accessible to summer steelhead is considered to be of low quality (Oregon Department of Fish and Wildlife 1990). The actual locations that support summer steelhead production, if any, are unknown (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality Of Middle Fork subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	46.8	27.0	26.2	0.0	--	67.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Middle Fork subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

REFERENCES

Buchanan, D.V., and M.G. Wade. 1982. Development and assessment of steelhead in the Willamette River basin. Oregon Department of Fish and Wildlife, Annual Project Report, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Middle Fork). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

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MIDDLE FORK SUBBASIN

Hatchery Produced Summer Steelhead

ORIGIN

The first release of hatchery summer steelhead in the Middle Fork subbasin was in 1975 (Oregon Department of Fish and Wildlife 1990). Since 1981, summer steelhead have been released on an annual basis (Table 1). Hatchery fish were initially released into the subbasin to establish a sport fishery (Oregon Department of Fish and Wildlife 1990). Only Skamania stock, and stocks derived from the Skamania stock, have been released into the subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery summer steelhead are released at various locations in the Middle Fork subbasin, including the mainstem Middle Fork and Dexter Reservoir (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases into the subbasin.

Fry

There are no records of releases into the subbasin.

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include McKenzie and Leaburg hatcheries (Table 1). Annual numbers released ranged from 3,552 to 367,803 fish (Table 1). Size at release ranged from 98.0 to 18.2 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include South Santiam, Gnat Creek, McKenzie, and Leaburg hatcheries (Table 1). Annual numbers released ranged from 5,244 to 78,908 fish (Table 1). Size at release ranged from 11.6 to 4.1 fish per pound (Table 1).

Adult

There are no records of releases into the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery produced summer steelhead are not available, run year specific estimates of sport harvest are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Numbers: Although brood year specific estimates of escapement for hatchery produced summer steelhead are not available, run year specific estimates are available in Oregon Department of Fish and Wildlife 1990).

Age Structure

Age structure for adult summer steelhead collected at Dexter Dam in 1984 was estimated at 3%, 97%, and 0% for 1, 2, and 3 salt fish, respectively (Table 2). Age structure for adult summer steelhead collected at Fall Creek Dam in 1984 was estimated at 0%, 88%, and 12% for 1, 2, and 3 salt fish, respectively (Table 2).

Sex Ratio

Although brood year specific estimates of sex ratio for hatchery produced summer steelhead are not available, run year specific estimates are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

DISEASES

The only parasite or disease agent of summer steelhead detected at hatchery facilities located in the Middle Fork subbasin is the parasite *Epistylis sp.* (Table 3). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see MCKENZIE RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES; see SANTIAM RIVER SUBBASIN, Hatchery Produced Summer Steelhead DISEASES. and see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES.

Table 1 (TR). Hatchery summer steelhead releases into the Middle Fork subbasin by brood year and, if marked, coded uire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
--	Skamani a	Unknown	fing.	01/01/75	12/31/75[c]	--	3,552	Above Dexter Dam	--
--	Skamania	Leaburg	fing.	01/01/77	12/31/77[c]	--	21,103	Lookout Point Reservoir	--
--	Skamania	Leaburg	fing.	01/01/78	12/31/78[c]	--	53,889	Lookout Point Reservoir	--
1979	Skamania R.	Gnat Creek	smolt	04/09/80	--	5.7	5,244	Salmon Creek	--
--	Skamanie	Leaburg	fing.	01/01/80	12/31/80[c]	--	99,387	Dexter Reservoir	--
1980	Skamania R.	South Santiam	smolt	04/13/81	--	5.3	18,080	MFk-1 Willamette River	--
1980	Skamania R.	South Santiam	smolt	04/13/81	--	5.3	2,007	MFk-1 Uillamette River	RV-RM
1980	Skamania R.	South Santiam	smolt	04/13/81	--	5.4	18,445	MFk-1 Uillamette River	--
1980	Skamania R.	South Santiam	smolt	04/13/81	--	5.4	2,048	MFk-1 Uillamette River	LV-RM
1981	Skamania R.	Leaburg	smolt	05/10/82	05/11/82	4.5	33,987	MFk-1 Uillamette River	LV-RV
1981	Skamania R.	McKenzie	smolt	05/10/82	--	4.8	17,630	MFk-1 Uillamette River	--
1981	Skamania R.	McKenzie	smolt	05/10/82	--	4.9	7,546	MFk-1 Uillamette River	--
1982	McKenzie R.[d]	Leaburg	fing.	11/05/82	--	27.1	7,425	MFk-1 Willamette River	--
1982	McKenzie R.[d]	Leaburg	fing.	09/09/82	--	55:o	26,675	MFk-1 Uillamette River	--
1982	Skamania R.	Leaburg	fing.	11/05/82		22.3	11,507	MFk-1 Uillamette River	--
1982	Skamania R.	Leaburg	fing.	09/15/82	--	48.0	34,560	MFk-1 Uillamatte River	--
1982	Skamania R.	Leaburg	fing.	09/09/82	--	62.0	4,402	MFk-1 Uillamette River	--
1982	Skamania R.	McKenzie	fing.	12/16/82	--	26.2	52,656	MFk-1 Uillamatte River	--
1982	Skamania R.	McKenzie	smolt	05/02/83	--	4.5	14,702	MFk-1 Uillamette River	--
1982	Skamania R.[d]	McKenzie	smolt	05/02/83	--	4.9	21,461	MFk-1 Uillamette River	--
1983	McKenzie R.[d]	Leaburg	fing.	11/04/83	--	21.3	10,096	MFk-1 Uillamette River	--
1983	McKenzie R.[d]	Leaburg	fing.	09/03/83	--	61.6	117,030	MFk-1 Uillamette River	--
1983	Skamania R.	Leaburg	fing.	08/10/83		49.8	27,988	Dexter Reservoir	--
1983	Skamania R.	Leaburg	fing.	11/04/83	--	19.6	4,900	MFk-1 Uillamette River	--
--	Skamania	Gnat Creek	smolt	01/01/84	12/31/84[c]	--	8,237	Below Dexter Dam	--
1983	Skamania R.	Uillamette	smolt	05/07/84	--	5.3	19,393	MFk-1 Uillamatte River	AD-RN
1983	Skamania R.	Willamette	smolt	05/07/84	--	5.7	21,261	MFk-1 Uillamatte River	AD-RM
--	Skamania	Uillamette	smolt	01/01/84	12/31/84[c]	--	6,664	Below Dexter Dam	--
1984	McKenzie R.[d]	Leaburg	fing.	11/14/84	--	31.8	12,084	MFk-1 Uillamette River	--
1984	McKenzie R.[d]	Leaburg	fing.	09/11/84		61.9	23,521	MFk-1 Uillamette River	--
1984	Skamania R.	Leaburg	fing.	11/14/84	--	31.8	986	MFk-1 Uillamette River	--
1984	Skamania R.	McKenzie	smolt	05/06/85	--	5.1	14,892	MFk-1 Uillamette River	AD
1984	Skamania R.	McKenzie	smolt	05/06/85	--	5.3	15,185	MFk-1 Uillamette River	AD
1984	Skamania R.	McKenzie	smolt	05/06/85	--	5.5	9,129	WFk-1 Uillamette River	AD
1984	Skamania R.[d]	McKenzie	smolt	05/06/85	--	5.7	6,554	MFk-1 Uillamette River	AD
1985	McKenzie R.[d]	Leaburg	fing.	10/31/85	--	19.9	21,472	MFk-1 Uillamette River	--
1985	McKenzie R.[d]	Leaburg	fing.	08/23/85		74.0	193,870	MFk-1 Uillamette River	--
1985	Skamania R.	McKenzie	fing.	12/16/85	--	28.1	4,918	MFk-1 Uillamette River	AD
1985	Skamania R.	McKenzie	smolt	04/28/86	--	4.8	18,959	MFk-1 Uillamette River	AD

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Middle Fork subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Fin	Code/ Clip
1985	Skamania R.	McKenzie	smolt	04/28/86	--	5.0	8,590	MFk-1 Uillamette River	AD	
1985	Skamania R.	McKenzie	smolt	04/28/86	--	5.1	10,201	MFk-1 Uillamette River	AD	
	Skamania	Unknown	fing.	01/01/86	12/31/86[c]	--	140,676	Middle Fork	--	
1986	McKenzie R.[d]	Leaburg	fing.	10/08/86	--	26.6	30,057	MFk-1 Uillamette River	--	
1986	McKenzie R.[d]	Leaburg	fing.	08/19/86	--	78.8	88,871	MFk-1 Uillamette River	--	
1986	McKenzie R.[d]	Leaburg	fing.	08/18/86	08/19/86	79.4	108,200	MFk-1 Uillamette River	--	
--	Skamania	McKenzie	smolt	01/01/87	12/31/87[c]	--	13,355	Pengra	--	
--	Skamania	McKenzie	smolt	01/01/87	12/31/87[c]	--	6,732	Tripp	--	
--	Skamania	McKenzie	smolt	01/01/87	12/31/87[c]	--	19,838	Jasper	--	
1987	McKenzie R.[d]	Leaburg	smolt	05/02/88	--	4.1	1,501	MFk-1 Willamette River	AD	
1987	McKenzie R.[d]	Leaburg	smolt	04/11/88	--	4.4	6,000	MFk-1 Uillamette River	--	
1987	McKenzie R.[d]	McKenzie	smolt	04/11/88	--	4.2	12,201	MFk-1 Uillamette River	--	
1987	McKenzie R.[d]	McKenzie	smolt	04/11/88	--	4.2	27,950	MFk-1 Uillamette River	AD	
1987	Skamania R.	McKenzie	smolt	04/11/88	--	5.4	12,015	MFk-1 Uillamette River	AD	
1988	McKenzie R.[d]	Leaburg	fing.	10/17/88	--	18.3	39,161	MFk-1 Uillamette River	--	
1988	McKenzie R.[d]	Leaburg	fing.	08/18/88	--	98:0	35,474	MFk-1 Uillamette River	--	
1988	McKenzie R.[d]	McKenzie	fing.	01/04/89	--	18.2	3,630	MFk-1 Uillamette River	--	
1988	McKenzie R.[d]	McKenzie	smolt	04/12/89	--	5.3	17,755	MFk-1 Uillamette River	AD	
1988	McKenzie R.[d]	McKenzie	smolt	04/12/89	--	5.5	14,135	MFk-1 Uillamette River	AD	
1988	McKenzie R.[d]	McKenzie	smolt	04/12/89	--	5.7	22,141	MFk-1 Uillamette River	AD	
1988	McKenzie R.[d]	McKenzie	smolt	04/12/89	--	5.8	6,003	MFk-1 Uillamette River	AD	
1989	McKenzie R.[d]	Leaburg	fing.	12/15/89	--	23:0	1,436	Dexter Reservoir	--	
1989	McKenzie R.[d]	Leaburg	fing.	12/15/89		23.0	1,435	Dexter Reservoir	AD	
1989	McKenzie R.[d]	Leaburg	fing.	09/18/89	--	51.4	47,796	Dexter Reservoir	--	
1989	McKenzie R.[d]	Leaburg	smolt	04/19/90	05/01/90	4.6	23,803	MFk-1 Willamette River	AD	
1989	McKenzie R.[d]	McKenzie	slilolt	04/16/90	--	5.2	17,253	MFk-1 Uillamette River	AD	
1989	McKenzie R.[d]	McKenzie	smolt	04/16/90	--	5.3	19,027	MFk-1 Willamette River	AD	
1989	McKenzie R.[d]	McKenzie	smolt	04/16/90	--	5.4	5,184	MFk-1 Willamette River	AD	
1990	Skamania R.	McKenzie	fing.	12/12/90	--	22:o	10,905	MFk-1 Willamette River	AD	
1990	McKenzie R.[d]	Leaburg	snlolt	04/16/91	--	5.1	10,746	MFk-1 Willamette River	AD	
1990	McKenzie R.[d]	McKenzie	snlolt	04/15/91		4.5	19,647	MFk-1 Willamette River	AD	
1990	McKenzie R.[d]	McKenzie	smolt	04/15/91	--	4.6	21,435	MFk-1 Uillamette River	AD	
1990	McKenzie R.[d]	McKenzie	smolt	04/15/91	--	4.7	19,112	MFk-1 Willamette River	AD	
1990	McKenzie R.[d]	McKenzie	smolt	04/15/91		4.8	7,968	MFk-1 Willamette River	AD	
1990	Skamania R.	McKenzie	smolt	12/12/90	--	11.6	8,511	MFk-1 Willamette River	AD	

[a] Modified form Oregon Department of Fish and Wildlife (1990); and Oregon Department of Fish and Wildlife's hatchery production database.

(cont.)

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Middle Fork subbasin by brood year and, if marked, coded wire tag code'.

b D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follow in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

c Month(s) and day(s) of release unknown; standardized to the first and last day of the year.

d McKenzie Fish Hatchery stock; derived from Skamania River stock, and also called Skamania stock.

Table 2 (AC-a). Age composition (freshwater.ocean) by run year for hatchery summer steelhead released in the Middle Fork subbasin[a].

	Run Year	Age Composition (%) X.1	X.2	X.3	X.4
	1984[b]	3	97	0	--
	N	10	302	0	--
st.	dev.	--	--	--	--
	1984=	0	88	12	--
	N	0	7	1	--
st.	dev.	--	--	--	--

[a] Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990.
[b] Sampled at Dexter Dam.
[c] Sampled at Fall Creek Dam.

Table 3 (TD). Parasites and diseases of juvenile summer steelhead at hatcheries located in the Middle Fork Willamette subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Willamette	*Epistylis sp.*

[a] Data are from Oregon Department of Fish and Wildlife (unpublished data).

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Middle Fork). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

MIDDLE FORK SUBBASIN

Naturally Produced Winter Steelhead

GEOGRAPHIC LOCATION

The Middle Fork of the Willamette River originates on the west slope of the Cascade Mountains and flows approximately 84 miles to the northwest, where it joins the Coast Fork to form the Willamette River (Oregon Department of Fish and Wildlife 1990; see MAINSTEM WILLAMETTE RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). The Middle Fork subbasin drains 1,350 square miles of Lane and Douglas counties, and is composed of "about 1,460 perennial streams that stretch for 1,910 stream miles" (State Water Resources Board 1961, cited by Oregon Department of Fish and Wildlife 1990).

ORIGIN

Winter steelhead are native to the Willamette River Basin (Howell et al. 1985) but it is unknown whether or not the Middle Fork subbasin supported a native run (Oregon Department of Fish and Wildlife 1990). Winter steelhead were observed in the mainstem and the North Fork of the Middle Fork in 1944, indicating their historical presence in the subbasin (Dimick and Merryfield 1945, cited by Oregon Department of Fish and Wildlife 1990). However, Wood and Wallis (undated) report that there were no winter steelhead in the subbasin until 1956, after the introduction of hatchery winter steelhead (see MIDDLE FORK SUBBASIN, Hatchery Produced Winter Steelhead).

DISTRIBUTION

Subbasin

Upon completion of Fall Creek Dam in 1965 a program was implemented to transport naturally produced winter steelhead above the dam in order to sustain natural production in spawning and rearing habitat located above the dam (Oregon Department of Fish and Wildlife 1990). The program allows the temporal distribution of spawning to remain similar to the distribution established in the 1950's (Oregon Department of Fish and Wildlife 1990). The area above Fall Creek Dam is managed exclusively for natural production (Howell et al. 1985). Hatchery fish are not trucked above the dam but are allowed to spawn in areas below the dam. There are an estimated 97.7 miles of potential habitat considered suitable for spawning and rearing in the Middle Fork subbasin (Tables 1 and 2). The habitat is primarily rated as "good" and "excellent" quality (Tables 1 and 2).

Spawning has been reported in the mainstem of the Middle Fork below Dexter Dam and in Fall Creek below Fall Creek Dam (Hutchison et al. 1966, cited by Oregon Department of Fish and Wildlife 1990); in Fall and Winberry creeks, above Fall Creek Dam (Fulton 1970, cited by Oregon Department of Fish and Wildlife 1990); and in Little Fall, Hills, and Lost creeks (Howell et al. 1985). Spawning may also occur in Wallace, Rattlesnake, Sturdy, Portland, and North Fall creeks, and the North and South forks of Winberry Creek (Oregon Department of Fish and Wildlife 1990). In recent years, the winter steelhead run has been declining, probably as a result of problems with downstream passage of juveniles at Fall Creek Dam (Oregon Department of Fish and Wildlife 1990).

Approximations of the temporal distribution of adult immigration, adult holding, spawning,

incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildhfe (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced fish are not available, run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1989, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Winter steelhead are observed in the Middle Fork as early as February and as late as mid-June with peak migration to Fall Creek Dam occurring in April (Oregon Department of Fish and Wildlife 1990). No stock specific estimates of run timing for naturally produced winter steelhead are available.

Numbers: Although brood year specific estimates of escapement for naturally produced winter steelhead are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Hutchison et al. (1988, cited by Oregon Department of Fish and Wildlife 1990).

Spawning Area

Timing: Winter steelhead spawn from mid-April through May (Oregon Department of Fish and Wildlife 1990). Spawning may, however, commence as early as mid-March (Hutchison and Aney 1964, cited by Oregon Department of Fish and Wildlife 1990). No stock specific estimates of the temporal distribution of spawning are available for either naturally or hatchery produced winter steelhead.

Fork Length

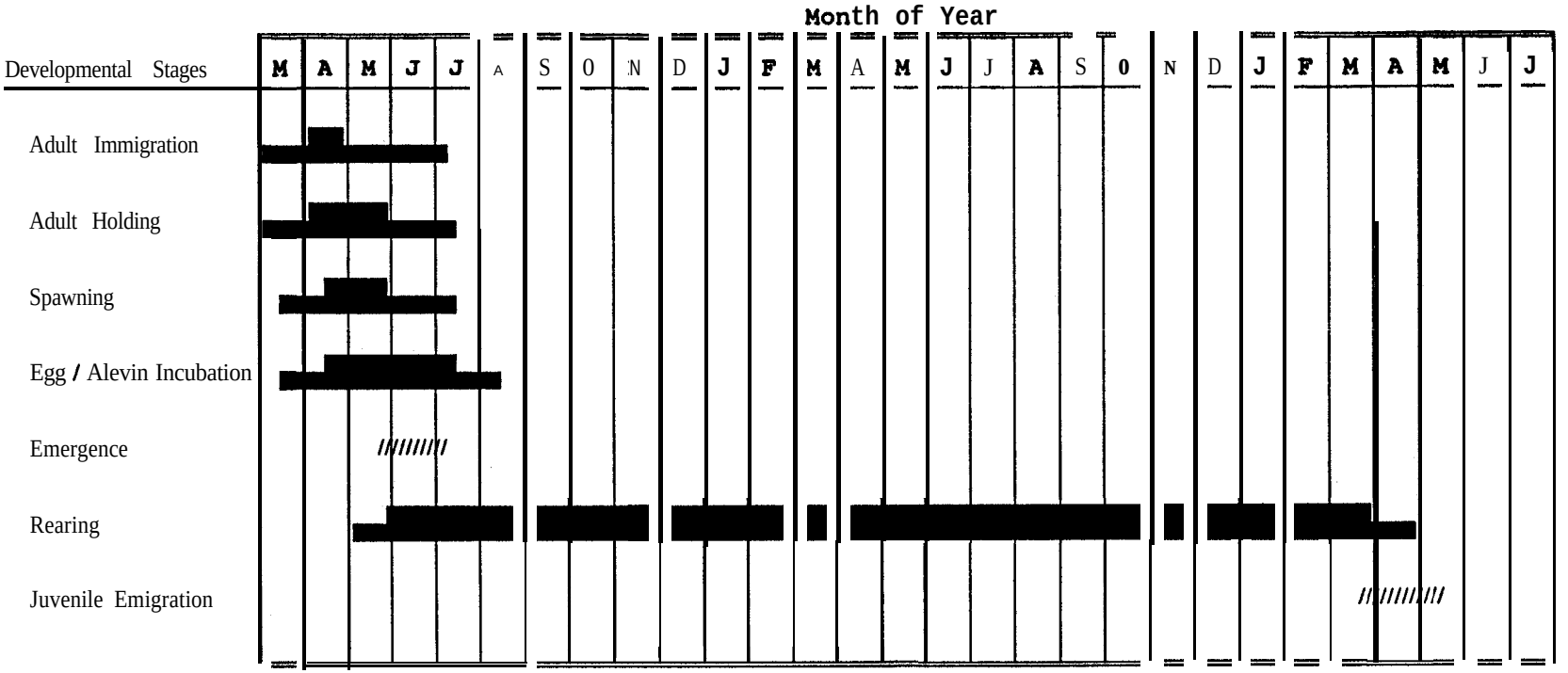
Although brood year specific estimates of fork length for naturally produced winter steelhead are not available; run year specific estimates for combined samples of naturally and hatchery produced fish are available in Wood and Wallis (undated, cited by Oregon Department of Fish and Wildlife 1990).

Age Structure

Although brood year specific estimates of age structure for naturally produced winter steelhead are not available, data derived from samples collected from naturally and hatchery produced fish returning in the-1962-63 run years are available in DeCew (1969, cited by Oregon Department of Fish and Wildlife 1990).

Sex Ratio

Although brood year specific estimates of sex ratio for naturally produced winter steelhead are not available, data for combined samples of naturally and hatchery produced fish returning in 1988 are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.
3. Hatched bars indicate inferred timing.

Figure 1 (TT). Wild **Willamette** winter steelhead freshwater **life history in the Middle Fork River subbasin (Oregon Department of Fish and Wildlife 1990).**

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Middle Fork subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	32.4	49.5	18.1	0.0	--	97.7	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Middle Fork subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by man.

REFERENCES

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MIDDLE FORK SUBBASIN

Hatchery Produced Winter Steelhead

ORIGIN

Hatchery winter steelhead were released into the subbasin beginning in 1953 to establish a self-sustaining run and create a sport fishery in the subbasin (Oregon Department of Fish and Wildlife 1990). All of the winter steelhead released in the Middle Fork subbasin have been Willatnette hatchery stock (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Hatchery winter steelhead are released at various locations including lower Fall Creek and Fall Creek Reservoir and Lost and Hills creeks (‘Table 1). Returning adult winter steelhead contribute to the naturally spawning population in the subbasin (see MIDDLE. FORK SUBBASIN, Naturally Produced Winter Steelhead, DISTRIBUTION, Subbasm)

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

There are no records of releases in the subbasin.

Fingerling

Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Willamette, South Santiam, and Marion Forks hatcheries (Table 1). Annual numbers released ranged from 19,899 to 617,711 fish (Table 1). Size at release ranged from 71.1 to 15.4 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Willamette, Marion Forks, and South Santiam hatcheries (Table 1). Annual numbers released ranged from 2,925 to 122,295 fish (Table 1). Size at release ranged from 12.1 to 6.5 fish per pound (Table 1).

Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery produced winter steelhead are not available, run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1989, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Winter steelhead are observed in the Middle Fork as early as February and as late as mid-June with peak migration to Fall Creek Dam occurring in April (Oregon Department of Fish and Wildlife 1990). No stock specific estimates of run timing for hatchery produced winter steelhead are available.

Numbers: Although brood year specific estimates of escapement for hatchery produced winter steelhead are not available, run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Hutchison et al. (1988, cited by Oregon Department of Fish and Wildlife 1990).

Fork Length

Although brood year specific estimates of fork length for hatchery produced winter steelhead are not available, run year specific estimates for combined samples of naturally and hatchery produced fish are available in Wood and Wallis (undated, cited by Oregon Department of Fish and Wildlife 1990).

Age Structure

Although brood year specific estimates of age structure for hatchery produced winter steelhead are not available, data derived from samples collected from naturally and hatchery produced fish returning in the 1962-63 run years are available in DeCew (1969, cited by Oregon Department of Fish and Wildlife 1990).

Ratio

Although brood year specific estimates of sex ratio for hatchery produced winter steelhead are not available, data for combined samples of naturally and hatchery produced fish returning in 1988 are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile winter steelhead for subbasin hatchery production (Table 2). Parasites include *Epistylis sp.*, Costia *(Zchthyobodo sp.)*, and gill amoeba. Bacterial diseases include *Ichthyophthirius sp.* (ICH) and *Cytophaga psychrophila* (cold water

disease). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see SANTIAM RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES.

Table 1 (TR). Hatchery winter steelhead releases into the Middle Fork subbasin by broodyear and, if marked, coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
--	Willamette	Uillamette	fing.	01/01/54	12/31/54[d]		617,711	Below Dexter	--
—	Willamette	Willamette	fing.	01/01/55	12/31/55[d]		198,893	Below Dexter	--
--	Willamette	Willamette	smolt	01/01/54	12/31/54[d]		40,762	Below Dexter	--
--	Uillamette	Uillamette	smolt	01/01/54	12/31/54[d]		57,678	Jasper	--
--	Uillamette	Uillamette	fing.	01/01/56	12/31/56[d]	--	363,025	Below Dexter	--
--	Uillamette	Uillamette	fing.	01/01/57	12/31/57[d]		140,022	Below Dexter	--
--	Uillamette	Willamette	fins.	01/01/57	12/31/57[d]		40,497	Lookout Point Reservoir	--
--	Uillamette	Uillamette	fing.	01/01/57	12/31/57[d]	--	75,754	Below Dexter	--
--	Uillamette	Willamette	fing.	01/01/58	12/31/58[d]		219,611	Below Dexter	--
--	Willamette	Willamette	fing.	01/01/58	12/31/58[d]	--	52,550	Lookout Point Reservoir	--
--	Willamette	Uillamette	fing.	01/01/59	12/31/59[d]		344,352	Below Dexter	--
--	Uillamette	Willamette	fing.	01/01/60	12/31/60[d]		99,597	Below Dexter	--
--	Uillamette	Willamette	smolt	01/01/61	12/31/61[d]	--	122,295	Below Dexter	--
--	Uillamette	Uillamette	fing.	01/01/66	12/31/66[d]		68,780	Fall Creek	--
--	Uillamette	Marion Forks	smolt	01/01/67	12/31/67[d]		10,000	Fall Creek	--
--	Uillamette	Marion Forks	smolt	01/01/69	12/31/69[d]		3,475	Fall Creek	--
--	Uillamette	South Santiam	fing.	01/01/72	12/31/72[d]		60,433	Lookout Point Reservoir	--
--	Uillamette	Marion Forks	fing.	01/01/75	12/31/75[d]		59,850	Lookout Point Reservoir	--
--	Uillamette	Marion Forks	fins.	01/01/83	12/31/83[d]	--	33,000	Below Dexter	--
1981	N. Santiam R.	Marion Forks	smolt	04/25/83	--	12.1	2,419	Hills Creek	--
1981	N. Santiam R.	Marion Forks	smolt	04/25/83	--	12.1	4,114	Lost Creek	--
1986	N. Santiam R.	Marion Forks	fing.	06/04/87	--	32.0	18,865	Fall Creek (Lower)	--
1986	N. Santiam R.	Marion Forks	fing.	06/04/87	--	37.7	17,699	Fall Creek (Lower)	--
1986	N. Santiam R.	Marion Forks	fing.	05/28/87	--	32.3	32,268	Hills Creek	--
1986	N. Santiam R.	Marion Forks	fing.	06/05/87	--	15.4	10,303	Lost Creek	--
1986	N. Santiam R.	Marion Forks	fing.	06/05/87	--	55.3	37,021	Lost Creek	--
1987	N. Santiam R.	Marion Forks	fing.	06/09/88	--	24.0	10,317	Hills Creek	--
1987	N. Santiam R.	Marion Forks	fing.	06/09/88	--	57.7	23,075	Lost Creek	--
1988	N. Santiam R.	Marion Forks	fing.	12/07/88	--	66.9	20,060	Fall Creek (Lower)	--
1988	N. Santiam R.	Marion Forks	fing.	12/07/88	--	71.1	14,931	Fall Creek (Lower)	--
1988	N. Santiam R.	Marion Forks	fing.	12/07/88	--	66.9	20,070	Hills Creek	--
1988	N. Santiam R.	Marion Forks	fing.	12/07/88	--	71.1	14,931	Hills Creek	--
1988	N. Santiam R.	Marion Forks	fing.	12/07/88	--	64.5	29,020	Lost Creek	—
1989	N. Santiam R.	Marion Forks	fing.	07/25/90	--	28.4	12,957	Fall Creek Reservoir	RV
1989	N. Santiam R.	Marion Forks	fing.	07/25/90	--	29.2	24,486	Fall Creek Reservoir	RV
1989	N. Santiam R.	Marion Forks	smolt	10/17/90	--	6.5	2,925	Fall Creek Reservoir	LV
1990	N. Santiam R.	Marion Forks	fins.	08/21/91	--	29.7	10,984	Fall Creek	AD-LM
1990	N. Santiam R.	Marion Forks	fing.	08/21/91	--	29.7	8,905	Fall Creek (Lower)	AD-LM

(cont.)

Table 1 (TR). (cont.) Hatchery winter steelhead releases into the Middle Fork subbasin by broodyear and, if marked, coded wire tag code'.

[a] Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990); and Oregon Department of Fish and Wildlife's hatchery production database.

[b] North Santiam River stock is part of the Uillamette River stock.

[c] D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown): AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand: CB = cold brand. For cold brands. the location of the b&d follows in parentheses, and the content, if known, is listed after a colon. Cold'brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

[d] Month(s) and day(s) of release unknown; standardized to the first and last day of the year.

Table 2 (TD). Parasites and diseases of juvenile winter steelhead at hatcheries located in the Middle Fork subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Willamette	**blood flukes**
Parasite	Willamette	*Gyrodactylus*
Parasite	Willamette	**Costia** *(Ichthyobodo sp.)*
Parasite	Willamette	**Gill amoeba**
Parasite	Willamette	*Epistylis sp.*
Parasite	Willamette	*Trichodina spp.*
Bacteria	Willamette	*Ichthyophthirius sp.* **(ICH)**
Bacteria	Willamette	**Coldwater disease** *(Cytophaga psychrophila)*

[a] Data are from Oregon Department of Fish and Wildlife (unpublished data).

REFERENCES

DeCew, M.G. 1969. The Marion Forks Hatchery steelhead trout rearing program and life history study of adult steelhead returning to Minto Pond. Fish Commission of Oregon, Clackamas, Oregon. (Unpublished Manuscript.)

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Oregon Department of Fish and Wildlife. 1989. Oregon salmon and steelhead catch data, 1975-86. Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990).

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Wood, J., and J. Wallis. Undated. Middle Willamette River steelhead run - 1957. Oregon State Game Commission, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990).

SANDY RIVER SUBBASIN

Naturally Produced Spring Chinook Salmon

GEOGRAPHIC LOCATION

The Sandy River originates in the Reid, Sandy, and Zigzag glaciers on the west slope of Mt. Hood, and flows into the Columbia River at River Mile (RM) 120.5 (Figure 1). Major tributaries of the Sandy River include the Bull Run, Zigzag and Salmon rivers. The Sandy River subbasin drains an area of 508 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

The Sandy River subbasin is believed to have supported a large run of native spring chinook prior to construction of Marmot Dam. The current size of the native run is considerably smaller than in the past (Oregon Department of Fish and Wildlife 1990). Natural production also occurs as a result hatchery fish spawning in the subbasin (see SANDY RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon). The proportions of hatchery and wild fish in the run are unknown (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Spring chinook spawn in the mainstem Sandy River above Cedar Creek, the Salmon and Zigzag rivers, and Still, Clear, and Lost creeks. Spawning also occurs in the lower reaches of the Bull Run and Little Sandy rivers, and in the Clear and Muddy forks of the mainstem Sandy River (Oregon Department of Fish and Wildlife 1990). The construction of Marmot Dam on the Sandy River, Bull Run Powerhouse on the Bull Run River, and dams which formed the Bull Run reservoirs in the Bull Run River drainage have resulted in altered stream flows and a subsequent degradation of habitat quality (Oregon Department of Fish and Wildlife 1990). Available spawning and rearing habitat in the Sandy River subbasin is rated as "excellent", "good", and "fair" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, and spawning were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 2. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced spring chinook are not available, estimates by run year for the combined sport

harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Although information on the run timing of naturally produced spring chinook is not available, information on run timing for the combined run of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Numbers: Although brood year specific estimates of run size for naturally produced spring chinook are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

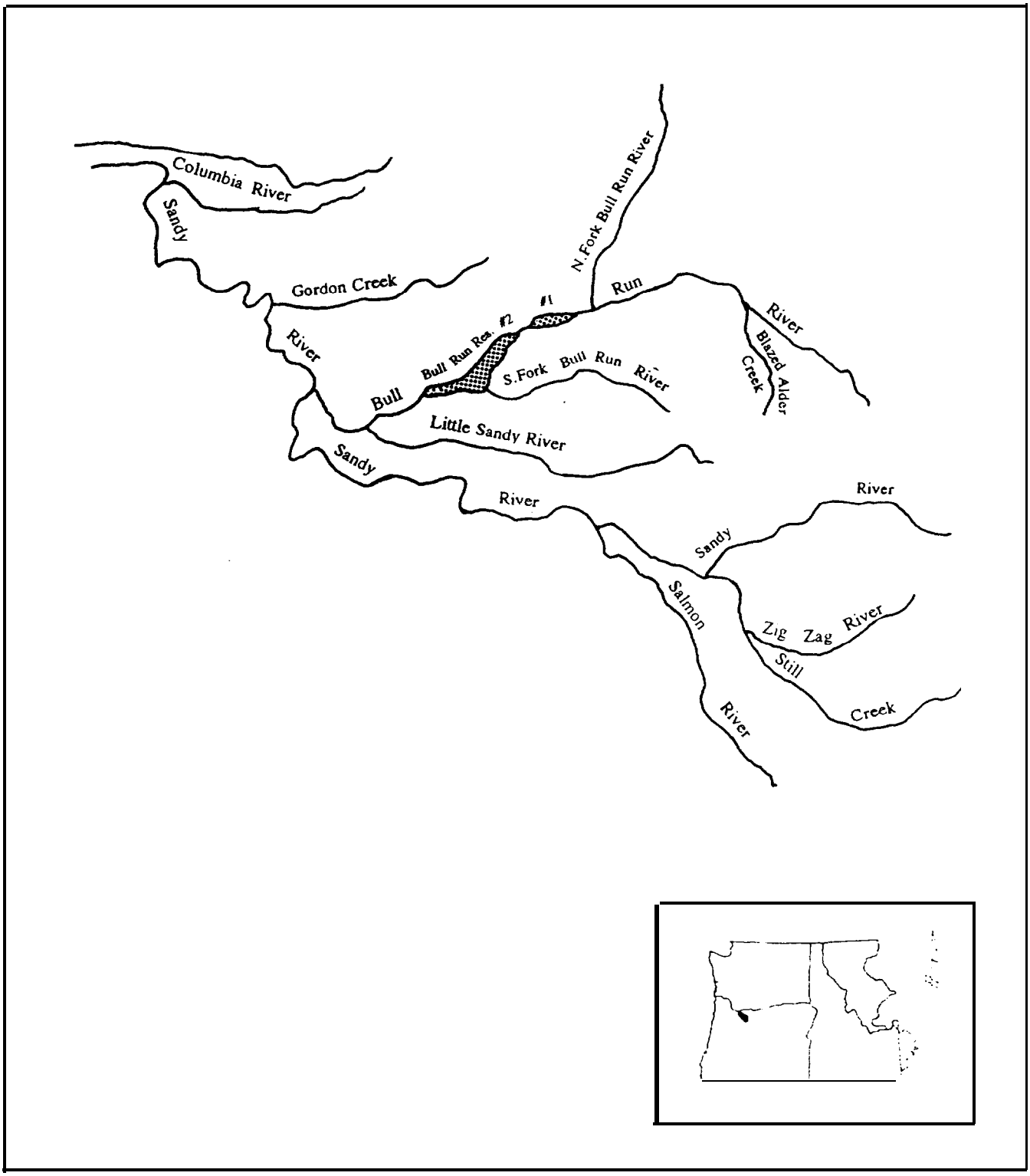
spawning Area

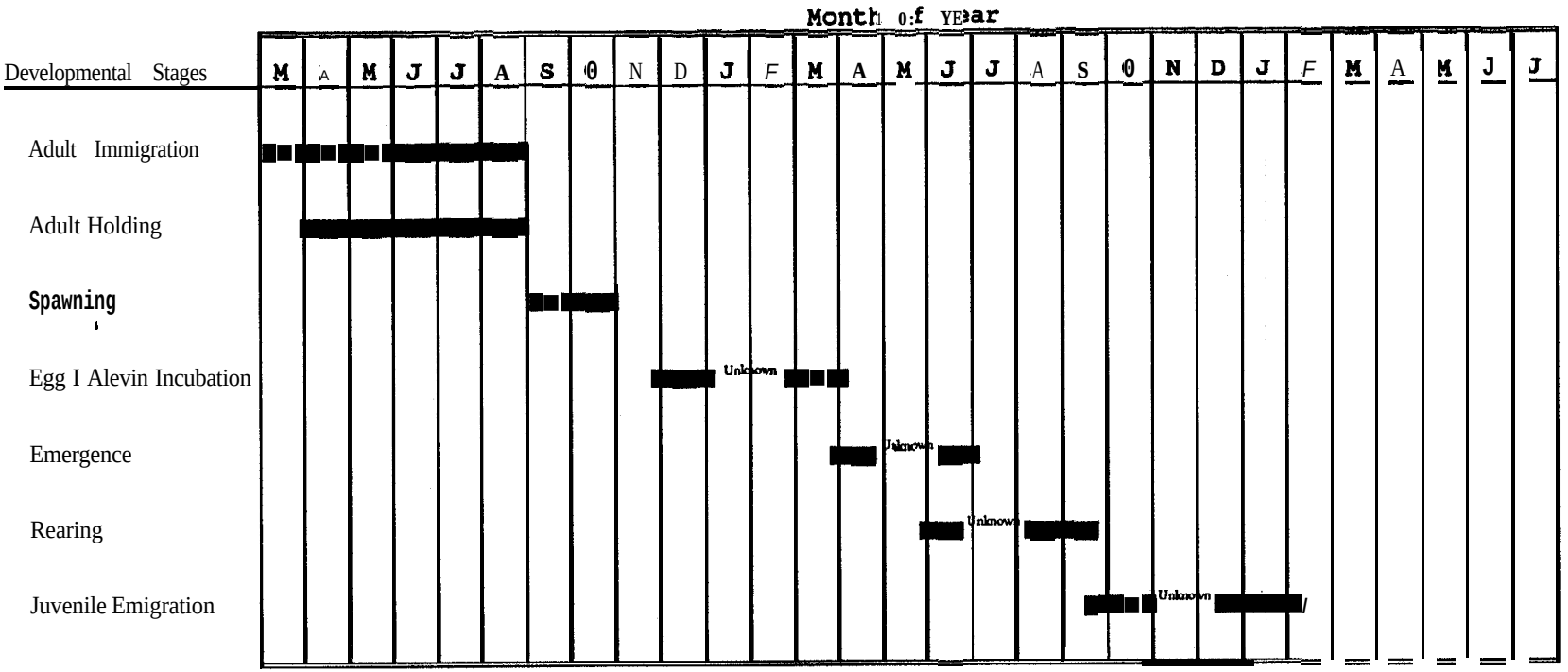
Numbers: Although brood year specific estimates of spawner escapement for naturally produced spring chinook are not available, estimates by run year for the combined spawner escapement of wild and hatchery produced fish are available in Portland General Electric (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Strays

Coded wire tagged hatchery spring chinook, released as juveniles in the Grande Ronde River subbasin, were recovered in the Sandy River subbasin (Table 3).

Figure 1. The Sandy River subbasin.





Notes:

. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.
3. Source: ODFW catch data, Marmot Dam counts, Howell et al. 1985.
4. Some life history stages were unknown for subbasin specific spring chinook; Willamette stock timing approximates these stages.

Figure 2 (TT). Spring chinook freshwater life history in the Sandy River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Sandy River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	35.8	30.7	32.7	0.8	--	62.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Sandy River subbasin spring chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	65.1	34.9	0.0	0.0	--	21.2	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (AI). Non-harvest recoveries of coded wire tagged hatchery spring chinook salmon in the Sandy River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	*Recovery* Method	Number Recovered	Total Number Estimated, (PSMFC)
Grande Ronde R.	Sandy River 1986	Hatchery Returns --	1	1

[a] Based on the following tag codes: 07-30-02.
[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Sandy River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

SANDY RIVER SUBBASIN

Hatchery Produced Spring Chinook Salmon

ORIGIN

Hatchery spring chinook were released in the Sandy River subbasin, in small numbers, as early as the 1940's and 1950's. These first hatchery releases were from Sandy Hatchery, which collected hatchery broodstock below Marmot Dam, from 1938-55, and on Cedar Creek, starting in 1955 (Oregon Department of Fish and Wildlife 1990; Wallis 1966, cited by Oregon Department of Fish and Wildlife 1990). Since the mid-1960's, Willamette stock has been the main stock used for purposes of hatchery supplementation, although Carson stock has also been used on occasion (Oregon Department of Fish and Wildlife 1990).

Eggs from spring chinook collected below Marmot Dam from 1938-55 were often used at rearing facilities in the Willamette (Wallis 1966, cited by Oregon Department of Fish and Wildlife 1990).

The hatchery supplementation program was implemented to 1) mitigate for lost subbasin production resulting from the construction of Bull Run Powerhouse and dams which formed the Bull Run reservoirs, 2) to provide increased recreational fishing opportunities, and 3) supplement the natural spawning population (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Fingerlings and smolts have been released into various tributaries of the Sandy River subbasin (Table 1). In general, fingerlings have been released in the spring and smolts have been released in the fall (Oregon Department of Fish and Wildlife 1990; Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which fry were reared or acclimated prior to release in the subbasin include Marion Forks, Oxbow, and Willamette hatcheries, and Eagle Creek National Fish Hatchery (Table 1). Annual numbers released ranged from 130,707 to 258,629 fish (Table 1). Size at release ranged from 447.0 to 131 .O fish per pound (Table 1).

Fingerling

The only hatchery facility in which fingerlings were reared or acclimated prior to release in the subbasin was Willamette Hatchery (Table 1). In 1973, 644,110 smolts were released into the Salmon River and Still Creek (Table 1). Size at release was 515 fish per pound

(Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Eagle Creek and Carson National Fish hatcheries, and Clackamas, Dexter, and Willamette hatcheries (Table 1). Annual numbers released ranged from 8,800 to 460,386 fish (Table 1). Size at release ranged from 17.5 to 4.5 fish per pound (Table 1).

Jack and Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery spring chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Although information on the run timing of hatchery spring chinook is not available, information on run timing for the combined run of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Numbers: Although brood year specific estimates of run size for hatchery spring chinook are not available, estimates by run year are available for the combined escapement of naturally and hatchery produced fish in Oregon Department of Fish and Wildlife (1990).

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile spring chinook for subbasin hatchery production (Table 2). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see CLACKAMAS RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES; see McKENZIE RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES; and see SANTIAM RIVER SUBBASIN, Hatchery Produced Spring Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery releases of spring chinook salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1972	Willamette	Uillamette	fing.	05/01/73	--	515.0	334,150	Salmon R.	--
1972	Uillamtte	Willamette	fing.	05/02/73	--	515.0	309,360	Still Cr.	--
1972	Uillamette	Eagle Cr NFH	smolt	10/23/73	--	8.8	8,800	Bridge above Green Canyon	--
1972	Uillamette	Eagle Cr NFH	smolt	02/14/74	--	4.5	19,742	Bridge above Green Canyon	--
1972	Uillamette	Eagle Cr NFH	smolt	02/14/74	--	5.9	8,943	Lewis and Clark Park	--
1973	Uillamette	Uillamette	smolt	--	--	12.8	51,200	Salmon R.	--
1974	Uillamette	Willamette	smolt	04/12/76	04/14/76	11.8	61,295	Marmot	--
1974	Uillamette	Uillamette	smolt	05/17/76	05/24/76	9.0	8,910	Marmot	--
1975	Carson	Carson	smolt	05/09/77	--	15.6	90,480	Dodge Park	--
1975	Carson	Carson	smolt	05/09/77	--	15.0	46,650	Revenue Br.	--
1975	Carson	Carson	smolt	--	--	--	49,663	Revenue Br.	--
1975	Carson	Carson	smolt	--	--	17.5	93,620	Salmon River	--
1976	Carson	Carson	smolt	03/22/78	--	9.7	57,861	Bridge above Green Canyon	--
1977	Uillamtte	Eagle Cr NFH	smolt	04/25/79	04/30/79	15.3	304,919	Salmon R.	--
1977	Uillamette	Uillamette	smolt	04/20/79	--	14.5	42,775	Bridge above Green Canyon	--
1978	Uillamatte	Uillamtte	smolt	11/14/79	--	7.2	23,190	Salmon R. Retaining Wall	--
1978	Uillamette	Uillamtte	smolt	11/14/79	11/15/79	7.2	76,507	Bridge above Green Canyon	--
1979	Eagle Cr.	Clackamas	smolt	11/03/80	11/04/80	9.9	100,397	Salmon River	--
1979	Eagle Cr.	Clackamas	smolt	11/05/80	--	8.2	69,168	Sandy River	--
1979	Eagle Cr.	Clackamas	smolt	11/04/80	--	8.9	9,790	Sandy River	--
1979	Eagle Cr.	Clackamas	smolt	11/03/80	11/04/80	9.9	21,038	Sandy River	--
1979	Willamette[c]	Clackamas	smolt	03/13/81	03/25/81	13.8	4,985	Sandy River	--
1980	Eagle Cr.	Clackamas	smolt	10/14/81	--	9.0	8,541	Salmon River	--
1980	Eagle Cr.	Clackamas	smolt	10/15/81	--	9.3	32,076	Salmon River	--
1980	Eagle Cr.	Clackamas	smolt	10/14/81	--	10.1	30,083	Salmon River	--
1980	Eagle Cr.	Clackamas	smolt	10/14/81		10.7	30,475	Salmon River	--
1980	Eagle Cr.	Clackamas	smolt	10/13/81	--	7.6	6,832	Sandy River	--
1980	Eagle Cr.	Clackamas	smolt	10/13/81	10/15/81	8.9	34,380	Sandy River	--
1980	Eagle Cr.	Clackamas	smolt	10/13/81	10/14/81	9.9	29,423	Sandy River	--
1980	Eagle Cr.	Clackamas	smolt	10/13/81	--	10.0	28,590	Sandy River	--
1981	MFk Will.[d]	Clackamas	smolt	11/05/82		6.3	22,661	Salmon River	--
1981	MFk Will.[d]	Clackamas	smolt	11/05/82	--	6.4	6,400	Salmon River	--
1981	MFk Will.[d]	Clackamas	smolt	11/05/82	--	6.5	34,034	Salmon River	--
1981	MFk Will.[d]	Clackamas	smolt	11/04/82		6.8	8,150	Salmon River	--
1981	MFk Will.[d]	Clackamas	smolt	11/04/82	11/05/82	6.9	21,942	Salmon River	--
1981	MFk Will.[d]	Clackamas	smolt	11/04/82	--	7.2	6,758	Salmon River	--
1981	MFk Will.[d]	Clackamas	smolt	11/03/82	11/04/82	7.0	42,175	Sandy River	--
1981	MFk Will.[d]	Clackamas	smolt	11/04/82	--	7.1	57,779	Sandy River	--
1982	MFk Will.[d]	Marion Forks	fry	06/01/83		427:0	215,435	Sandy River	--

Table 1 (TR). (cont.) Hatchery releases of spring chinook salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1982	MFk Will.[d]	Clackamas	smolt	11/08/83	--	5.0	6,275	Salmon River	--
1982	MFK Will.[d]	Clackames	smolt	11/08/83	11/09/83	5.2	86,594	Salmon River	--
1982	MFk Will.[d]	Clackamas	smolt	11/08/83	--	5.5	6,745	Salmon River	--
1982	MFk Will.[d]	Clackamas	smolt	11/09/83		4.8	9,196	Sandy River	--
1982	MFk Will.[d]	Clackames	smolt	11/07/83	--	5.1	16,423	Sandy River	--
1982	MFk Will.[d]	Clackames	smolt	11/07/83	11/08/83	5.2	36,248	Sandy River	--
1982	MFk Will.[d]	Clackamas	smolt	11/07/83	--	5.4	5,708	Sandy River	--
1982	MFk Will.[d]	Clackames	smolt	11/07/83	--	5.5	30,579	Sandy River	--
1982	MFk Will.[d]	Clackames	smolt	11/07/83	--	5.6	6,086	Sandy River	--
1982	MFk Will.[d]	Clackames	smolt	11/07/83	--	5.7	4,820	Sandy River	--
1983	MFk Will.[d]	Marion Forks	fry	05/01/84		447:o	176,873	Sandy River	--
1983	Clackamas R.	Eagle Creek	fry	07/02/84	--	131.8	54,170	Still Creek	--
1983	MFk Will.[d]	Clackamas	smolt	11/06/84	--	7.7	49,158	Salmon River	--
1983	MFk Will.[d]	Clackamas	smolt	11/05/84	--	8.0	24,930	Salmon River	--
1983	MFk Will.[d]	Clackamas	smolt	11/05/84	11/06/84	8.1	51,552	Salmon River	--
1983	MFk Will.[d]	Clackamas	smolt	11/05/84	--	8.4	25,427	Salmon River	--
1983	MFk Will.[d]	Clackames	smolt	11/05/84		8.0	19,160	Still Creek	--
1983	MFk Will.[d]	Clackamas	smolt	11/05/84	--	8.1	9,543	Still Creek	--
1983	MFk Will.[d]	Clackames	smolt	11/05/84	--	8.2	20,125	Still Creek	--
1984	Clackamas R.	Oxbow (Herman)	fry	04/19/85	--	141.0	130,707	Sandy River	--
1984	Eagle Cr.	Clackames	smolt	10/17/85	--	8.2	20,449	gig Creek	--
1984	Eagle Cr.	Clackames	smolt	10/15/85	--	7.9	26,099	Salmon River	--
1984	Eagle Cr.	Clackamas	smolt	10/16/85	--	8.2	50,913	Salmon River	--
1984	Eagle Cr.	Clackamas	smolt	10/15/85	10/16/85	8.3	52,479	Salmon River	--
1984	Eagle Cr.	Clackamas	smolt	10/16/85	--	8.2	17,836	Still Creek	--
1984	Eagle Cr.	Clackamas	smolt	10/16/85	_	8.3	6,298	Still Creek	--
1984	Eagle Cr.	Clackames	smolt	10/15/85	--	8.4	8,385	Still Creek	--
1984	Eagle Cr.	Clackamas	smolt	10/15/85	--	8.5	8,560	Still Creek	--
1984	Eagle Cr.	Clackames	smolt	10/15/85	--	8.8	9,836	Still Creek	--
1985	S Santiam R.	Willamette	fry	06/12/86	--	186.0	200,830	Sandy River	--
1985	Eagle Cr.	Clackamas	smolt	11/10/86	--	9.3	32,995	Salmon River	--
1985	Eagle Cr.	Clackamas	smolt	11/10/86	--	9.4	33,790	Salmon River	--
1985	Eagle Cr.	Clackamas	smolt	11/10/86	--	9.6	33,118	Salmon River	--
1985	Eagle Cr.	Clackames	smolt	10/29/86	--	9.8	34,819	Salmon River	--
1985	Eagle Cr.	Clackames	smolt	10/29/86		10.3	34,970	Salmon River	--
1985	Eagle Cr.	Clackamas	smolt	10/28/86	--	10.4	30,110	Salmon River	--

Table 1 (TR). (cont.) Hatchery releases of spring chinook salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1985	Eagle Cr.	Clackamas	smolt	10/29/86	--	9.0	10,570	Sandy River	--
1985	Eagle Cr.	Clackamss	smolt	10/29/86	--	9.2	11,164	Sandy River	--
1985	Eagle Cr.	Clackames	smolt	10/29/86	10/30/86	9.3	60,958	Sandy River	--
1985	Eagle Cr.	Clackemas	smolt	10/28/86	--	9.4	8,638	Sandy River	--
1985	Eagle Cr.	Clackamas	smolt			9.5	34,560	Sandy River	--
1985	Eagle Cr.	Clackamas	smolt	11/12/86	--	9.7	38,800	Sandy River	--
1985	Eagle Cr.	Clackamas	smolt	10/28/86	--	10.0	10,245	Sandy River	--
1985	Eagle Cr.	Clackamas	smolt	10/28/86	--	10.2	10,389	Sandy River	--
1985	Eagle Cr.	Clackamas	smolt			10.3	25,010	Sandy River	--
1985	Eagle Cr.	Clackamas	smolt	10/28/86	--	10.4	9,038	Sandy River	--
1986	Eagle Cr.	Clackamas	smolt	10/14/87	10/15/87	9.4	21,006	Salmon River	--
1986	Eagle Cr.	Clackamas	smolt	10/14/87	--	9.5	10,975	Salmon River	--
1986	Eagle Cr.	Clackamas	smolt	10/15/87	--	9.6	23,048	Salmon River	--
1986	Eagle Cr.	Clackamas	smolt	10/15/87	--	9.7	8,632	Salmon River	--
1986	Eagle Cr.	Clackemas	smolt	10/15/87	--	9.8	11,760	Salmon River	--
1986	Eagle Cr.	Clackamas	smolt	10/15/87	--	9.9	14,305	Salmon River	--
1986	Eagle Cr.	Clackamas	smolt	10/15/87	--	10.1	11,050	Salmon River	--
1986	Eaale Cr.	Clackamas	smolt	10/14/87	--	a.9	7,110	Sandy River	--
1986	Eagle Cr.	Clackamas	smolt	10/14/87	--	9.2	9,742	Sandy River	--
1986	Eagle Cr.	Clackamas	smolt	10/14/87	--	9.5	28,465	Sandy River	--
1986	Eagle Cr.	Clackamas	smolt	10/14/87	--	9.6	10,828	Sandy River	--
1986	Eagle Cr.	Clackmas	smolt	10/15/87	--	9.7	12,585	Sandy River	--
1986	Eagle Cr.	Clackamas	smolt	10/14/87	--	9.8	17,865	Sandy River	--
1986	Eagle Cr.	Clackamas	smolt	10/14/87	--	9.9	13,157	Sandy River	--
1986	MFk Will.[d]	Dexter Pond	smolt	03/11/88	--	8.7	12,354	Big Creek	--
1986	MFk Will.[d]	Dexter Pond	smolt	03/11/88	--	8.7	30,691	Salmon River	--
1986	MFk Will.[d]	Dexter Pond	smolt			8.9	18,690	Salmon River	--
1986	MFk Will.[d]	Dexter Pond	smolt	03/11/88	--	8.7	31,054	Sandy River	--
1986	MFk Will.[d]	Dexter Pond	smolt	03/10/88	03/11/88	8.9	60,313	Sandy River	--
1987	Eagle Cr.	Clackemas	smolt	03/13/89	--	8.8	26,418	Sal&n River	--
1987	Eagle Cr.	Clackamas	smolt	03/13/89	--	8.8	677	Salmon River	07-46-53[e]
1987	Eagle Cr.	Clackamas	smolt	03/13/89	--	10.1	21,091	Salmon River	--
1987	Eagle Cr.	Clackemas	smolt	03/13/89	--	10.1	540	Salmon River	07-46-53[e]
1987	Eagle Cr.	Clackamas	smolt	09/29/88	--	10.5	32,392	Salmon River	--
1987	Eagle Cr.	Clackmas	smolt			10.7	33,248	Salmon River	--
1987	Eagle Cr.	Clackamas	smolt	09/30/88	09/30/88	10.8	57,706	Salmon River	--
1987	Eagle Cr.	Clackamas	smolt	03/13/89	--	10.8	633	Salmon River	07-46-53[e]
1987	Eagle Cr.	Clackamas	smolt	03/13/89	--	11.0	25,284	Salmon River	--
1987	Eagle Cr.	Clackamas	smolt	03/13/89	--	11.0	648	Salmon River	07-46-53[e]

Table 1 (TR)[a]. (cont.) Hatchery releases of spring chinook salmon into the Sandy River subbasin by brood year and If marked, by coded wire tag code.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT code/ Fin Clip
1987	Eagle Cr.	Clackamss	smolt	03/13/89	..	9.0	7,615	Sandy River	..
1987	Eagle' Cr.	Clackamss	smolt	03/13/89	..	9.0	195	Sandy River	07-46-53[e]
1987	Eagle Cr.	Clackamas	smolt	03/14/89	--	9.8	20,113	Sandy River	..
1987	Eagle Cr.	Clackamas	smolt	03/14/89	--	9.8	515	Sandy River	07-46-53[e]
1987	Eagle Cr.	Clackamas	smolt	03/13/89	--	9.9	19,538	Sandy River	..
1987	Eagle Cr.	Clackamss	smolt	03/13/89	..	9.9	500	Sandy River	07-46-53[e]
1987	Eagle Cr.	Clackames	smolt	03/14/89	..	10.0	42,716	Sandy River	..
1987	Eagle Cr.	Clackamas	smolt	03/14/89	--	10.0	1,093	Sandy River	07-46-53[e]
1987	Eagle Cr.	Clackemas	smolt	09/29/88	--	10.1	11,636	Sandy River	..
1987	Eagle Cr.	Clackemas	smolt	03/14/89	--	10.2	10,623	Sandy River	..
1987	Eagle Cr.	Clackames	smolt	03/14/89	--	10.2	271	Sandy River	07-46-53[e]
1987	Eagle Cr.	Clackamas	smolt	09/29/88	09/29/88	10.3	35,240	Sandy River	..
1987	Eagle Cr.	Clackamas	smolt	03/14/89	..	10.3	640	Sandy River	07-46-53[e]
1987	Eagle Cr.	Clackamas	smolt	03/13/89	..	10.6	8,761	Sandy River	..
1987	Eagle Cr.	Clackamas	smolt	03/13/89	..	10.6	224	Sandy River	07-46-53[e]
1987	Eagle Cr.	Clackames	smolt	09/29/88	..	10.8	26,342	Sandy River	..
1987	Eagle Cr.	Clackamas	smolt	09/29/88	..	11.0	14,168	Sandy River	..
1987	Eagle Cr.	Clackamas	smolt	09/29/88	03/13/89	11.1	24,098	Sandy River	..
1987	Eagle Cr.	Clackamas	smolt	03/13/89	..	11.1	277	Sandy River	07-46-53[e]
1987	Eagle Cr.	Clackemas	smolt	09/29/88	..	11.3	24,597	Sandy River	--
1987	Eagle Cr.	Clackamas	smolt	03/13/89	..	12.1	11,631	Sandy River	..
1987	Eagle Cr.	Clackamas	smolt	03/13/89	..	12.1	298	Sandy River	07-46-53[e]
1988	Eagle Cr.	Clackames	smolt	03/14/90	03/16/90	10.1	201,750	Salmon River	..
1988	Eagle Cr.	Clackamas	smolt	09/11/89	..	10.0	10,450	Sandy River	..
1988	Eagle Cr.	Clackamas	smolt	09/11 J89	03/15/90	10.1	166,777	Sandy River	..
1988	Eagle Cr.	Clackamas	smolt	09/11/89	..	10.3	10,215	Sandy River	..
1988	Eagle Cr.	Clackamas	smolt	09/11/89	--	10.4	10,692	Sandy River	..
1988	Eagle Cr.	Clackamas	smolt	09/11/89	..	10.5	6,285	Sandy River	--
1988	Eagle Cr.	Clackamas	smolt	09/1 1/89	..	10.6	21,039	Sandy River	--
1988	Eagle Cr.	Clackamss	smolt	09/11/89	..	10.7	10,772	Sandy River	..
1988	Eagle Cr.	Clackamas	smolt	09/11/89	..	11.6	9,434	Sandy River	..
1988	Eagle Cr.	Clackamas	smolt	09/1 1 J89	..	11.8	14,361	Sandy River	..
1989	Clackamas R.	Oxbow (Herman)	fry	05/08/90	..	131.0	172,870	Sandy River	..
1989	Clackamas R.	Oxbow (Herman)	fry	05/08/90	..	134.0	85,759	Sandy River	..
1989	Eagle Cr.	Clackamas	smolt	03/28/91	..	9.8	34,682	Salmon River	..
1989	Eagle Cr.	Clackamas	smolt	03/27/91	03/28/91	10.8	158,734	Salmon River	--

Table 1 (TR)[a]. (cont.) Hatchery releases of spring chinook salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip
1989	Eagle Cr.	Clackamas	smolt	03/28/91	--	9.8	92,090	Sandy River	..
1989	Eagle Cr.	Clackamas	smolt	03/27/91	03/28/91	10.8	174,365	Sandy River	..

a Modified from Oregon Department of Fish and Wildlife (unpublished data); and Oregon Department of Fish and Wildlife's hatchery production database.

b North Santiam, South Santiam, Clackamas, McKenzie, and Middle Fork Willamette rivers stocks, and Eagle Creek stock are all considered part of the Uillamette River stock.

c Fall Creek Reservoir stock.

d Uillamette Hatchery stock.

e Juveniles with this tag group were also released into the Clackamas River subbasin

Table 2 (TD). Parasites and diseases of spring chinook at hatchery facilities that rear or hold juveniles prior to release into the Sandy River subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Oxbow (Herman)	*Epistylis sp.*
Bacteria	Oxbow (Herman)	**Coldwater disease** *(Cytophaga psychrophila)*
Bacteria	Oxbow (Herman)	**Bacterial gill disease**
Bacteria	Oxbow (Herman)	*Aeromonas spp.*
Bacteria	Oxbow (Herman)	*Pseudomonas spp.*
Fungi	Oxbow (Herman)	**External fungi**
Fungi	Oxbow (Herman)	**Internal fungi**

[a] Modified from Oregon Department of Fish and Wildlife (1990).

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Sandy River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

Wallis, J. 1966. An evaluation of the Sandy River salmon hatchery. Oregon Fish Commission Report, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

SANDY RIVER SUBBASIN

Naturally Produced Fall Chinook Salmon (late run)

GEOGRAPHIC LOCATION

The Sandy River originates in the Reid, Sandy, and Zigzag glaciers on the west slope of Mt. Hood, and flows into the Columbia River at River Mile (RM) 120.5 (see SANDY RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Sandy River include the Bull Run, Zigzag and Salmon rivers. The Sandy system drains an area of 508 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Late spawning fall chinook are native to the Sandy River subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Historically, native fall chinook spawned in the mainstem Sandy River and in Trout and Gordon creeks (Oregon Department of Fish and Wildlife 1990). The construction of Marmot Dam on the Sandy River has resulted in reduced stream flows below the dam, and a subsequent loss of spawning and rearing habitat downstream to the mouth of the Bull Run River. Marmot Dam also impedes upstream migrants, which has resulted in lower subbasin production, and the reservoir behind the dam has eliminated some historical spawning and rearing habitat. Native fall chinook still spawn in the mainstem Sandy River and in Trout and Gordon creeks, although spawning ground counts indicate reduced spawner escapements to Trout and Gordon creeks since 1980 (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990). Available spawning and rearing habitat in the Sandy River subbasin is rated as "excellent" and "good" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, and emergence were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for native fall chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Berry (1981, cited by Howell et al. 1985) and in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Run timing of fall chinook in the Sandy River subbasin is inferred from timing of recreational harvest (Oregon Department of Fish and Wildlife 1990). The native stock returns from November through February (Oregon Department of Fish and Wildlife 1990).

Spawning Area

Numbers: No brood year specific estimates of spawner escapement are available. Spawning ground counts for late spawning fall chinook are available for Trout and Gordon creeks in Hirose (1982, cited by Howell et al. 1985) and from personal communication with P. Hirose, Oregon Department of Fish and Wildlife, Columbia River Management, Clackamas, Oregon, cited by Howell et al. (1985). Spawning ground counts in the Sandy subbasin, below Marmot Dam, are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Strays

Coded wire tags were recovered from stray hatchery fall chinook releases as juveniles in the Washougal and Willamette river subbasins and in the Tanner and Big creek subbasins (Table 3). All coded wire tag recoveries were from fish released as juveniles in subbasins located below Bonneville Dam. The Upriver Bright stock of fall chinook is also known to stray into the subbasin (Howell et al. 1985) but no coded wire tagged fish from this stock were recovered on spawning ground surveys or at hatchery facilities located in the subbasin.

Age Structure

Although brood year specific estimates of age structure for native fall chinook are not available, data by run year from returns of naturally and LRH stock hatchery produced fish combined are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Howell et al. 1985).

Sex Ratio

Although brood year specific estimates of sex ratio for native fall chinook are not available, data by run year from returns of naturally and LRH stock hatchery produced fish combined are available in Oregon Department of Fish and Wildlife (1990).

JWENILE LIFE HISTORY

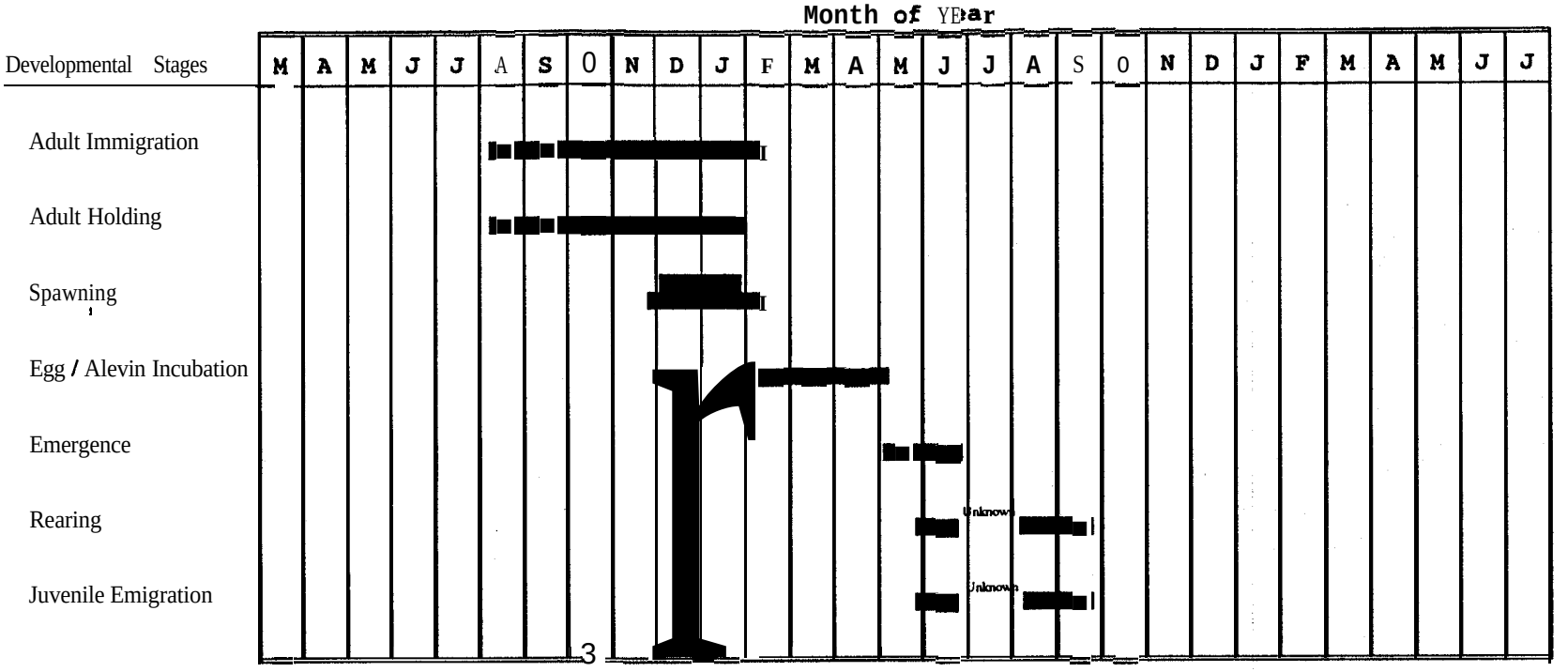
Age Structure

Although brood year specific information on age structure of native fall chinook is not available, data for native and naturally produced LRH stock juvenile fish combined are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Howell et al. 1985).

BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile fall chinook were collected from the Sandy River in 1984 and 1985, and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1986). Relative allele mobilities and allele frequencies were determined for 15 and 18 enzyme systems (for the 1984 and 1985 samples, respectively; Appendix Table 3). No rare alleles were detected.

Schreck et al. (1986) classified Columbia River Basin chinook into several clusters of similar stocks based on biochemical, morphological and life history characters. Columbia River Basin chinook stocks segregated into two primary groups. The first group consisted of spring chinook from east of the Cascade Mountains and summer chinook from Idaho. The second group consisted of spring chinook from west of the Cascades, summer chinook from the upper Columbia, and all fall chinook stocks. The second primary group was composed of 3 subgroups. At the subgroup level, wild fall chinook from the Sandy River were found to be most similar to certain stocks of hatchery and wild fall chinook that are distributed from the Cowlitz River up to Hanford Reach (not including Bonneville Hatchery fall chinook or chinook from the Willamette subbasin), and two stocks of spring chinook from the lower Columbia. This subgroup was characterized by the latest average time of adult entry into freshwater; the lowest average number of scales in the lateral series, scales above the lateral line, and vertebrae; and the lowest frequency of the common dipeptidase allele. The streams of the wild stocks placed in this subgroup are generally located at low elevations near the mouth of the Columbia, with gentle stream gradients and mild, moist climates.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of lighter or unknown activity for a given life history stage.
3. Wide bars indicate periods of heavier activity.
4. Source: Howell et al. 1985.
5. Freshwater and estuary rearing histories are unknown; limited scale analysis indicates zero-age and yearling emigration of smolts.

Figure 1 (TT). **Native fall chinook freshwater life history in the Sandy River subbasin (Oregon Department of Fish and Wildlife 1990).**

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Sandy River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	50.4	32.7	16.9	0.0	--	35.5	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Sandy River subbasin fall chinook production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (AI). Non-harvest recoveries of coded wire tagged hatchery fall chinook salmon in the Sandy River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Washougal River	Sandy River	Hatchery Returns		
	1988	--	1	1
Washougal River	Sandy River	Spawner Surveys		
	1984	--	1	1
	1985	--	--	--
	1986	--		--
	1987	--	15	15
	1988	--	6	6
	1989		2	2
Willamette River	Sandy River	Spawner Surveys		
	1987	--	3	3
	1988	--	1	1
Tanner Creek, OR	Sandy River	Spawner Surveys		
	1984	--	1	1
Big Creek, OR	Sandy River	Spawner Surveys		
	1989	--	1	1

[a] Based on the following tag codes: 07-23-46, 07-33-53, 07-33-54, 07-33-55, 07-33-56, 07-34-42, 63-22-51, 63-22-59, 63-31-17, 63-31-19, 63-34-14, 63-34-15, 63-34-16, 63-34-33, 63-34-34.

[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

REFERENCES

Berry, R.L. 1981. Oregon salmon and steelhead sport catch statistics, 1970-80. Oregon Department of Fish and Wildlife, Portland, Oregon. (As reported in Howell et al. 19%)

Hirose, P. 1982. Lower Columbia River fall chinook spawning ground surveys, 1970-81. Oregon Department of Fish and Wildlife, Information Report 82-2, Portland, Oregon. (As reported in Howell et al. 1985)

Howell, P.J., K. Jones, D. Scamecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Sandy River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

Schreck, C.B., H.W. Li, R.C. Hjort, and C.S. Sharpe. 1986. Stock identification of Columbia River chinook salmon and steelhead trout. Final Report of Cooperative Fisheries Research Unit, Oregon State University (Project 83-451, Agreement DE-A179-83 BP 13499) to Bonneville Power Administration, Portland, Oregon.

SANDY RIVER SUBBASIN

Naturally Produced Fall Chinook Salmon (early run)

ORIGIN

A remnant run of early spawning Lower Columbia River Hatchery (LRH) stock fall chinook (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced-Fall Chinook Salmon, ORIGIN) currently exists in the Sandy River subbasin. The naturally producing population developed from LRH stock hatchery fall chinook that returned to spawn in the subbasin from hatchery releases made prior to 1977 (see SANDY RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1).

DISTRIBUTION

Subbasin

LRH stock fall chinook primarily spawn in the mainstem Sandy River below Marmot Dam (Oregon Department of Fish and Wildlife 1990). For a summarized description of the quality of the spawning and rearing habitat, see SANDY RIVER SUBBASIN, Naturally Produced Fall Chinook Salmon (late run), DISTRIBUTION, Subbasin.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for naturally produced LRH fall chinook are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Berry (198 1, cited by Howell et al. 1985) and in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Run timing of fall chinook in the Sandy River subbasin is inferred from timing of recreational harvest (Oregon Department of Fish and Wildlife 1990). LRH stock fall chinook are harvested in August and September (Oregon Department of Fish and Wildlife 1990).

Spawning Area

Numbers: No brood year specific estimates of LRH stock spawner escapement are available. Spawning ground counts are available for the Sandy River subbasin, below Marmot Dam, in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

strays

For information on strays in the subbasin, see SANDY RIVER SUBBASIN, Naturally Produced Fall Chinook Salmon (late run, ADULT LIFE HISTORY, Strays.

Age Structure

Although brood year specific information on age structure of naturally produced LRH stock is not available, data by run year from returns of native and naturally produced LRH stock fish combined are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Howell et al. 1985).

Sex Ratio

Although brood year specific estimates of sex ratio for naturally produced LRH stock are not available, data by run year from returns of native and naturally produced LRH stock fish combined are available in Oregon Department of Fish and Wildlife (1990).

JUVENILE LIFE HISTORY

Age Structure

Although brood year specific information on age structure of naturally produced LRH stock is not available, data by run year for native and naturally produced LRH stock juvenile fish combined are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Howell et al. 1985).

REFERENCES

Berry, R.L. 1981. Oregon salmon and steelhead sport catch statistics, 1970-80. Oregon Department of Fish and Wildlife, Portland, Oregon. (As reported in Howell et al. 1985)

Howell, P.J., K. Jones, D. Scamecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Sandy River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

SANDY RIVER SUBBASIN

Hatchery Produced Fall Chinook Salmon

ORIGIN

In the late 1800's, hatchery facilities located in the Sandy River subbasin began collecting hatchery broodstock from the Sandy River for purposes of hatchery supplementation. Most recently (in the 1960's and 1970's), the subbasin has been supplemented with Lower Columbia River Hatchery (LRH) stock "tule" fall chinook (see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, ORIGIN) obtained from Sandy hatchery and from other hatcheries located outside of the subbasin (Table 1). Production has not been continuous and at the present time there is no hatchery supplementation program in the subbasin (Oregon Department of Fish and Wildlife 1990).

Hatchery fall chinook were released in the subbasin to supplement natural production (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Records of early releases are sketchy (Oregon Department of Fish and Wildlife 1990). In the 1960's and 1970's, fry were released into Gordon, Still and Cedar creeks, fingerlings were released into Cedar Creek, and one recorded release of smolts was made into Cedar Creek (Table 1). The 1976 brood fingerling release was the last release of hatchery fall chinook in the subbasin (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Sandy Hatchery supplied-most of the fall chinook fry that were released in the 1960's and 1970 s, although Bonneville Hatchery did supply fry for one year of releases (Table 1). Annual numbers released ranged from 11,200 to 1,000,000 fish (Table 1). Size at release ranged from 1,186 to 860 fish per pound (Table 1).

Fingerling

Sandy Hatchery supplied most of the fall chinook fingerlings that were released in the 1960 s and 1970's (Table 1). Cascade Hatchery and Salem Pond also contributed to releases. Annual numbers released ranged from 16,634 to 1,085,699 fish (Table 1). Size at release ranged from 372 to 60 fish per pound (Table 1).

Smolt

In 1964, 65,384 smolts were released from Sandy Hatchery, at a size of 12.3 fish per pound (Table 1).

Jack and Adult

No information available.

DISEASES

There are no hatchery facilities in the Sandy River subbasin that currently hold or rear hatchery fall chinook salmon prior to release in the subbasin. For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Fall Chinook Salmon, DISEASES.

Table 1 (TR). Hatchery releases of fall chinook salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip
1960	LRH	Sandy	fing.	04/20/61	--	246	497,435	Cedar Cr.	--
1960	LRH	Sandy	fing.	07/10/61		88	59,727	Cedar Cr.	--
1961	LRH	Sandy	fing.	06/08/62	--	372	231,999	Cedar Cr.	--
1962	LRH	Sandy	fry	04/10/63	--	1100	50,000	Gordon Cr.	--
1962	LRH	Sandy	fry	05/10/63	--	986	86,558	Gordon Cr.	--
1962	LRH	Sandy	f ing.	06/12/63	--	88	79,464	Cedar Cr.	--
1962	LRH	Sandy	smolt	03/04/64	--	12.3	65,384	Cedar Cr.	--
1963	LRH	Sandy	f ing.	06/15/64	06/16/64	111.9	969,154	Cedar Cr.	--
1964	LRH	Bonneville	fry	03/18/65	--	1,150	I.,ooo,ooo	Gordon Cr.	--
1964	LRH	Cascade	fing.	07/17/65		131	85,281	Cedar Cr.	--
1964	LRH	Sandy	fing.	05/29/65	--	80.0	219,935	Cedar Cr.	--
1964	LRH	Sandy	fing.	06/28/65	_	93.0	780,483	Cedar Cr.	--
1965	LRH	Sandy	fing.	06/15/66		69	174,648	Cedar Cr.	--
1966	LRH	Sandy	fry	03/22/67		1,186	34,399	Cedar Cr.	--
1967	LRH	Sandy	fing.	06/11/68	--	78	58,890	Cedar Cr.	--
1968	LRH	Sandy	fry	01/28/69	_	1,020	11,200	Still Cr.	--
1970	LRH	Salem pond	fing.	05/12/71	06/26/71	63	55,500	Cedar Cr.	--
1970	LRH	Salem pond	fing.	06/01/71	06/18/71	80	22,496	Cedar Cr.	--
1971	LRH	Sandy	fry	01/19/72	--	860	15,361	Cedar Cr.	--
1971	LRH	Sandy	fing.	04/14/72	--	240	101,520	Cedar Cr.	--
1975	LRH	Sandy	fing.	05/27/76	--	64	16,634	Cedar Cr.	--
1976	LRH	Sandy	fing.	06/08/77		60	20,514	Cedar Cr.	--

a Modified from Oregon Department of Fish and Wildlife (unpublished data).
b LRH refers to Lower Columbia River Hatchery Stock, which are informally called tules (along with Bonneville Pool Hatchery Stock).

REFERENCES

Howell, P.J., K. Jones, D. Scamecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume I: chinook, coho, chum and sockeye salmon stock summaries. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Sandy River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

SANDY RIVER SUBBASIN

Naturally Produced Coho Salmon (late run)

GEOGRAPHIC LOCATION

The Sandy River originates in the Reid, Sandy, and Zigzag glaciers on the west slope of Mt. Hood, and flows into the Columbia River at River Mile (RM) 120.5 (see SANDY RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Sandy River include the Bull Run, Zigzag, and Salmon rivers. The Sandy system drains an area of 508 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

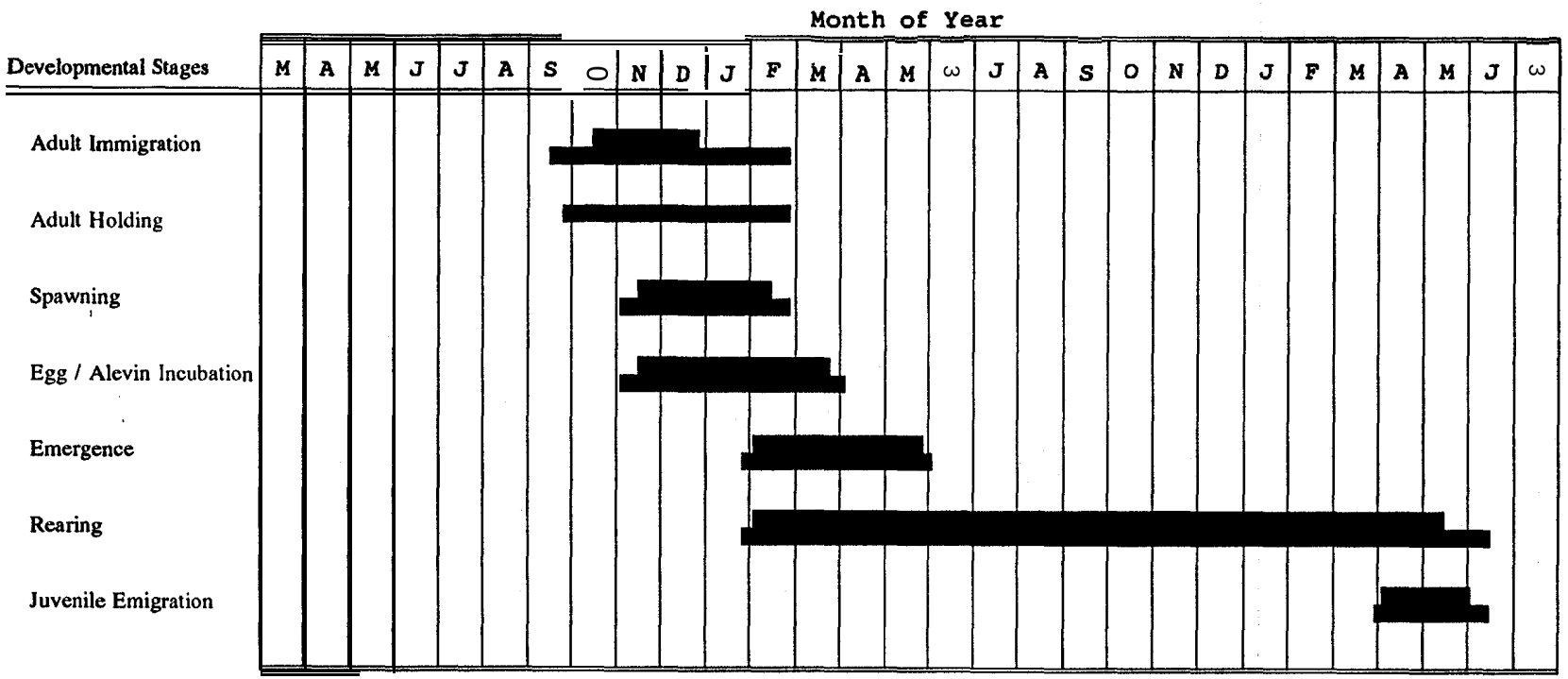
Late spawning coho are native to the Sandy River subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Historically, native coho spawned and reared in most of the tributaries of the Sandy River and in the upper mainstem of the Sandy River (Oregon Department of Fish and Wildlife 1990). Construction of Marmot Dam, on the mainstem Sandy River, and the Bull Run Reservoir, in the Bull Run River drainage, resulted in a reduction in coho spawning and rearing habitat. Habitat loss, poor logging practices, overharvest, and hatchery supplementation have contributed to the near extinction of the native stock (Oregon Department of Fish and Wildlife 1990).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and 'uvenile emigration were reported in Oregon Department of Fish and Wildlife (1940) and are presented in Figure 1. The methodology used to generate these approximations is unknown.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.
3. Sources for immigration, spawning, rearing, and emigration were Willis, 1962, and Niska and Willis, 1963.
4. Incubation and emergence were derived using average subbasin water temperatures and STEP temperature unit guidelines.

Figure 1 (TT). Coho (late run) freshwater life history in the Sandy River subbasin (Oregon Department of Fish and Wildlife 1990).

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Sandy River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

SANDY RIVER SUBBASIN

Naturally Produced Coho Salmon (early run)

ORIGIN

Early spawning coho occur in the subbasin as a result of hatchery coho that have returned to spawn naturally (see SANDY RIVER SUBBASIN, Hatchery Produced Coho Salmon; Oregon Department of Fish and Wildlife 1990). Currently, the run of coho to the Sandy subbasin is composed almost entirely of early run stock, either naturally or hatchery produced (personal communication, J. Massey, Oregon Department of Fish and Wildlife, Columbia Regional Office, Clackamas, Oregon, cited by Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Early run coho spawn and rear in the mainstem and many of its tributaries (Oregon Department of Fish and Wildlife 1990). Available spawning and rearing habitat in the Sandy River subbasin is rated as "excellent", "good" and "fair" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and 'uvenile emigration were reported in Oregon Department of Fish and Wildlife (1940) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest of naturally produced early run coho are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Although information on run timing for naturally produced early run coho is not available, information on run timing for the combined run of naturally and hatchery produced fish is available in Oregon Department of Fish and Wildlife (1990).

Numbers: Although brood year specific estimates of run size for naturally produced early run coho are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and

Wildlife (1990).

Spawning Area

Numbers: Although brood year specific estimates of spawner escapement for naturally produced early run coho are not available, estimates by run year for the combined spawner escapement of naturally and hatchery produced fish are available in Portland General Electric (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Strays

Coded wire tagged hatchery coho, released as juveniles in the lower Columbia, Nehalem, Trask, Siletz, Rogue, Kalama and Washougal rivers and in Tanner Creek were recovered in the Sandy River subbasin (Tables 3 and 4).

Age Structure

Coho return to the subbasin as 2 year old jacks and 3 year old adults (Oregon Department of Fish and Wildlife 1990). Run year specific information is available in Oregon Department of Fish and Wildlife (1990).

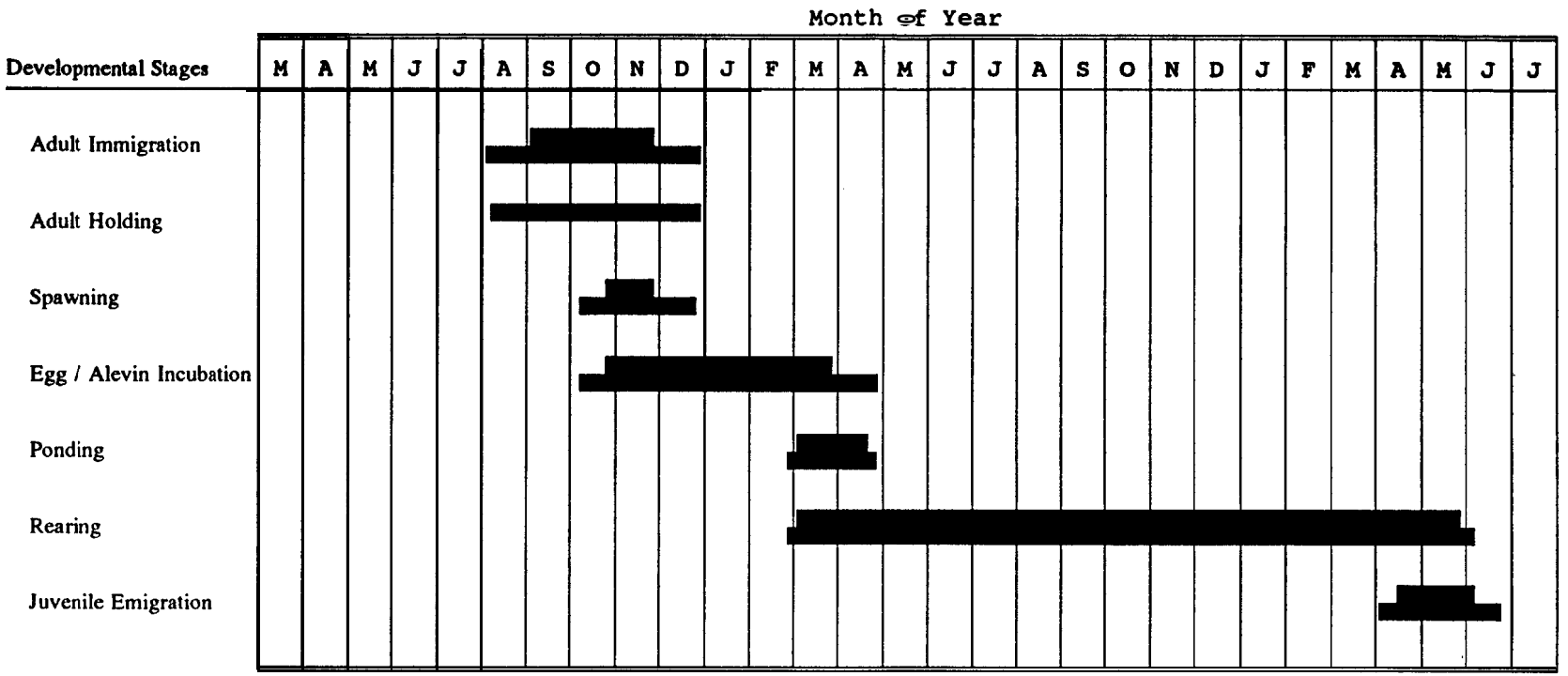
JUVENILE LIFE HISTORY

Fork Length

Niska and Willis (1963, cited by Oregon Department of Fish and Wildlife 1990) report that smolts in Cedar Creek average 4 inches.

Age Structure

Juveniles generally migrate from the subbasin as age 1+ smolts (i.e. 12-14 months of age; Oregon Department of Fish and Wildlife 1990).



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.
3. Sources for life history stages were hatchery fish adult and rearing data (Sheldon, 1988) and personal communications with hatchery personnel.

Figure 1 (TT). Coho (early run) freshwater life history in the Sandy River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Sandy River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	35.5	35.5	28.1	1.2	--	139.3	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Sandy River subbasin coho production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 3 (AI-l). Non-harvest recoveries of coded wire tagged hatchery coho salmon in the Sandy River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Sandy River	Sandy River	Spawner Surveys		
	1984	--	1	1
	1985	--	2	2
	1986	--		--
	1987	--	4	4
Sandy River	Sandy River	Hatchery Returns		
	1977	--	112	112
	1978	--	1,178	1,178
	1979	--	--	--
	1980	--	--	--
	1981	--	--	--
	1982	--	1,192	1,192
	1983	--	251	251
	1984	--	1,877	1,895
	1985	--	2,370	2,392
	1986	--	8,242	8 , 2 4 2
	1987	--	2,420	2,420
	1988	--	4,297	4,340
Nehalem River	Sandy River	Hatchery Returns		
	1986	--	1	1
Trask River	Sandy River	Hatchery Returns		
	1986		1	1
Siletz River	Sandy River	Hatchery Returns		
	unknown		1	1
Tanner Creek	Sandy River	Hatchery Returns		
	1984		1	1
	1985	--	1	1

Table 3 (AI-l). (cont.) Non-harvest recoveries of coded wire tagged hatchery coho salmon in the Sandy River subbasin[a,b].

Hatchery/Release Site	Recovery Run	Site, Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Rogue River	Sandy River	Hatchery	Returns		
	1986		--	1	1
Washougal River	Sandy River	Hatchery	Returns		
Lower Col.	1986		--	1	1
R.[c]	Sandy River	Hatchery	Returns		
	1985		--	2	2

a Based on the following tag codes: 07-22-55, 07-24-57, 07-25-49, 07-25-50, 07-25-51, 07-25-52, 07-25-53, 07-25-54, 07-25-55, 07-25-56, 07-25-57, 07-25-58, 07-26-06, 07-27-31, 07-27-32, 07-27-33, 07-27-34, 07-27-35, 07-27-36, 07-28-06, 07-28-11, 07-28-22, 07-29-06, 07-29-07, 07-29-08, 07-29-09, 07-29-10, 07-29-11, 07-29-12, 07-29-13, 07-30-11, 07-30-14, 07-30-45, 07-30-46, 07-30-47, 07-30-48, 07-30-49, 07-30-50, 07-31-01, 07-31-05, 07-31-06, 07-31-07, 07-31-08, 07-32-61, 07-32-62, 07-32-63, 07-33-01, 07-33-02, 07-36-18, 07-36-19, 07-36-20, 07-36-21, 07-36-22, 07-36-23, 07-37-43, 07-37-44, 07-37-45, 07-37-46, 07-41-08, 07-41-11, 07-41-13, 07-41-14, 07-41-16, 07-41-19, 07-41-21, 07-44-26, 07-44-41, 07-44-42, 07-44-44, 07-44-47, 07-44-49, 07-44-50, 07-47-26, 07-47-28, 07-49-50, 07-49-52, 07-49-55, 07-49-56, 07-49-59, 07-49-61, 09-05-14, 09-05-15, 09-06-01, 09-06-02, 09-06-03, 09-06-04, 63-31-32.

b Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

c Mainstem from the mouth to Bonneville Dam.

Table 4 (AI-2). Non-harvest recoveries of coded wire tagged hatchery late coho salmon in the Sandy River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Kalama River	Sandy River 1986	Hatchery Returns --	1	1
Washougal River	Sandy River 1984	Hatchery Returns --	1	1

[a] Based on the following tag codes: 63-27-15, 63-31-57.
[b] Modified from Pacific States Marine Fisheries Commission's coded wire tag database.

REFERENCES

Niska, E.L., and R.A. Willis. 1963. A study of the early life history of stream- and hatchery-reared coho salmon in Cedar and Big Creeks and the North Fork of the Klaskanine River. Oregon Fish Commission, Research Division Report, Portland, Oregon. (As reported in Oregon Department of Fish and Wildlife 1990.)

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Sandy River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

SANDY RIVER SUBBASIN

Hatchery Produced Coho Salmon

ORIGIN

The Sandy River subbasin has been supplemented with hatchery coho since 1961. The majority of coho releases in the subbasin have been of Lower Columbia Early Run (LCER), or Toutle (Howell et al. 1985), stock. Late run Cowlitz stock has also been released (Table 1). Hatchery coho are released to supplement natural production (Oregon Department of Fish and Wildlife 1990).

Sandy Hatchery rears LCER stock, using adult returns for broodstock (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Sandy Hatchery and other hatcheries outside of the subbasin release LCER fry and fingerlings into various tributaries of the Sandy River (Table 1). Smolts are released on-site from Sandy Hatchery, on Cedar Creek, in late April or early May (Oregon Department of Fish and Wildlife 1990).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Sandy, Cascade and Oxbow hatcheries (Table 1). Annual numbers released ranged from 23,881 to 973,262 fish (Table 1). Size at release ranged from 1,468 to 371 fish per pound (Table 1).

Fingerling

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Bonneville, Cascade, Oxbow and Sandy hatcheries (Table 1). Annual numbers released ranged from 6,402 to 644,110 fish (Table 1). Size at release ranged from 5 15 to 65 fish per pound (Table 1).

Smolt

Sandy Hatchery has supplied coho smolts for regular release into Cedar Creek since 1960 (Table 1). Annual numbers released ranged from 477,051 to 2,066,165 fish (Table 1). Size at release ranged from 25.3 to 8.7 fish per pound (Table 1).

Jack and Adult

Excess adult coho are released from Sandy Hatchery into various Sandy River tributaries (Table 1). Annual numbers released ranged from 238 to 8,205 fish (Table 1).

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery coho are not available, eshmates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Information on run timing is inferred from trapping activities at Sandy Hatchery, which are variable and subject to constraints of water flow and hatchery broodstock needs, as well as the biology of the fish (Oregon Department of Fish and Wildlife 1990). For the 1978-87 run years, Sandy Hatchery operated the-trapping facility beginning as early as 10 September and as late as 22 October and discontinued operation of the trapping facility as early as 29 November and as late as 10 January (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990). Coho adults were generally collected at the trapping facility from mid-September through December.

Numbers: Although brood year specific estimates of run size for hatchery coho are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Hatchery Facilities

Timing: The time of spawning at Sandy Hatchery is variable and subject to constraints such as water flow, production needs, and number of returns (Oregon Department of Fish and Wildlife 1990). For the 1978-87 run years, fish were spawned beginning as early as 15 October and as late as 9 November and spawning was completed as early as 1 November and as late as 19 December (Oregon Department of Fish and Wildlife unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Numbers: Estimates of spawner escapement are available at Sandy Hatchery (Table 2). Escapement, by age category, was determined in most years based on a visual classification of jack and adult fish. Jacks were distinguished from adults based on size. Prior to the 1990 return year, the general rule was to classify fish as jacks if they were less than 20 inches in fork length. Beginning in 1990, the size cutoff was changed so that fish less than 18 inches in fork length were classified as jacks. All jacks were assumed to be males and were designated as two year old fish and all adults were designated as three year old fish. Scale analysis was used in selected years to adjust estimates in each age category to account for smaller than normal adult fish returning in selected run years.

All returning hatchery coho salmon were assigned to a given brood year based on the assumption that all hatchery fish migrate as age 1+ smolts whether they are released as sub-yearling or yearling smolts. This assumption is based on several factors: 1) that sub-yearlings not programmed to be raised to the size of yearling-releases have a high mortality rate and 2) that yearling juveniles migrate as age 1+ smolts. These assumptions are based on data that indicates most downstream migrant age 0+ smolts do not survive (Willis 1962) and data from an analysis of coho scales (Oregon Department of Fish and Wildlife unpublished data) that indicates virtually all returning hatchery coho migrate as age 1+ smolts (personal communication on 7/30/92 with Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon). Freshwater age was designated as 2 years for juveniles migrating as age 1+ smolts. Ocean age was designated as age 1 for jacks and age 2 for adults for purposes of presenting age in the standardized format of this report; even though jacks return in the same year in which they migrate as smolts and adults do not spend two complete years in the ocean (personal communication on 8/10/92 with Paul Hirose, Oregon Department of Fish and Wildlife, Clackamas, Oregon).

Estimated returns to Sandy Hatchery include both marked and unmarked fish. Unmarked fish returning to Sandy Hatchery may include both unmarked hatchery fish and an unknown number of naturally produced fish. Naturally produced fish are primarily assumed to be returns of LCER stock coho based on the fact that 1) few stray hatchery coho are recovered in the subbasin (see SANDY RIVER SUBBASIN, Naturally Produced Coho Salmon (early run), Strays) and 2) that subbasin coho production is almost entirely from hatchery early run coho that spawn in the subbasin (see SANDY RIVER SUBBASIN, Naturally Produced Coho Salmon (early run), ORIGIN).

Annual estimates of spawner escapement ranged from 204 to 6,224 jacks and 2,875 to 25,872 adults (Table 2).

Age Structure

Age structure was estimated for coho salmon returning to the Sandy Hatchery (Tables 3 and 4). Age structure was determined based on estimates of brood returns by age category (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities). Stock of origin is unknown but virtually all returning fish are believed to be either marked or unmarked progeny of LCER stock hatchery fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Annual estimates of age structure, by brood year, ranged from 2% to 46% jacks and 54% to 98 % adults at Sandy Hatchery (Table 3).

Annual estimates of age structure, by run year, ranged from 2% to 68% jacks and 32% to 98% adults at Sandy Hatchery (Table 4).

Sex Ratio

Sex ratio (percent females) was estimated for coho salmon returning to Sandy Hatchery (Table 5). All females were classified as adult fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities). Stock of origin is unknown but virtually all returning fish are believed to be either marked or unmarked progeny of LCER stock hatchery fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Annual estimates of sex ratio ranged from 36% to 49% for adult fish at Sandy Hatchery (Table 5).

Fecundity

Mean fecundity was estimated for coho salmon returning to Sandy Hatchery (Table 6). All females were classified as adult fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities). Stock of origin is unknown but virtually all returning fish are believed to be either marked or unmarked progeny of LCER stock hatchery fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Annual estimates of mean fecundity ranged from 2,042 to 2,981 eggs per female for adult fish at Sandy Hatchery (Table 6).

Mark Recoveries

Coded wire tagged hatchery coho, released as juveniles in the Sandy River subbasin, were recovered in the mainstem Columbia River below Bonneville Dam; mainstem Columbia River tributaries below Bonneville Dam, including the Kalama and Washougal rivers; the mid-Columbia River; and coastal tributaries in Oregon and Washington (Table 7).

JUVENILE LIFE HISTORY

Aee Structure

Hatchery coho smolts (age 1+ fish) are assumed to outmigrate in the year of release (Oregon Department of Fish and Wildlife 1990).

DISEASES

Various parasites and infectious disease agents have been identified at hatchery facilities that rear or hold juvenile coho for subbasm hatchery production (Table 8). In particular, cold water disease causes high juvenile mortality at Sandy Hatchery (Oregon Department of Fish and Wildlife 1990). For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Coho Salmon, DISEASES.

Table 1 (TR). Hatchery releases of coho salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1960	LCER	Sandy	fing.	07/10/61	—	102.0	10,733	Cedar Cr.	--
1960	LCER	Sandy	fing.	07/13/61	07/17/61	65.0	97,840	Salmon R.	--
1960	LCER	Sandy	fing.	05/18/61	05/24/61	300.0	50,000	Cedar Cr.	--
1960	LCER	Sandy	smolt	04/02/62	04/09/62	18.5	580,796	Cedar Cr.	—
1961	LCER	Sandy	fry	03/16/62	03/21/62	1,048.0	100,346	Salmon R.	--
1961	LCER	Sandy	smolt	--	--	16.2	955,494	Cedar Cr.	--
1962	LCER	Sandy	fry	03/12/63		1,171.Q	505,368	Salmon R.	--
1962	LCER	Cascade	fry	03/28/63	--	1,325.Q	467,894	Salmon R.	
1962	LCER	Sandy	smolt	04/07/64	--	16.7	889,692	Cedar Cr.	
1963	LCER	Sandy	fry	03/27/64	03/30/64	1,158.Q	23,881	Cedar Cr.	—
1963	LCER	Sandy	smolt	03/10/65	03/31/65	15.3-17	801,927	Cedar Cr.	--
1964	LCER	Sandy	fry	02/26/65		1,168.0	112,786	Lost Cr.	--
1964	LCER	Sandy	fry	02/23/65	02/26/65	1,168.0	540,383	Salmon R.	
1964	LCER	Sandy	fry	03/06/65		1,168.0	90,000	Lost Cr.	--
1964	LCER	Sandy	fry	02/11/65	--	1,168.0	196,811	Zigzag R.	--
1964	LCER	Sandy	smolt	03/22/66	—	16.2	477,224	Cedar Cr.	--
1964	LCER	Sandy	adult	10/29/64	--	••	180	Alder Cr.	
1964	LCER	Sandy	adult	11/06/64	--	--	380	Lost Cr.	--
1964	LCER	Sandy	adult	10/22/64	11/09/64	--	1,310	Upper Salmon R.	--
1964	LCER	Sandy	adult	09/25/64	11/10/64	--	1,925	Salmon R.	—
1964	LCER	Sandy	adult	10/28/64	11/02/64	--	510	Clear Cr.	••
1964	LCER	Sandy	adult	11/04/64		--	400	Badger Cr.	--
1964	LCER	Sandy	adult	09/29/64	11/02/64	--	300	Camp Cr.	--
1964	LCER	Sandy	adult	11/03/64	--	••	150	Clear Fork	••
1964	LCER	Sandy	adult	11/04/64	11/05/64	--	880	Upper Cedar Cr.	--
1964	LCER	Sandy	adult	09/29/64	11/10/64	--	1,990	Still Cr.	--
1964	LCER	Sandy	adult	10/29/64	--	••	180	Cheney Cr.	
1965	LCER	Sandy	fry	04/06/66		1,170.0	26,502	Clear Cr.	--
1965	LCER	Sandy	fry	04/04/66	--	1,087.0	87,801	Still Cr.	
1965	LCER	Sandy	fry	04/06/66		1,170.0	4,358	Clear Fork	
1965	LCER	Sandy	fry	04/05/66	--	1,183.Q	33,357	Badger Cr.	
1965	LCER	Sandy	fry	04/02/66	04/06/66	1,129.Q	186,218	Salmon R.	
1965	LCER	Sandy	fry	04/06/66		1,170.0	12,976	Lost Cr.	--
1965	LCER	Sandy	fry	03/13/66	—	1,142.Q	22,500	Zigzag R.	—
1965	LCER	Sandy	smolt	03/03/67	--	16.5	958,240	Cedar Cr.	
1965	LCER	Sandy	adult	11/18/65	12/09/65	••	305	Clear Cr.	--
1965	LCER	Sandy	adult	11/02/65	12/01/65	--	871	Salmon R.	--
1965	LCER	Sandy	adult	11/21/65	--	--	200	Lost Cr.	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1966	LCER	Sandy	fry	02/15/67	02/21/67	1,110.0	49,859	Badger Cr.	--
1966	LCER	Sandy	fry	02/21/67	--	1,110.0	144,638	Camp Cr.	--
1966	LCER	Sandy	fry	03/03/67	--	1,110.0	21,200	Alder Cr.	--
1966	LCER	Sandy	fry	02/21/67	--	--	324,000	Salmon R.	--
1966	LCER	Sandy	smolt	03/13/68	--	17.8	1,062,408	Cedar Cr.	--
1966	LCER	Sandy	adult	10/31/66	--	--	125	Clear Cr.	--
1966	LCER	Sandy	adult	10/26/66	12/09/66	--	386	Salmon R.	--
1966	LCER	Sandy	adult	10/31/66	--	--	274	Still Cr.	--
1967	LCER	Sandy	fry	03/29/68	--	1,102.0	35,801	Badger Cr.	--
1967	LCER	Sandy	fry	03/05/68	--	1,180.0	98,218	Alder Cr.	--
1967	LCER	Sandy	fry	--	--	1,180.0	402,143	Salmon R.	--
1967	LCER	Sandy	smolt	04/15/69	--	13.7	825,773	Cedar Cr.	--
1967	LCER	Sandy	adult	10/13/67	10/19/67	--	300	Still Cr.	--
1967	LCER	Sandy	adult	10/16/67	--	--	150	Little Sandy R.	--
1967	LCER	Sandy	adult	10/16/67	--	--	150	Lost Cr.	--
1967	LCER	Sandy	adult	10/13/67	10/24/67	--	650	Salmon R.	--
1967	LCER	Sandy	adult	10/16/67	--	--	150	Clear Cr.	--
1968	LCER	Sandy	fry	04/07/69	04/09/69	1,363.0	206,400	Salmon R.	--
1968	LCER	Sandy	fry	04/09/69	--	1,363.0	17,202	Zigzag R.	--
1968	LCER	Sandy	fry	04/08/69	--	1,363.0	86,000	Clear Cr.	--
1968	LCER	Sandy	sntolt	04/17/70	--	14.6	459,088	Cedar Cr.	--
1968	LCER	Sandy	adult	10/14/68	--	--	210	Still Cr.	--
1968	LCER	Sandy	adult	09/23/68	10/21/68	--	492	Salmon R.	--
1968	LCER	Sandy	adult	10/21/68	--	--	150	Clear Cr.	--
1968	LCER	Sandy	adult	12/02/68	--	--	20	Alder Cr.	--
1969	LCER	Sandy	fry	03/31/70	--	1,252.0	66,323	Cedar Cr.	--
1969	LCER	Sandy	fry	02/03/70	02/04/70	1,261.0	187,917	Salmon R.	--
1969	LCER	Sandy	smolt	03/29/71	--	15.0	743,069	Cedar Cr.	--
1969	LCER	Sandy	smolt	03/28/71	--	14.8	236,818	Cedar Cr.	--
1969	LCER	Sandy	smolt	12/04/70	--	25.3	17,963	Cedar Cr.	--
1969	LCER	Sandy	adult	11/21/69	--	--	100	Clear Cr.	--
1969	LCER	Sandy	adult	09/29/69	--	--	138	Salmon R.	--
1970	LCER	Sandy	smolt	04/21/72	--	14.3	1,080,924	Cedar Cr.	--
1970	LCER	Sandy	adult	11/04/70	--	--	160	Still Cr.	--
1970	LCER	Sandy	adult	11/10/70	--	--	160	Salmon R.	--
1970	LCER	Sandy	adult	11/13/70	--	--	160	Lost Cr.	--
1971	LCER	Sandy	fry	03/09/72	--	1,468.0	450,629	Salmon R.	--
1971	LCER	Sandy	fry	03/28/72	--	1,411.0	347,427	Salmon R.	--
1971	LCER	Sandy	smolt	04/30/73	05/02/73	15.3	712,253	Cedar Cr.	--
1971	LCER	Sandy	smolt	05/03/73	--	13.9	247,050	Cedar Cr.	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1971	LCER	Sandy	adult	11/24/71	—	--	202	Still Cr.	--
1971	LCER	Sandy	adult	11/24/71	--	--	184	Salmon R.	--
1972	LCER	Sandy	fing.	05/02/73	--	515.0	309,360	Still Cr.	--
1972	LCER	Sandy	fing.	05/01/73	--	515.0	334,750	Salmon R.	—
1972	LCER	Sandy	smolt	04/24/74	--	14.8	518,450	Cedar Cr.	—
1972	LCER	Sandy	adult	11/27/72	--	--	172	Still Cr.	--
1972	LCER	Sandy	adult	11/24/72	—	--	155	Clear Cr.	--
1973	LCER	Sandy	fry	03/23/74	--	963.0	235,884	Cedar Cr.	
1973	LCER	Sandy	fing.	06/06/74	--	194.0	6,402	Still Cr.	—
1973	LCER	Sandy	smolt	04/18/75	04/30/75	14.4	831,920	Cedar Cr.	
1974	LCER	Sandy	smolt	05/27/76	--	16.9	14,830	Cedar Cr.	
1974	LCER	Sandy	smolt	04/15/76	04/29/76	15.1	783,538	Cedar Cr.	
1974	LCER	Sandy	smolt	04/29/76	04/30/76	14.8	159,714	Cedar Cr.	--
1975	LCER	Sandy	smolt	04/27/77	--	17.0	392,751	Cedar Cr.	--
1975	LCER	Sandy	smolt	04/29/77	--	15.0	244,582	Cedar Cr.	--
1975	LCER	Sandy	smolt	05/06/77	—	15.0	302,923	Cedar Cr.	--
1976	LCER	Sandy	smolt	04/28/78	--	15.5	252,968	Cedar Cr.	
1976	LCER	Sandy	smolt	05/02/78	05/04/78	14.0	440.048	Cedar Cr.	
1976	LCER	Sandy	smolt	05/10/78	--	16.0	52,159	Cedar Cr.	
1976	LCER	Sandy	smolt	05/23/78	--	19.0	131,721	Cedar Cr.	—
1977	LCER	Sandy	smolt	04/30/79		19.0	209,794	Cedar Cr.	—
1977	LCER	Sandy	smolt	05/01/79	--	20.0	779,352	Cedar Cr.	—
1978	Sandy R.[d]	Sandy	smolt	05/01/80	--	18.0	983,117	Cedar Creek	—
1978	Sandy R.[d]	Sandy	smolt	05/01/80	--	18.0	205,748	Cedar Creek	AD-CUT
1979	Sandy R.[d]	Bonneville	fing.	06/05/80	--	235.0	29,845	Beaver Creek	--
1979	Sandy R.[d]	Bonneville	fing.	06/02/80	--	235.0	20,000	Hackett Creek	
1979	Sandy R.[d]	Bonneville	fing.	06/02/80	--	235.Q	30,000	Lost Creek	--
1979	Sandy R.[d]	Bonneville	fing.	06/02/80	--	235.0	82,700	Still Creek	
1979	LCER	Bonneville	fing.	06/02/80	--	235.0	20,000	Clear Cr.	
1979	Sandy R.[d]	Sandy	smolt	05/01/81	--	17.4	488,557	Cedar Creek	
1979	Sandy R.[d]	Sandy	smolt	05/01/81		18.3	365,610	Cedar Creek	--
1979	Sandy R.[d]	Sandy	smolt	05/01/81		18.3	18,031	Cedar Creek	AD-CUT
1979	Sandy R.[d]	Sandy	smolt	05/01/81		18.5	244,413	Cedar Creek	--
1979	Sandy R.[d]	Sandy	smolt	05/01/81	—	18.5	11,516	Cedar Creek	AD-CUT
1980	Tanner Cr.[d]	Oxbow (Herman)	fry	02/27/81	--	1,200	61,615	Beaver Creek	--
1980	Sandy R.[d]	Sandy	smolt	05/24/82	--	16.3	25,395	Cedar Creek	
1980	Sandy R.[d]	Sandy	smolt	04/15/82	--	17.5	112,578	Cedar Creek	
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.0	30,190	Cedar Creek	--
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.0	27,644	Cedar Creek	07-25-56

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.1	'60,248	Cedar Creek	--
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.1	28,290	Cedar Creek	07-25-55
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.1	27,882	Cedar Creek	07-25-58
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.2	62,883	Cedar Creek	--
1980	Sand;/ R.[d]	Sandy	smolt	04/30/82	--	18.2	26,870	Cedar Creek	07-25-52
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.2	25,944	Cedar Creek	07-25-53
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.4	31,649	Cedar Creek	--
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.4	26,421	Cedar Creek	07-25-50
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.5	30,759	Cedar Creek	--
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.5	27,276	Cedar Creek	07-25-51
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.7	279,135	Cedar Creek	--
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.8	34,068	Cedar Creek	--
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	18.8	23,968	Cedar Creek	07-25-49
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	19.0	30,069	Cedar Creek	--
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	19.0	28,090	Cedar Creek	07-25-57
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	19.1	29,886	Cedar Creek	--
1980	Sandy R.[d]	Sandy	smolt	04/30/82	--	19.1	27,586	Cedar Creek	07-25-54
1980	LCER	Sandy	adult	11/13/80	--	--	100	Clear Fork	--
1980	LCER	Sandy	adult	11/13/80	--	--	100	Clear Cr.	--
1980	LCER	Sandy	adult	11/13/80	12/02/80	--	600	Still Cr.	--
1980	LCER	Sandy	adult	11/13/80	--	--	400	Salmon R.	--
1981	Sandy R.[d]	Bonneville	fing.	06/08/82	--	189.0	25,893	Beaver Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	191.0	20,055	Camp Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	191.0	4,966	Cast Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	179.0	28,750	Clear Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	191.0	20,246	Clear Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	191.0	20,055	Clear Fork	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	191.0	4,966	Devil Canyon Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	191.0	15,089	Hackett Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	191.0	5,157	Henry Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	191.0	30,178	Lost Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/07/82	--	191.0	34,953	Still Creek	--
1981	Sandy R.[d]	Bonneville	fing.	06/09/82	--	197.0	60,676	Still Creek	--
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	15.8	584,110	Cedar Creek	--
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	16.2	27,462	Cedar Creek	--
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	16.2	26,597	Cedar Creek	07-27-33
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	16.5	28,962	Cedar Creek	--
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	16.5	25,785	Cedar Creek	07-27-34
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	16.9	53,749	Cedar Creek	--
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	16.9	27,579	Cedar Creek	07-27-31
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	16.9	28,251	Cedar Creek	07-27-36

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	17.0	28,042	Cedar Creek	--
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	17.0	26,834	Cedar Creek	07-27-32
1981	Sandy R.[d]	sandy	smolt	04/15/83	04/29/83	17.2	141,816	Cedar Creek	--
1981	Sandy R.[d]	Sandy	smolt	04/29/83	--	17.2	28,052	Cedar Creek	07-27-35
1981	LCER	Sandy	adult	11/19/81	--	--	234	Still Cr.	--
1981	LCER	Sandy	adult	11/25/81	--	--	114	Still Cr.	--
1982	Sandy R.[d]	Cascade	fry	02/01/83	--	1,150	36,800	Big Creek	
1982	Sandy R.[d]	Cascade	fry	02/01/83	--	1,150	36,800	Buck Creek	--
1982	Sandy R.[d]	Cascade	fry	02/01/83	--	1,150	25,300	Howard Creek	
1982	Sandy R.[d]	Cascade	fry	02/01/83	--	1,150	62,095	Trout Creek	--
1982	Sandy R.[d]	STEP	fry	02/09/83	--	1,090	23,980	Buck Creek	
1982	Sandy R.[d]	STEP	fry	02/18/83	--	1,108	14,404	Henry Creek	--
1982	Sandy R.[d]	STEP	fry	01/12/83	--	1,122	24,684	Henry Creek	--
1982	Tanner Cr.[d]	Cascade	fry	02/25/83	--	1,150	63,240	Beaver Creek	--
1982	Sandy R.[d]	Cascade	fing.	05/23/83	--	194.0	46,540	Camp Creek	--
1982	Sandy R.[d]	Cascade	fing.	05/23/83	--	194.0	81,450	Still Creek	--
1982	Sandy R.[d]	Sandy	fing.	04/01/83	--	217.0	3,689	Cedar Creek	
1982	Sandy R.[d]	Sandy	fing.	05/23/83	--	174.0	35,670	Clear Fork	
1982	Sandy R.[d]	Sandy	fing.	05/23/83	--	174.0	41,238	Lost Creek	--
1982	Sandy R.[d]	Sandy	smolt	04/30/84	--	17.0	829,692	Cedar Creek	--
1982	Sandy R.[d]	Sandy	smolt	04/30/84	--	17.0	27,003	Cedar Creek	07-29-06
1982	Sandy R.[d]	Sandy	smolt	04/30/84	--	17.0	26,079	Cedar Creek	07-29-07
1982	Sandy R.[d]	Sandy	smolt	04/30/84	--	17.0	26,244	Cedar Creek	07-29-08
1982	Sandy R.[d]	Sandy	smolt	04/30/84	--	17.0	26,554	Cedar Creek	07-29-09
1982	Sandy R.[d]	Sandy	smolt	04/30/84	--	17.0	26.630	Cedar Creek	07-29-10
1982	Sandy R.[d]	Sandy	smolt	04/30/84	--	17.0	25,736	Cedar Creek	07-29-11
1982	Sandy R.[d]	Sandy	smolt	04/30/84	--	17.0	25,227	Cedar Creek	07-29-12
1982	Sandy R.[d]	Sandy	smolt	04/30/84	--	17.0	25,773	Cedar Creek	07-29-13
1982	LCER	Sandy	adult	11/05/82	--	--	200	Salmon R.	
1982	LCER	Sandy	adult	11/02/82	--	--	476	Still Cr.	
1982	LCER	Sandy	adult	11/05/82	--	--	250	Clear Cr.	--
1983	LCER	oxbow	fry	02/14/84	--	1,200.0	69,607	Big Cr.	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/26/84	--	371.0	17,808	Camp Creek	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/26/84	--	371.0	11,872	Cast Creek	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/26/84	--	371.0	37,413	Clear Fork	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/26/84	--	371.0	11,872	Devil Canyon Creek	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/26/84	--	371.0	50,085	Lost Creek	--
1983	Cowlitz River	Oxbow (Herman)	fry	06/26/84	--	371.0	87,927	Still Creek	--
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	11.4	187,652	Cedar Creek	

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1983	Sandy R.[d]	Sandy	smolt	04/30/85		11.4	25,596	Cedar Creek	07-28-11
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	13.9	30,841	Cedar Creek	--
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	13.9	26,483	Cedar Creek	07-31-05
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	14.1	31,501	Cedar Creek	--
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	14.1	25,773	Cedar Creek	07-31-08
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	14.4	30,884	Cedar Creek	--
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	14.4	25,679	Cedar Creek	07-30-45
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	14.8	28,982	Cedar Creek	
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	14.8	28,294	Cedar Creek	07-30-49
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	14.9	113,419	Cedar Creek	--
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	15.4	61,192	Cedar Creek	--
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	15.4	26,672	Cedar Creek	07-30-48
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	15.4	25,742	Cedar Creek	07-31-06
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	15.6	29,707	Cedar Creek	--
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	15.6	27,311	Cedar Creek	07-30-50
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	15.7	31,409	Cedar Creek	--
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	15.7	25,802	Cedar Creek	07-31-07
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	15.8	61,834	Cedar Creek	--
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	15.8	26,328	Cedar Creek	07-30-46
1983	Sandy R.[d]	Sandy	smolt	04/30/85	--	15.8	25,503	Cedar Creek	07-30-47
1984	LCER	Cascade	fry	05/01/85	--	--	37,500	Trout Cr.	--
1984	LCER	Cascade	fry	05/01/85	--	--	32,340	Big Cr.	--
1984	Sandy R.[d]	STEP	fing.	06/03/85	--	94.0	7,492	Beaver Creek	--
1984	Tanner Cr	Oxbow (Herman)	fing.	06/06/85	--	249.0	30,378	Camp Creek	--
1984	Tanner Cr	Oxbow (Herman)	fing.	06/06/85	--	249.0	35,856	Clear Creek	--
1984	Tanner Cr	Oxbow (Herman)	fing.	06/06/85	--	249.0	9,960	Devil Canyon Creek	--
1984	Tanner Cr	Oxbow (Herman)	fing.	06/06/85	--	249.0	49,302	Lost Creek	--
1984	Tanner Cr	Oxbow (Herman)	fing.	06/06/85	--	249.0	45,069	Still Creek	--
1984	Sandy R.[d]	Sandy	fing.	07/09/85	--	123.0	24,969	Camp Creek	--
1984	Sandy R.[d]	Sandy	fins.	07/09/85	--	123.0	15,006	Cast Creek	--
1984	Sandy R.[d]	Sandy	fing.	07/09/85	--	123.0	38,253	Clear Fork	
1984	Sandy R.[d]	Sandy	fing.	07/09/85	--	123.0	30,012	Still Creek	--
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	10.6	166,045	Cedar Creek	--
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	10.6	9,945	Cedar Creek	07-32-61
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	10.6	10,534	Cedar Creek	07-32-62
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	10.6	9,999	Cedar Creek	07-32-63
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	10.6	10,072	Cedar Creek	07-33-01
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	10.6	10,037	Cedar Creek	07-33-02
1984	Sandy R.[d]	Sandy	smolt	05/30/86	--	12.9	56,837	Cedar Creek	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code& Fin Clip
1984	Sandy R.[d]	Sandy	smolt	05/30/86	--	13.1	57,627	Cedar Creek	--
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	13.7	30,324	Cedar Creek	--
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	13.7	27,106	Cedar Creek	07-36-19
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	13.8	29,693	Cedar Creek	--
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	13.8	28,074	Cedar Creek	07-37-45
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.1	30,047	Cedar Creek	--
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.1	27,735	Cedar Creek	07-37-44
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.2	91,020	Cedar Creek	--
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.2	27,962	Cedar Creek	07-36-20
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.2	27,225	Cedar Creek	07-36-22
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.2	27,601	Cedar Creek	07-37-46
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.5	60,357	Cedar Creek	--
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.5	27,502	Cedar Creek	07-36-18
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.5	27,765	Cedar Creek	07-36-21
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.6	60,308	Cedar Creek	--
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.6	27,541	Cedar Creek	07-36-23
1984	Sandy R.[d]	Sandy	smolt	04/30/86	--	14.6	27,681	Cedar Creek	07-37-43
1984	LCER	Sandy	adult	11/06/84	--	--	400	Still Cr.	--
1984	LCER	Sandy	adult	11/06/84	--	--	100	Clear Cr.	--
1984	LCER	Sandy	adult	11/06/84	--	--	200	Salmon R.	--
1984	LCER	Sandy	adult	11/07/84	--	--	100	Clear Fork	--
1985	Sandy R.[d]	Sandy	smolt	05/29/87	--	8.7	33,164	Cedar Creek	--
1985	Sandy R.[d]	Sandy	smolt	05/29/87	--	9.0	33,588	Cedar Creek	
1985	Sandy R.[d]	Sandy	smolt	05/29/87	--	9.1	82,358	Cedar Creek	--
1985	Sandy R.[d]	Sandy	smolt	05/29/87	--	9.1	20,572	Cedar Creek	07-41-08
1985	Sandy R.[d]	Sandy	smolt	05/29/87	--	9.2	24,704	Cedar Creek	--
1985	Sandy R.[d]	Sandy	smolt	05/29/87	--	9.2	10,238	Cedar Creek	07-41-08
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	14.7	27,095	Cedar Creek	--
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	14.7	32,322	Cedar Creek	07-44-50
1985	Sandy [illegible]	Sandy	smolt	04/30/87	--	14.9	55,235	Cedar Creek	--
1985	Sandy [illegible]	Sandy	smolt	04/30/87	--	14.9	32,542	Cedar Creek	07-41-14
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	14.9	31,885	Cedar Creek	07-41-19
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	15.1	49,093	Cedar Creek	
1985	Sandy [illegible]	Sandy	smolt	04/30/87	--	15.1	33,116	Cedar Creek	07-41-16
1985	Sandy [illegible]	Sand;	smolt	04/30/87	--	15.1	32,491	Cedar Creek	07-44-44
1985	Sandy [illegible]	Sandy	smolt	04/30/87	--	15.2	23,958	Cedar Creek	--
1985	Sandy [illegible]	Sandy	smolt	04/30/87	--	15.2	31,887	Cedar Creek	07-41-13
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	15.3	42,473	Cedar Creek	--
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	15.3	30,544	Cedar Creek	07-44-41

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	15.3	32,813	Cedar Creek	07-44-47
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	15.4	49,271	Cedar Creek	--
1985	Sandy R.[d]	Sandy	smolt	04/30/87		15.4	30,298	Cedar Creek	07-41-11
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	15.4	32,836	Cedar Creek	07-44-49
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	15.6	54,267	Cedar Creek	--
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	15.6	31,321	Cedar Creek	07-41-21
1985	Sandy R.[d]	Sandy	smolt	04/30/87	--	15.6	31,615	Cedar Creek	07-44-42
1985	LCER	Sandy	adult	11/12/85	--	--	100	Clear Cr.	--
1985	LCER	Sandy	adult	11/21/85	--	--	200	Salmon R.	--
1985	LCER	Sandy	adult	11/21/85	--	--	200	Still Cr.	--
1985	LCER	Sandy	adult	11/12/85	--	--	100	Lost Cr.	--
1986	Sandy R.[d]	STEP	fing.	05/20/87	--	135.0	17,186	Beaver Creek	--
1986	Tanner Cr	Bonneville	fing.	05/26/87	--	201.0	50,853	Beaver Creek	--
1986	Tanner Cr	Bonneville	fing.	05/27/87	--	217.0	49,860	Big Creek	--
1986	Tanner Cr	Bonneville	fing.	05/27/87	--	217.0	30,380	Buck Creek	--
1986	Tanner Cr	Bonnevi lle	fing.	06/01/87	--	190.0	140,590	Salmon River	--
1986	Tanner Cr	Bonneville	fing.	05/27/87	--	217.0	60,760	Trout Creek	--
1986	Sandy R.[d]	Sandy	fing.	06/15/87	--	146.0	43,800	Camp Creek	--
1986	Sandy R.[d]	Sandy	fing.	06/15/87	--	146.0	11,680	Cast Creek	--
1986	Sandy R.[d]	Sandy	fing.	06/15/87	--	146.0	24,820	Clear Creek	--
1986	Sandy R.[d]	Sandy	fing.	06/15/87	--	146.0	32,120	Clear Fork	--
1986	Sandy R.[d]	Sandy	fing.	06/15/87	--	146.0	13,870	Devil Canyon Creek	--
1986	Sandy R.[d]	Sandy	fing.	06/15/87	--	146.0	14,600	Zigzag River	--
1986	Sandy R.[d]	Sandy	smolt	05/03/88	--	13.9	27,937	Cedar Creek	--
1986	Sandy R.[d]	Sandy	smolt	05/03/88	--	13.9	25,787	Cedar Creek	07-49-55
1986	Sandy R.[d]	Sandy	smolt	05/31/88	--	14.6	51,261	Cedar Creek	--
1986	Sandy R.[d]	Sandy	smolt	05/31/88	--	14.7	110,059	Cedar Creek	--
1986	Sandy R.[d]	Sandy	smolt	05/02/88	05/31/88	14.8	141,397	Cedar Creek	--
1986	Sandy R.[d]	Sandy	smolt	05/02/88		14.8	26,982	Cedar Creek	07-47-26
1986	Sandy R.[d]	Sandy	smolt	05/03/88		15.0	27,987	Cedar Creek	--
1986	Sandy R.[d]	Sandy	smolt	05/03/88		15.0	25,833	Cedar Creek	07-49-56
1986	Sandy R.[d]	Sandy	smolt	05/02/88	05/31/88	15.2	259,002	Cedar Creek	--
1986	Sandy R.[d]	Sandy	smolt	05/31/88	--	15.2	27,621	Cedar Creek	07-44-26
1986	Sandy R.[d]	Sandy	smott	05/03/88	--	15.2	25,485	Cedar Creek	07-47-28
1986	Sandy R.[d]	Sandy	smolt	05/02/88	--	15.2	27,141	Cedar Creek	07-49-59
1986	Sandy R.[d]	Sandy	smolt	05/03/88	--	15.3	62,260	Cedar Creek	--
1986	Sandy R.[d]	Sandy	smolt	05/03/88	--	15.3	26,175	Cedar Creek	07-49-52
1986	Sandy R.[d]	Sandy	smolt	05/03/88	--	15.3	25,688	Cedar Creek	07-49-61
1986	Sandy R.[d]	Sandy	smolt	05/02/88	--	15.4	31,443	Cedar Creek	--

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip[c]
1986	Sandy R.[d]	Sandy	smolt	05/02/88	--	15.4	26,892	Cedar Creak	07-49-50
1986	Sandy R.[d]	Sandy	smolt	05/31/88	--	15.5	57.862	Cedar Creek	--
1986	LCER	Sandy	adult	11/26/86	--	--	-100	Clear Fork	--
1986	LCER	Sandy	adult	11/21/86	--	--	400	Salmon R.	--
1986	LCER	Sandy	adult	11/21/86	--	--	200	Still Cr.	--
1986	LCER	Sandy	adult	11/21/86	--	--	100	Clear Cr.	--
1986	LCER	Sandy	adult	11/26/86	--	--	100	Camp Cr.	--
1986	LCER	Sandy	adult	11/26/86	--	--	100	Lost Cr.	--
1987	Sandy R.[d]	STEP	fing.	05/18/88	--	122.8	20,477	Beaver Creek	--
1987	Sandy R.[d]	Sandy	smolt	05/31/89	--	13.6	53,502	Cedar Creek	--
1987	Sandy R.[d]	Sandy	smolt	05/31/89		13.8	116,665	Cedar Creek	--
1987	Sandy R.[d]	Sandy	smolt	05/31/89	--	14.0	107,864	Cedar Creek	--
1987	Sandy R.[d]	Sandy	smolt	05/31/89	--	14.0	12,452	Cedar Creek	07-44-46
1987	Sandy R.[d]	Sandy	smolt	05/31/89	--	14.1	111,743	Cedar Creek	--
1987	Sandy R.[d]	Sandy	smolt	05/31/89	--	14.5	108,814	Cedar Creek	
1987	Sandy R.[d]	Sandy	smolt	05/31/89	--	14.5	13,320	Cedar Creek	07-44-46
1987	Sandy R.[d]	Sandy	smolt	05/31/89	--	14.6	306,834	Cedar Creek	--
1987	Sandy R.[d]	Sandy	smolt	04/30/89	--	14.9	27,081	Cedar Creek	--
1987	Sandy R.[d]	Sandy	smolt	04/30/89	--	14.9	27,960	Cedar Creek	07-44-54
1987	Sandy R.[d]	Sandy	smolt	04/30/89	--	15.1	60,448	Cedar Creek	
1987	Sandy R.[d]	Sandy	smolt	04/30/89	--	15.1	27,964	Cedar Creek	07-44-45
1987	Sandy R.[d]	Sandy	smolt	04/30/89	--	15.1	27,043	Cedar Creek	07-44-58
1987	Sandy R.[d]	Sandy	smolt	04/30/89	--	15.2	31,193	Cedar Creek	--
1987	Sandy R.[d]	Sandy	smolt	04/30/89		15.2	27,661	Cedar Creek	07-44-57
1987	LCER	Sandy	adult	11/30/86		--	260	Salmon River	--
1987	LCER	Sandy	adult	11/30/86	--	--	30	Camp Cr.	
1988	Sandy R.[d]	Sandy	smolt	05/31/90	--	14.1	26,762	Cedar Creek	
1988	Sandy R.[d]	Sandy	smolt	05/31/90	--	14.1	27,854	Cedar Creek	07-48-56
1988	Sandy R.[d]	Sandy	smolt	05/31/90	--	14.3	27,470	Cedar Creek	--
1988	Sandy R.[d]	Sandy	smolt	05/31/90	--	14.3	27,579	Cedar Creek	07-48-57
1988	Sandy R.[d]	Sandy	smolt	05/31/90		14.4	51,732	Cedar Creek	--
1988	Sandy R.[d]	Sandy	smolt	05/31/90	--	14.5	27,223	Cedar Creek	--
1988	Sandy R.[d]	Sandy	smolt	05/31/90	--	14.5	27,884	Cedar Creek	07-48-50
1988	Sandy R.[d]	Sandy	smolt	05/31/90		14.6	99,670	Cedar Creek	--
1988	Sandy R.[d]	Sandy	smolt	05/31/90	--	14.7	51,623	Cedar Creek	
1988	Sandy R.[d]	Sandy	smolt	05/31/90	--	14.7	27,609	Cedar Creek	07-48-52
1988	Sandy R.[d]	Sandy	smolt	05/31/90		14.7	27,980	Cedar Creek	07-48-55
1988	Sandy R.[d]	Sandy	smolt	05/31/90		14.8	109,094	Cedar Creek	--
1988	Sandy R.[d]	Sandy	smolt	05/31/90		14.9	136,156	Cedar Creek	

Table 1 (TR). (cont.) Hatchery releases of coho salmon into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock[b]	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[c]
1988	Sandy R.[d]	Sandy	smolt	05/31/90	--	14.9	27,877	Cedar Creek	07-48-51
1988	Sandy R.[d]	Sandy	smolt	05/31/90	--	15.0	54,078	Cedar Creek	--
1988	Sandy R.[d]	Sandy	smolt	05/07/90	--	15.1	39,762	Cedar Creek	--
1988	Sandy R.[d]	Sandy	smolt	05/07/90	--	15.1	13,183	Cedar Creek	07-48-49
1988	Sandy R.[d]	Sandy	smolt	05/07/90	05/31/90	15.2	137,565	Cedar Creek	--
1988	Sandy R.[d]	Sandy	smolt	05/07/90	--	15.2	14,251	Cedar Creek	07-48-49
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	14.3	22,811	Cedar Creek	--
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	14.3	20,637	Cedar Creek	07-55-45
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	14.5	59,891	Cedar Creek	--
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	14.7	118,082	Cedar Creek	
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	14.8	145,189	Cedar Creek	--
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	14.8	25,893	Cedar Creek	07-55-44
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	14.9	243,214	Cedar Creek	--
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	14.9	27,023	Cedar Creek	07-55-42
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	14.9	27,314	Cedar Creek	07-55-47
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	15.0	28,902	Cedar Creek	--
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	15.0	26,359	Cedar Creek	07-55-43
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	15.1	29,934	Cedar Creek	
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	15.1	27,409	Cedar Creek	07-55-46
1989	Sandy R.[d]	Sandy	smolt	06/06/91	--	15.2	59,510	Cedar Creek	--
1989	Sandy R.[d]	Sandy	smolt	05/01/91	--	15.3	35,604	Cedar Creek	
1989	Sandy R.[d]	Sandy	smolt	05/01/91	--	15.3	27,747	Cedar Creek	07-55-41
1989	Sandy R.[d]	Sandy	smolt	05/01/91	06/06/91	15.6	98,763	Cedar Creek	
1989	Sandy R.[d]	Sandy	smolt	05/01/91	--	15.6	26,647	Cedar Creek	07-55-40

[a] Modified from Oregon Department of Fish and Wildlife (unpublished data); and Oregon Department of Fish and Wildlife's hatchery production database.

[b] LCER refers to Lower Columbia Early Run stock, a "catchall" name for early run hatchery stocks, including Eagle Creek, Clackamas River, Sandy River, Big Creek, and Tanner Creek stocks. These stocks have been previously grouped as early run Toutle stock, or just early run coho. Cowlitz stock is part of a late run stock group.

[c] D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown): AD-CUT = adipose fin clip plus coded wire tag (tag code unknown): FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

[d] Sandy Fish Hatchery stock.

Table 2 (RH). Total escapement of LCER stock coho salmon to Sandy Hatchery by brood year[a,b].

Brood Year	Total Age 2	3	4	5	6	Total	Adult Total
1966	--	3,370	--	--	--	--	3,370
1967	3,472	14,311	--	--	--	17,783	14,311
1968	3,788	4,425	--	--	--	8,213	4,425
1969	2,123	5,603	--	--	--	7,726	5,603
1970	1,086	2,875	--	--	--	3,961	2,875
1971	6,224	9,719	--	--	--	15,943	9,719
1972	1,567	5,695	--	--	--	7,262	5,695
1973	2,504	8,409	--	--	--	10,913	8,409
1974	2,186	5,359	--	--	--	7,545	5,359
1975	1,276	8,751	--	--	--	10,027	8,751
1976	324	8,692	--	--	--	9,016	8,692
1977	590	9,500	--	--	--	10,090	9,500
1978	204	6,884	--	--	--	7,088	6,884
1979	265	13,944	--	--	--	14,209	13,944
1980	1,234	4,974[c]	--	--	--	6,208	4,974
1981	487[c]	12,290	--	--	--	12,777	12,290
1982	279	8,145	--	--	--	8,424	8,145
1983	3,024	25,872	--	--	--	28,896	25,872
1984	833	5,467	--	--	--	6,300	5,467
1985	3,727	10,297	--	--	--	14,024	10,297
1986	2,373	22,199'	--	--	--	24,572	22,199
1987	343c	6,131[d]	--	--	--	6,474	6,131
1988	460[d]	11,534[e]	--	--	--	11,994	11,534
1989	413e	--	--	--	--	--	--

[a] Unless otherwise footed, estimates are modified from Washington Department of Fisheries and Oregon Department of Fish and Wildlife (1992).

[b] Unless otherwise footnoted, returning fish were visually classified as jack or adult fish (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

[c] Scale analysis was used to adjust estimates to account for smaller than normal adult fish returning to the facility. Data are from Oregon Department of Fish and Wildlife (unpublished data).

[d] Preliminary estimate.

[e] Preliminary estimate. Data are from Oregon Department of Fish and Wildlife (unpublished data).

Table 3 (AC). Age composition (freshwater.ocean) by brood year for LCER stock coho salmon returning to Sandy Hatchery[a].

Brood Year	N	Age Composition (%)								
		1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3
1967	17,783	--		--	20	80		--		
1968	8,213	--		--	46	54			--	--
1969	7,726	--		--	27	73	--	--	--	--
1970	3,961	--		--	27	73		--	--	
1971	15,943	--		--	39	61			--	
1972	7,262	--		--	22	78	--		--	--
1973	10,913	--		--	23	77	--			--
1974	7,545	--		--	29	71	--		--	--
1975	10,027		--	--	13	87	--	--	--	--
1976	9,016		--	--	4	96	--		--	--
1977	10,090	--	--		6	94	--		--	--
1978	7,088		--	--	3	97	--		--	--
1979	14,209		--	--	2	98	--	--	--	
1980	6,208	--	--	--	20	80			--	--
1981	12,777	--	--	--	4	96		--	--	
1982	8,424	--	--	--	3	97	--			
1983	28,896	--	--	--	10	90				
1984	6,300	--		--	13	87		--	--	--
1985	14,024	--		--	27	73			--	--
1986	24,572		--		10	90	--	--	--	--
1987	6,474		--		5	95	--	--	--	--
1988	11,994	--			4	96	--	--	--	--

[a] Estimates of age structure are based on brood returns to Sandy Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 4 (AC-a). Age composition (freshwater.ocean) by run year for LCER stock coho salmon returning to Sandy Hatchery[a].

Run Year	N	Age Composition (%)								
		1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3
1969	6,842	--	--	--	51	49	--	--	--	--
1970	18,099	--	--	--	21	79	--	--	--	--
1971	6,548	--	--	--	32	68	--	--	--	--
1972	6,689	--	--	--	16	84	--	--	--	--
1973	9,099	--	--	--	68	32	--	--	--	--
1974	11,286	--	--	--	14	86	--	--	--	--
1975	8,199	--	--	--	31	69	--	--	--	--
1976	10,595	--	--	--	21	79	--	--	--	--
1977	6,635	--	--	--	19	81	--	--	--	--
1978	9,075	--	--	--	4	96	--	--	--	--
1979	9,282	--	--	--	6	94	--	--	--	--
1980	9,704	--	--	--	2	98	--	--	--	--
1981	7,149	--	--	--	4	96	--	--	--	--
1982	15,178	--	--	--	8	92	--	--	--	--
1983	5,461	--	--	--	9	91	--	--	--	--
1984	12,569	--	--	--	2	98	--	--	--	--
1985	11,169	--	--	--	27	73	--	--	--	--
1986	26,705	--	--	--	3	97	--	--	--	--
1987	9,194	--	--	--	41	59	--	--	--	--
1988	12,670	--	--	--	19	81	--	--	--	--
1989	22,542	--	--	--	2	98	--	--	--	--
1990	6,591	--	--	--	7	93	--	--	--	--
1991	11,947	--	--	--	3	97	--	--	--	--

[a] Estimates of age structure are based on brood returns to sandy Hatchery (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 5 (AS). Percent females by brood year and age class (freshwater.ocean) for hatchery early run coho released in the Sandy River[a,b].

	Females (%)									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1975	--	--	--	--	0	43	--	--	--	--
N	--	--	--	--	324	8,751	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--
1976	--	--	--	--	0	36	--	--	--	--
N	--	--	--	--	590	8,692	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--
1977	--	--	--	--	0	43	--	--	--	--
N	--	--	--	--	204	9,500	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--
1978	--	--	--	--	0	45	--	--	--	--
N	--	--	--	--	265	6,884	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--
1979	--	--	--	--	0	41	--	--	--	--
N	--	--	--	--	1,234	13,944	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--
1980	--	--	--	--	0	40	--	--	--	--
N	--	--	--	--	705	4,756	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--

Table 5 (AS). (cont.) Percent females by brood year and age class (freshwater.ocean) for hatchery early run coho released in the Sandy River[a,b].

	Females (%)									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1981	--				0	49	--	--	--	--
N	--	--	--	--	279	12,290	--	--	--	--
St. dev.	--	--	--	--	--	--	--	--	--	--
1982					0	38	--	--	--	--
N	--	--	--	--	3,024	8,145	--	--	--	--
St. dev.	--	--	--	--	--	--	--	--	--	--
1983					0	41	--	--	--	--
N	--	--	--	--	833	25,872	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--

[a] Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

[b] Coho were aged based on a combination of factors associated with size and sex of the fish and all fish were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 6 (AF). Mean fecundity (eggs per female) by brood year and age class (freshwater.ocean) for hatchery early run coho released in the Sandy River[a,b].

Mean Fecundity

Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1975	--	--		--	--	2,981	--	--	--	--
N	--	--		--	--	3,728	--	--	--	--
st. dev.	--	--		--	--	--	--	--	--	--
1976	--	--		--	--	2,947	--	--	--	--
N	--	--		--	--	3,127	--	--	--	--
st. dev.	--	--		--	--	--	--		--	--
1977	--	--	--	--	--	2,281	--	--	--	--
N	--	--		--	--	4,132	--	--	--	--
st. dev.	--	--		--	--	--	--	--	--	--
1978	--	--	--	--	--	2,495	--	--	--	--
N	--	--	--	--	--	3,094	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--
1979	--	--	--	--	--	2,575	--	--		--
N	--	--	--	--	--	5,681	--	--		
st. dev.	--	--	--	--	--	--	--	--		
1980	--	--	--	--	--	1,638	--	--		
N	--	--	--		--	1,883	--	--	--	--
st. dev.	--	--	--		--	--	--	--	--	--

Table 6 (AF). (cont.) Mean fecundity (eggs per female) by brood year and age class (freshwater.ocean) for hatchery early run coho released in the Sandy River[a,b].

	Mean Fecundity									
Brood Year	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3
1981	--				--	2,714	--		--	
N	--	--	--	--	--	5,990	--	--	--	--
st. dev.	--	--	--	--	--			--	--	
1982				--		2,771				
N	--	--	--	--	--	3,073	--	--	--	--
st. dev.	--	--	--	--	--	--	--	--	--	--
1983						2,042	--			--
N	--	--	--	--	--	10,674		--		
st. dev.								--		--

[a] Modified from Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

[b] Coho were aged based on a combination of factors associated with size and sex of the fish and all fish were assumed to have migrated as age 1+ smolts (see ADULT LIFE HISTORY, Escapement, Hatchery Facilities).

Table 7 (AE). Emigration of coded wire tagged hatchery coho salmon released as juveniles in the Sandy River subbasin[a,b].

Hatchery/Release Site	Recovery Site, Run Year(s)	Recovery Method	Number Recovered	Total Number Estimated, (PSMFC)
Sandy River mid-Col. R. Trib.[c]	Hatchery Returns 1987	--	2	2
Sandy River	Coos Bay Hatchery Returns 1988	--	1	1
Sandy River	Kalama River Spawner Surveys 1986	--	1	1
Sandy River	Kalama River Hatchery Returns 1987	--	1	1
Sandy River	Salmon River Hatchery Returns 1978	--	1	1
Sandy River	Trask River Spawner Surveys 1986	--	1	1
Sandy River	Trask River Hatchery Returns 1987	--	2	2

[a] Based on the following tag codes: 09-16-44, 07-28-11, 07-30-49, 07-36-18, 07-36-19, 07-36-21, 07-37-45, 07-41-21, 07-44-44.
[b] Modified from Oregon Department of Fish and Wildlife (unpublished data).
[c] Tributaries of the mainstem between Bonneville Dam and McNary Dam.

Table 8 (TD). Parasites and diseases of early run coho salmon at hatchery facilities that rear or hold juveniles prior to release into the Sandy River subbasin[a].

Disease Type	Hatchery	Specific Pathogen
Parasite	Sandy	Ichthyobodo *spp.*
Parasite	Cascade	Costia *(Ichthyobodo sp.)*
Parasite	Cascade	*Epistylis sp.*
Parasite	Cascade	Gill amoeba
Parasite	Oxbow (Herman)	*Trichophrya*
Parasite	oxbow (Herman)	Costia *(Ichthyobodo sp.)*
Bacteria	Sandy	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Sandy	Furunculosis *(Aeromonas salmonicida)*
Bacteria	Sandy	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Sandy	Columnaris *(Flexibacter columnaris)*
Bacteria	Cascade	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Cascade	*Pseudomonas spp.*
Bacteria	Cascade	Bacterial kidney disease *(Renibacterium salmoninarum)*
Bacteria	Cascade	*Aeromonas spp.*
Bacteria	Oxbow (Herman)	Coldwater disease *(Cytophaga psychrophila)*
Bacteria	Oxbow (Herman)	*Aeromonas spp.*
Bacteria	Oxbow (Herman)	*Pseudomonas spp.*
Bacteria	Oxbow (Herman)	Bacterial kidney disease *(Renibacterium salmoninarum)*
Virus	Cascade	Viral Erythropoietic Necrosis (VEN)
Virus	Cascade	Erythrocytic Inclusion Body Syndrome (EIBS)
Virus	Oxbow (Herman)	Viral Erythropoietic Necrosis (VEN)
Virus	Oxbow (Herman)	Erythrocytic Inclusion Body Syndrome (EIBS)
Fungi	Cascade	External fungi
Fungi	Oxbow (Herman)	External fungi

[a] Modified from Oregon Department of Fish and Wildlife (1990).

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SANDY RIVER SUBBASIN

Naturally Produced Summer Steelhead

GEOGRAPHIC LOCATION

The Sandy River originates in the Reid, Sandy, and Zigzag glaciers on the west slope of Mt. Hood, and flows into the Columbia River at River Mile (RM) 120.5 (see SANDY RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Sandy River include the Bull Run, Zigzag and Salmon rivers. The Sandy system drains an area of 508 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Summer steelhead are not native to the Sandy River subbasin. The summer steelhead run to the subbasin is assumed be entirely of hatchery fish returning from subbasin hatchery production releases (see SANDY RIVER SUBBASIN, Hatchery Produced Summer Steelhead; Oregon Department of Fish and Wildlife 1990). It is believed that a limited amount of natural production occurs in the subbasin but naturally produced juvenile summer steelhead are not believed to be able to successfully compete with the native winter steelhead and coho juveniles (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Habitat considered suitable for spawning and rearing in the subbasin is primarily rated as "excellent" and "good" quality (Tables 1 and 2).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Sandy River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	53.3	40.1	6.6	0.0	--	109.9	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Sandy River subbasin summer steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confidence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

REFERENCES

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SANDY RIVER SUBBASIN

Hatchery Produced Summer Steelhead

ORIGIN

Hatchery summer steelhead were introduced into the Sandy River in 1975, to provide increased recreational fishing opportunities in the mainstem Sandy River and tributaries (Oregon Department of Fish and Wildlife 1990). The first hatchery summer steelhead released into the Sandy River subbasin were Skamania stock fish obtained from Skamania Hatchery in Washington (Table 1). Summer steelhead, which were derived from the original Skamania stock, are currently released into the subbasin. The stock currently used for purposes of hatchery supplementation is still commonly referred to as the Skamania stock but is more specifically defined as the Foster stock (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Summer steelhead have been released into the Sandy River subbasin primarily as smolts, in April or May (Table 1). Smolts have been released into Still Creek and the Zigzag and Salmon rivers (Table 1).

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

There are no records of releases in the subbasin.

Fingerling

The only hatchery facility in which fingerlings were reared or acclimated prior to release in the subbasin was Gnat Creek Hatchery (Table 1). Annual numbers released ranged from 7,112 to 21,134 fish (Table 1). Size at release ranged from 45.9 to 17.6 fish per pound (Table 1).

Smolt

Hatchery facilities in which smolts were reared or acclimated prior to release in the subbasin include Skamania, Oak Springs, Gnat Creek, and South Santiam hatcheries, and Trojan Pond (Table 1). Annual numbers released ranged from 35,220 to 117,309 fish (Table 1). Size at release ranged from 14.0 to 3.3 fish per pound (Table 1).

Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery summer steelhead are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Run timing of adult summer steelhead in the Sandy River subbasin is inferred from timing of escapement past Marmot Dam (Oregon Department of Fish and Wildlife 1990). Adult fish pass Marmot Dam from April through October, with peak escapement occurring in June and July (Portland General Electric unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

Numbers: Although brood year specific estimates of hatchery run size are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

JUVENILE LIFE HISTORY

Age Structure

Hatchery juvenile summer steelhead are released as age 1+ smolts (i.e. 12 to 14 months after hatching) and are believed to emigrate to the Columbia River within a few days of release (Oregon Department of Fish and Wildlife 1990).

DISEASES

There are no hatchery facilities in the Sandy River subbasin that currently. hold or rear hatchery summer steelhead prior to release in the subbasin. For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES; see DESCHUTES RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES; and see SANTIAM RIVER SUBBASIN, Hatchery Produced Summer Steelhead, DISEASES.

Table 1 (TR). Hatchery summer steelhead releases into the Sandy River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Tear	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1974	Skamania	Skamania	smolt	05/07/75	--	6.0	8,760	Retaining Uall	AD LV
1974	Skamania	Skamania	smolt	05/07/75	--	6.0	26,460	First Br. above Green Canyon	AD LV
1975	Skamania	Skamania	smolt	04/10/76	--	6.4	35,666	First Br. above Green Canyon	AD RP
1976	Skamania	Oak Spr., Gnat Cr.	smolt	04/12/77	04/13/77	5.1	27,849	First Br. above Green Canyon	LP
1976	Skamania	Oak Spr., Gnat Cr.	smolt	05/09/77	05/11/77	7.5	47,078	Arrah Uanna Br.	LP
1977	Skamania	So. Santiam	smolt	04/24/78	04/25/78	5.1	24,890	Sleepy Hollow Br.	--
1977	Skamania	So. Santiam	smolt	04/25/78	05/10/78	5.3	22,765	Arrah Uanna Br.	--
1977	Skamania	So. Santiam	smolt	05/10/78	05/11/78	5.7	22,514	S-38 Rd. gr.	--
1978	Skamania	So. Santiam	smolt	04/27/79	--	5.8	31,375	S-38 Rd. gr.	--
1978	Skamania	So. Santiam	smolt	04/16/79	--	5.2	26,021	Arrah Uanna Br.	--
1978	Skamania	So. Santiam	smolt	04/23/79	--	5.6	7,840	Sleepy Hollow Br.	--
1979	Skamania R.	Oak Springs	smolt	04/18/80	04/22/80	3.7	27,081	Salmon River	--
1979	Skamania R.	Oak Springs	smolt	04/17/80	--	4.2	9,912	Salmon River	--
1979	Skamania	So. Santiam	smolt	04/08/80	04/09/80	5.7	40,470	S-38 Rd. Br.	--
1979	Skamania R.	Gnat Creek	smolt	04/08/80	04/09/80	5.7	35,226	Salmon River	--
1980	Skamania R.	Oak Springs	smolt	04/16/80	--	4.2	4,620	Salmon River	--
1980	Skamania R.	Oak Springs	smolt	04/15/81	04/16/81	5.0	33,990	Salmon River	--
1980	Skamania R.	Oak Springs	smolt	04/16/81	--	5.2	6,370	Salmon River	--
1980	Skamania	So. Santiam	smolt	04/15/81	04/27/81	6.0	41,887	S-38 Rd. Br.	--
1980	Skamania R.	Gnat Creek	smolt	04/27/81	--	6.3	19,183	Salmon River	--
1980	Skamania R.	Gnat Creek	smolt	04/27/81		6.7	4,770	Salmon River	--
1980	Skamania R.	Gnat Creek	smolt	04/27/81		6.8	6,834	Salmon River	--
1981	Skamania R.	Trojan Pond	smolt	04/28/82	--	4.2	3,695	Salmon River	--
1981	Skamania R.	Trojan Pond	smolt	04/28/82	04/29/82	4.5	22,520	Salmon River	--
1981	Skamania R.	Trojan Pond	smolt	04/29/82	--	5.0	44,103	Salmon River	--
1981	Skamania R.	Trojan Pond	smolt	04/28/82		5.4	23,087	Salmon River	--
1982	Skamania R.	Oak Springs	smolt	04/25/83	05/06/83	4.5	61,420	Salmon River	--
1982	Skamania R.	Oak Springs	smolt	05/05/83	--	4.7	10,913	Salmon River	--
1983	Skamania R.	Oak Springs	smolt	04/12/84	--	3.8	3,610	Salmon River	AD
1983	Skamania R.	Oak Springs	smolt	04/10/84	04/11/84	3.9	27,170	Salmon River	AD
1983	Skamania R.	Oak Springs	smolt	04/11/84	--	4.0	5,600	Salmon River	AD
1983	Skamania R.	Oak Springs	smolt	04/11/84	--	5.1	11,368	Salmon River	AD
1983	Skamania R.	Oak Springs	smolt	04/12/84	--	3.8	10,830	Still Creek	AD
1983	Skamania R.	Oak Springs	smolt	04/12/84		5.1	5,610	Still Creek	AD
1984	Skamania R.	Oak Springs	smolt	04/24/85		4.0	4,508	Salmon River	AD
1984	Skamania R.	Oak Springs	smolt	04/24/85	--	4.1	5,203	Salmon River	AD
1984	Skamania R.	Oak Springs	smolt	04/22/85	04/23/85	4.3	20,400	Salmon River	AD
1984	Skamenia R.	Oak Springs	smolt	04/17/85	--	4.5	29,967	Salmon River	AD
1984	Skamania R.	Oak Springs	smolt	04/25/85	04/26/85	4.1	16,409	Still Creek	AD

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Sandy River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Code/ Fin Clip
1985	Skamania R.	Oak Springs	smolt	04/16/86	04/21/86	4.0	29,371	Salmon River	AD
1985	Skamania R.	Oak Springs	smolt	04/15/86	--	4.4	4,576	Salmon River	AD
1985	Skamania R.	Oak Springs	smolt	04/14/86	--	4.7	21,511	Salmon River	AD
1985	Skamania R.	Oak Springs	smolt	04/16/86	04/18/86	4.0	8,320	Still Creek	AD
1985	Skamania R.	Oak Springs	smolt	04/15/86	--	4.4	5,016	Still Creek	AD
1985	Skamania R.	Oak Springs	smolt	04/16/86	--	4.5	7,020	Still Creek	AD
1986	Skamania R.	Gnat Creek	fing.	10/06/86	--	17.6	16,544	Sandy River	--
1986	Skamania R.	Gnat Creek	fing.	10/06/86	--	45.9	4,590	Sandy River	--
1986	Skamania R.	Oak Springs	smolt	05/13/87	--	3.3	8,478	Salmon River	AD
1986	Skamania R.	Oak Springs	smolt	05/14/87	05/19/87	3.6	15,876	Salmon River	AD
1986	Skamania R.	Oak Springs	smolt	05/13/87	--	4.0	6,280	Salmon River	AD
1986	Skamania R.	Oak Springs	smolt	05115187	--	4.1	4,305	Salmon River	AD
1986	Skamania R.	Oak Springs	smolt	05/14/87	--	4.2	1,491	Salmon River	AD
1986	Skamania R.	Oak Springs	smolt	05/15/87	--	4.3	15,436	Salmon River	AD
1986	Skamania R.	Oak Springs	smolt	05/14/87	--	4.4	13,156	Salmon River	AD
1986	Skamania R.	Oak Springs	smolt	05/11/87	--	4.0	7,120	Still Creek	AD
1986	Skamania R.	Oak Springs	smolt	05/15/87	--	4.2	3,360	Still Creek	AD
1986	Skamania R.	Oak Springs	smolt	05119187	--	3.6	4,968	Zigzag River	AD
1986	Skamania R.	Oak Springs	smolt	05/11/87	--	4.0	5,198	Zigzag River	AD
1986	Skamania R.	Oak Springs	smolt	05/15/87	--	4.4	4,620	Zigzag River	AD
1987	Skamania R.	Gnat Creek	fins.	01/28/88	--	44.7	7,112	Roslyn Lake	--
1987	Skamania R.	Oak Springs	smoit	05/04/88	--	3.6	16,740	Salmon River	AD
1987	Skamania R.	Oak Springs	smolt	05/03/88	--	4.2	8,083	Salmon River	AD
1987	Skamania R.	Oak Springs	smolt	05/03/88	--	4.3	3,999	Salmon River	AD
1987	Skamania R.	Oak Springs	smolt	05104188	--	4.4	15,092	Salmon River	AD
1987	Skamania R.	Oak Springs	smolt	05/03/88	05/05/88	4.5	14,805	Salmon River	AD
1987	Skamania R.	Oak Springs	smolt	05/03/88	--	4.2	10,101	Still Creek	AD
1987	Skamania R.	Oak Springs	smolt	05/04/88	--	4.4	4,994	Still Creek	AD
1987	Skamania R.	Oak Springs	smolt	05103188	--	4.3	5,010	Zigzag River	AD
1988	Skamania R.	Gnat Creek	smolt	01123189	--	14.0	26,813	Roslyn Lake	--
1988	Skamania R.	Oak Springs	smolt	05/02/89	--	5.3	9,897	Salmon River	AD
1988	Skamania R.	Oak Springs	smolt	04/24/89	--	5.8	20,039	Salmon River	--
1988	Skamania R.	Oak Springs	smolt	04/25/89	--	5.9	9,322	Salmon River	--
1988	Skamania R.	Oak Springs	smolt	04/25/89	--	5.9	7,670	Salmon River	AD
1988	Skamania R.	Oak Springs	smolt	04125189	--	5.9	5,161	Still Creek	AD
1988	Skamania R.	Oak Springs	smolt	04124189	--	5.8	9,452	Zigzag River	AD
1988	Skamania R.	Oak Springs	smolt	04/24/89	--	6.0	5,638	Zigzag River	AD
1989	Skamania R.	Dak Springs	smolt	04/30/90	05/01/90	5.4	15,714	Salmon River	AD
1989	Skamania R.	Oak Springs	smolt	05/02/90	05/03/90	5.5	9,680	Salmon River	AD

Table 1 (TR). (cont.) Hatchery summer steelhead releases into the Sandy River subbasin by brood year and, if marked, coded wire tag code[a].

Brood Year	stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CUT Fin Clip	Code/
						5.8				
1989	Skamania R.	Oak Springs	smolt	05/03/90	05/04/90	6.0	16,733	Salmon River	AD	
1989	Skamania R.	Oak Springs	smolt	05/03/90	05/07/90		18,900	Salmon River	AD	
1989	Skamania R.	Oak Springs	smolt	05/01/90	--	:-:	5,022	Still Creek	AD	
1989	Skamania R.	Oak Springs	smolt	05/04/90	--		4,988	Still Creek	AD	
1989	Skamania R.	Oak Springs	smolt	05/02/90	--	5:5	5,115	Zigzag River	AD	
1989	Skamania R.	Oak Springs	smolt	05/07/90	--	5.3	5,280	Zigzag River	AD	
1990	Skamania R.	Oak Springs	smolt	04/11/91	--	5.4	5,353	Salmon River	AD	
1990	Skamania R.	Oak Springs	smolt	04/08/91	04/11/91		22,464	Salmon River	AD	
1990	Skamania R.	Oak Springs	smolt	04/09/91	04/12/91	5.5	31,844	Salmon River	AD	
1990	Skamania R.	Oak Springs	smolt	04/08/91	04/11/91	5.4	10,530	Still Creek	AD	
1990	Skamania R.	Oak Springs	smolt	04/08/91	04/10/91	5.2	10,244	Zigzag River	AD	

a Modified from Oregon Department of Fish and Wildlife (unpublished data); and Oregon Department of Fish and Wildlife's hatchery production database.

b D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded uire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

REFERENCES

Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Sandy River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

SANDY RIVER SUBBASIN

Naturally Produced Winter Steelhead (late run)

GEOGRAPHIC LOCATION

The Sandy River originates in the Reid, Sandy, and Zigzag glaciers on the west slope of Mt. Hood, and flows into the Columbia River at River Mile (RM) 120.5 (see SANDY RIVER SUBBASIN, Naturally Produced Spring Chinook Salmon, Figure 1). Major tributaries of the Sandy River include the Bull Run, Zigzag, and Salmon rivers. The Sandy system drains an area of 508 square miles (Oregon Department of Fish and Wildlife 1990).

ORIGIN

Late spawning winter steelhead are native to the Sandy River subbasin (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Native winter steelhead utilize the mainstem Sandy and tributaries above Marmot Dam for spawning and rearing (Oregon Department of Fish and Wildlife 1990). The Salmon River system supports a considerable amount of wild winter steelhead production (Oregon Department of Fish and Wildlife 1990). Some spawning and rearing of native stock occurs in the subbasin below Marmot Dam, although the extent is unknown (Oregon Department of Fish and Wildlife 1990). Available spawning and rearing habitat in the Sandy River subbasm is rated as primarily of "excellent" and "good" quality (Tables 1 and 2).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and 'uvenile emigration were reported in Oregon Department of Fish and Wildlife (1940) and are presented in Figure 1. The methodology used to generate these approximations is unknown.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of native winter steelhead harvest are not available, estimates by run year are available in Wagner (1967, cited by Howell et al. 1985). Run year specific estimates for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Although information on the run timing of native winter steelhead is not available, mformation on run timing for the combined escapement of naturally and hatchery produced fish is available in Oregon Department of Fish and Wildlife (1990).

Numbers: Although brood year specific estimates of run size for native winter steelhead are not available, estimates by run year are available in Wagner (1967, cited by Howell et al. 1985). Run year specific estimates for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Numbers: Although brood year specific estimates of spawner escapement for native winter steelhead are not available, estimates by run year are available in Wagner (1967, cited by Howell et al. 1985). Run year specific estimates for the combined spawner escapement of naturally and hatchery produced fish are available in Howell et al. (1985), Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990), and in Portland General Electric (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

JUVENILE LIFE HISTORY

Age Structure

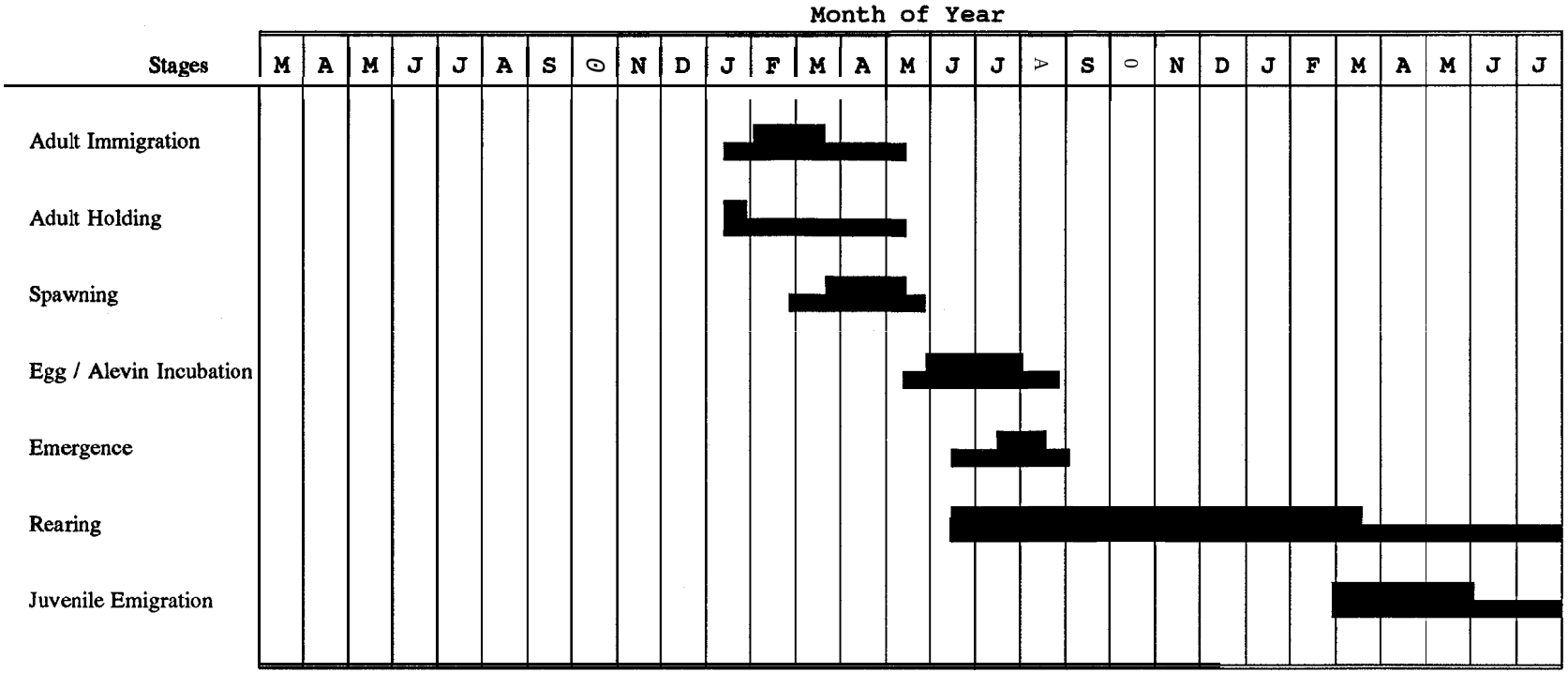
An analysis of scale samples collected from almost 200 wild adult winter steelhead returning to the Salmon and Sandy rivers in the 1985-86 and 1987-88 run years showed that 79% of the adults had spent 2 years rearing in freshwater and the other 21% had spent 3 years in freshwater (Oregon Department of Fish and Wildlife 1990). Winter steelhead have been observed to outmigrate as fry and as 4 year old smolts (Oregon Department of Fish and Wildlife 1990).

BIOCHEMICAL-GENETIC CHARACTERISTICS

Juvenile winter steelhead were collected from the Sandy River in 1984 and analyzed electrophoretically at selected protein-coding loci (Schreck et al. 1985). Relative allele frequencies and allele mobilities were determined for 21 loci (Appendix Table 4). One rare allele was detected, at the malate dehydrogenase-B3,4 locus.

Schreck et al. (1986) classified Columbia River Basin steelhead into several clusters of similar stocks based on biochemical, morphological and life history characters. Columbia River Basin steelhead stocks segregated into two primary groups, those from west of the Cascade Mountains and those from east of the Cascades. As expected, wild winter steelhead from the Sandy River clustered with other stocks from west of the Cascades. This primary group was composed of 3 subgroups. At the subgroup level, wild Sandy River winter steelhead were found to be more similar to wild winter steelhead stocks from the Hood, McKenzie, and 4 Washington rivers (along with 2 hatchery winter steelhead

stocks, and 2 wild summer steelhead stocks) than to other steelhead from west of the Cascades. This subgroup was characterized by the greatest average head width, the highest average number of anal fin rays and branchiostegal rays, and the lowest average frequencies of the common malate dehydrogenase (NADP+) and glucose phosphate isomerase alleles.



N s:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activi
3. Sources for immigration, spawning, rearing, and emigration were Willis, 1962, and Niska and Willis, 1963.
4. ncubation and emergence were derived using average subbasin water temperatures and STEP temperature unit guidelines

Figure 1 (TT). Native winter steelhead freshwater life history in the Sandy River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (HB-1). Estimated amount of spawning and rearing habitat by quality of Sandy River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	49.0	37.4	12.5	1.1	--	164.1	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

Table 2 (HB-2). Estimated amount of rearing only habitat by quality of Sandy River subbasin winter steelhead production area[a].

Distance/ Area	Excellent	Good	Fair[b]	Poor[b]	Unknown	Total	Confi-dence
Miles (%)	0.0	0.0	0.0	0.0	--	0.0	--
Acres (%)	--	--	--	--	--	--	--

[a] Modified from Northwest Power Planning Council's presence/absence database.

[b] Ratings of fair and poor habitat quality may reflect natural physical features such as waterfall barriers, as well as degradation caused by humans.

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Howell, P.J., K. Jones, D. Scarnecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume II: steelhead stock summaries, stock transfer guidelines-information needs. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

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SANDY RIVER SUBBASIN

Naturally Produced Winter Steelhead (early run)

ORIGIN

Natural production of early spawning winter steelhead occurs as a result of releases of hatchery fish (see SANDY RIVER SUBBASIN, Hatchery Produced Winter Steelhead; Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Naturally produced early run winter steelhead spawn and rear in the Sandy River subbasin both above and below Marmot Dam (Oregon Department of Fish and Wildlife 1990). For a summarized description of the quality of the available winter steelhead spawning and rearing habitat, see SANDY RIVER SUBBASIN, Naturally Produced Winter Steelhead (late run), DISTRIBUTION, Subbasin.

PRODUCTION

Harvest

Sport

Subbasin: Although brood year specific estimates of early run winter steelhead harvest are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Although information on run timing for naturally produced early run winter steelhead is not available, information for the combined run of naturally and hatchery produced fish is available in Oregon Department of Fish and Wildlife (1990).

Numbers: Although brood year specific estimates of run size for naturally produced early run winter steelhead are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

Spawning Area

Numbers: Although brood year specific estimates of spawner escapement for naturally produced early run winter steelhead are not available, estimates by run year for the combined spawner escapement of naturally and hatchery produced fish are available in Howell et al. (1985), Oregon Department of Fish and Wildlife (unpublished data, cited by

Oregon Department of Fish and Wildlife 1990), and in Portland General Electric (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

REFERENCES

Howell, P.J., K. Jones, D. Scamecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids, volume II: steelhead stock summaries, stock transfer guidelines-information needs. Final Report of Oregon Department of Fish and Wildlife, Washington Department of Fisheries, Washington Department of Game, and Idaho Department of Fish and Game (Project 83-335, Contract DE-AI79-84BP12737) to Bonneville Power Administration, Portland, Oregon.

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SANDY 90

SANDY RIVER SUBBASIN

Hatchery Produced Winter Steelhead

ORIGIN

Historic releases of winter steelhead in the Sandy River subbasin have been primarily of Big Creek stock, with infrequent releases of Cedar Creek and Alsea stocks. Currently, Big Creek and Eagle Creek winter steelhead stocks are released into the subbasin (Table 1).

Eagle Creek stock is released to mitigate for habitat which was lost due to the construction of the Bull Run Powerhouse and dams which formed the Bull Run reservoirs. Both Big Creek and Eagle Creek stocks are released to provide increased recreational fishing opportunities (Oregon Department of Fish and Wildlife 1990).

DISTRIBUTION

Subbasin

Prior to 1964, hatchery winter steelhead were released exclusively above Marmot Dam. From 1964-88, hatchery winter steelhead were released both above and below the dam. Currently, hatchery winter steelhead smolts are released into the Sandy River mainstem below Marmot Dam (Oregon Department of Fish and Wildlife 1990). Smolts have been released primarily in April and May (Table 1).

Approximations of the temporal distribution of adult immigration, adult holding, spawning, incubation, emergence, rearing, and juvenile emigration were reported in Oregon Department of Fish and Wildlife (1990) and are presented in Figure 1. Estimates are for Big Creek stock winter steelhead that spawn and rear in the wild. The methodology used to generate these approximations is unknown.

PRODUCTION

Releases

Egg

There are no records of releases in the subbasin.

Fry

In 1983, 22,950 fry were released into the subbasin at a size of 1,700 fish per pound (Table 1).

Fingerling

Prior to the 1965 brood year, the life stage at which hatchery winter steelhead were released is unknown. Hatchery facilities in which fingerlings were reared or acclimated prior to release in the subbasin include Eagle Creek National Fish Hatchery and Gnat Creek Hatchery (Table 1). Annual numbers released since 1965 ranged from 20,366 to 24,431 fish (Table 1). Size at release ranged from 41.0 to 24.0 fish per pound (Table 1).

Smolt

Prior to the 1965 brood year, the life stage at which hatchery winter steelhead were released is unknown. Big Creek Hatchery supplied the majority of winter steelhead smolts for release into the Sandy River subbasin through the 1983 brood year. Since then, Gnat Creek and Clackamas hatcheries have supplied Big Creek and Eagle Creek stocks, respectively, for release (Table 1). Annual numbers released since 1965 ranged from 119,032 to 236,664 fish (Table 1). Size at release ranged from 11.4 to 3.0 fish per pound (Table 1).

Adult

There are no records of releases in the subbasin.

Harvest

Sport

Subbasin: Although brood year specific estimates of sport harvest for hatchery winter steelhead are not available, estimates by run year for the combined sport harvest of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (unpublished data, cited by Oregon Department of Fish and Wildlife 1990).

ADULT LIFE HISTORY

Escapement

Subbasin

Timing: Although information on run timing for hatchery winter steelhead is not available, information for the combined run of naturally and hatchery produced fish is available in Oregon Department of Fish and Wildlife 1990).

Numbers: Although brood year specific estimates of run size for hatchery winter steelhead are not available, estimates by run year for the combined escapement of naturally and hatchery produced fish are available in Oregon Department of Fish and Wildlife (1990).

JUVENILE LIFE HISTORY

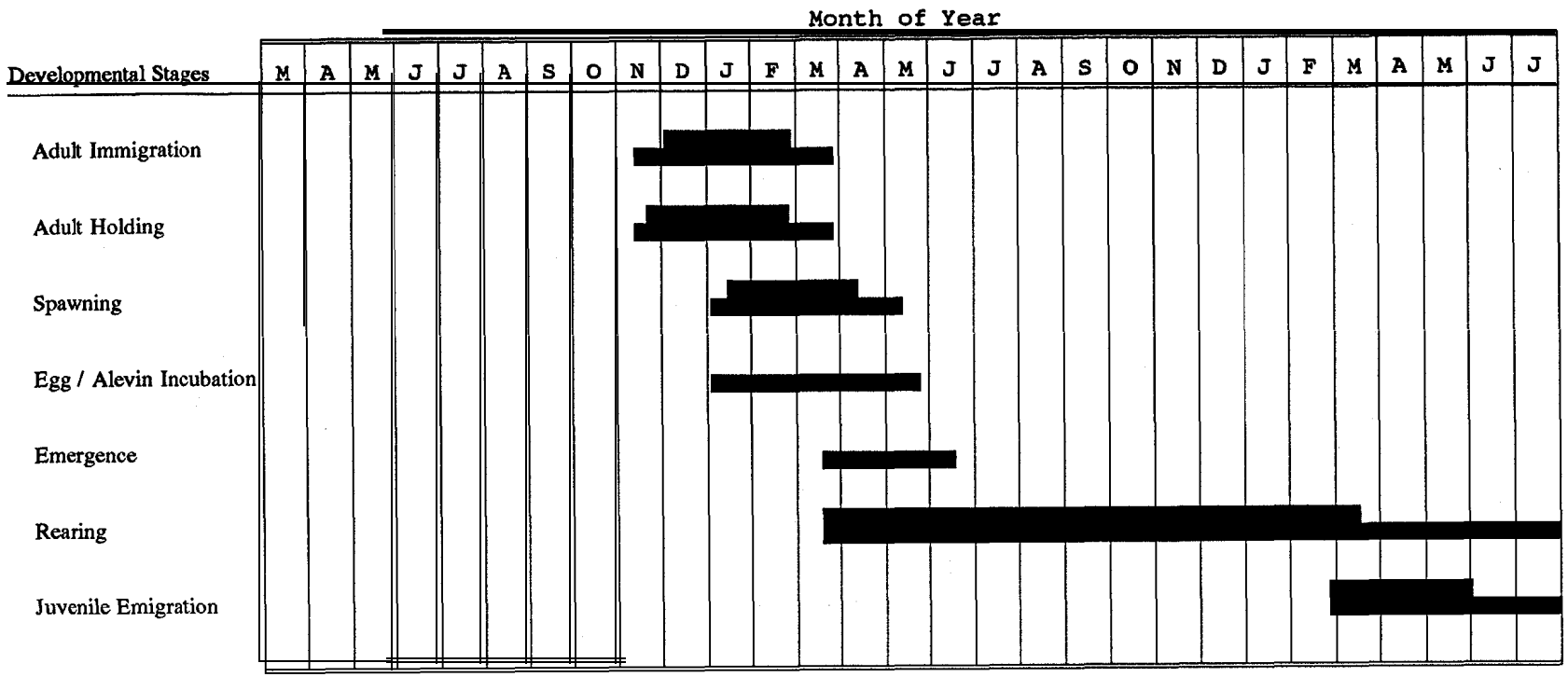
Age Structure

Hatchery winter steelhead are released as age 1+ smolts (i.e. 12-14 months after hatching) and are assumed to outmigrate immediately after release (Oregon Department of Fish and Wildlife 1990).

DISEASES

There are no hatchery facilities in the Sandy River subbasin that currently hold or rear hatchery winter steelhead prior to release in the subbasin. For information on parasites and disease agents of subbasin hatchery production that is held or reared at hatchery facilities

located outside of the subbasin see LOWER COLUMBIA RIVER SUBBASIN, Hatchery Produced Winter Steelhead, DISEASES.



Notes:

1. The developmental stage timing represents basin wide averages, local conditions may cause some variability.
2. Narrow bars indicate periods of light to moderate activity for a given life history stage. Wide bars indicate heavier activity.
3. Source: Howell et al. 1985.
4. Considerable overlap now occurs between the run of Big Creek Hatchery stock and the wild stock.
5. The hatchery stock emigrates as yearling smolts.

Figure 1 (TT). Winter steelhead (Big Creek stock) freshwater life history in the Sandy River subbasin (Oregon Department of Fish and Wildlife 1990).

Table 1 (TR). Hatchery releases of winter steelhead into the Sandy River subbasin by brood year and if marked, by coded wire tag code'.

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ Lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1954	--	--	--	01/01/55	12/31/55[c]	--	82,937	Sandy River subbasin	—
1955	Chambers Cr,WA	--	--	01/01/56	12/31/56[c]	--	78,279	Sandy River subbasin	—
1956	Alsea	--	--	01/01/57	12/31/57[c]	--	77,194	Sandy River subbasin	--
1957	Alsea	--	--	01/01/58	12/31/58[c]	--	57,623	Sandy River subbasin	--
1958	Alsea,Eagle Cr	--	--	01/01/59	12/31/59[c]	--	83,462	Sandy River subbasin	—
1959	d	--	--	01/01/60	12/31/60[c]	--	76,908	Sandy River subbasin	--
1960	d	--	--	01/01/61	12/31/61[c]	--	90,481	Above Marmot Dam	--
1961	d	--	—	01/01/62	12/31/62[c]	--	8,500	Above Marmot Dam	--
1961	d	--	—	01/01/62	12/31/62[c]	--	168,345	Below Marmot Dam	--
1962	e	--	—	01/01/63	12/31/63[c]	--	207,688	Above Marmot Dam	—
1963	e	--	—	01/01/64	12/31/64[c]	--	122,357	Above Marmot Dam	—
1963	e	--	--	01/01/64	12/31/64[c]	--	77,979	Below Marmot Dam	—
1964	e	--	--	01/01/65	12/31/65[c]	--	100,958	Above Marmot Dam	--
1964	e	--	--	01/01/65	12/31/65[c]	--	97‘847	Below Marmot Dam	--
1965	Alsea	Alsea	smolt	05/09/66	05/10/66	9.2	80,081	Sleepy Hollow Br.	LP
1965	Alsea	Alsea	smolt	05/12/66	--	10.0	20,000	Sleepy Hollow Br.	LP
1965	Alsea	Alsea	smolt	05/17/66	05/20/66	9.3	58,462	Sleepy Hollow Br.	LP
1966	Alsea	Alsea	smolt	03/29/67	--	7.8	10,000	Sleepy Hollow Br.	RP
1966	Alsea	Alsea	smolt	04/03/67	04/26/67	8.0	67,920	Sleepy Hollow Br.	RP
1966	Alsea	Alsea	smolt	04/04/67	04/24/67	7.8	70,072	Brightwood Br.	RP
1966	Big Cr	Big Cr	smolt	05/23/67	--	9.3	5,003	Brightwood Br.	RP
1966	Big Cr	Big Cr	smolt	05/22/67	--	9.3	10,044	Sleepy Hollow Br.	RP
1967	Big Cr	Big Cr	smolt	05/08/68	05/10/68	8.3	71,875	Sleepy Hollow Br.	LP
1967	Big Cr	Big Cr	smolt	05/15/68	05/16/68	9.9	31,689	Dodge Park	LP
1967	Big Cr	Big Cr	smolt	05/08/68	05/14/68	9.2	31,407	Revenue Br.	LP
1967	Big Cr	Big Cr	smolt	05/13/68	05/14/68	9.9	20,877	Oxbow Park	LP
1968	Big Cr	Big Cr	smolt	05/12/69	05/13/69	7.2	25,860	Revenue Br.	RP
1968	Big Cr	Big Cr	smolt	05/13/69	05/15/69	7.7	17,592	Dodge Park	RP
1968	Big Cr	Big Cr	smolt	05/12/69	05/15/69	8.2	79,915	Sleepy Hollow Br.	RP
1968	Big Cr	Big Cr	smolt	05/13/69	05/14/69	7.9	29,427	Gordon Cr.	RP
1969	Big Cr	Big Cr	smolt	05/11/70	--	6.7	16,080	Gordon Cr.	LP
1969	Big Cr	Big Cr	smolt	05/28/70	05/29/70	6.8	49,508	Dodge Park	LP
1969	Big Cr	Big Cr	smolt	05/19/70	05/29/70	6.8	87,242	Sleepy Hollow Br.	LP
1969	Big Cr	Big Cr	smolt	06/01/70	06/04/70	6.5	18,868	Revenue Br.	LP
1970	Big Cr	Big Cr	smolt	04/26/71	04/29/71	11.3	56,152	Sleepy Hollow Br.	RP
1970	Big Cr	Big Cr	smolt	04/30/71	--	11.3	29,388	Revenue Br.	RP
1970	Big Cr	Big Cr	smolt	04/29/71	04/30/71	11.4	23,309	Dodge Park	RP
1970	Big Cr	Big Cr	smolt	04/29/71	04/30/71	10.7	30,528	Oxbow Park	RP
1970	Big Cr	Big Cr	smolt	05/03/71	--	7.2	17,928	Sleepy Hollow Br.	RP

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1971	Big Cr	Big Cr	smolt	04/17/72	04/19/72	7.0	23,274	Revenue Br.	LP
1971	Big Cr	Big Cr	smolt	04/18/72	··	7.0	12,247	Oxbow Park	LP
1971	Big Cr	Big Cr	smolt	04/17/72	04/19/72	6.7	60,546	Sleepy Hollow Br.	LP
1971	Big Cr	Big Cr	smolt	04/21/72	04/26/72	6.0	27,078	Dodge Park	LP
1971	Big Cr	Big Cr	smolt	04/20/72	··	7.3	36,500	Gordon Cr.	LP
1972	Big Cr	Big Cr	smolt	04/20/73		7.2	24,159	Oxbow Park	RP
1972	Big Cr	Big Cr	smolt	04/30/73	··	6.5	20,148	Revenue Br.	RP
1972	Big Cr	Big Cr	smolt	05/10/73	··	3.0	8,750	Sleepy Hollow Br.	RP
1972	Big Cr	Big Cr	smolt	05/10/73	··	3.5	6,560	Dodge Park	RP
1972	Big Cr	Big Cr	smolt	05/02/73	··	7.2	21,733	Oxbow Park	RP
1972	Big Cr	Big Cr	smolt	05/07/73	··	6.8	8,024	Revenue Br.	RP
1972	Big Cr	Big Cr	smolt	05/04/73	05/07/73	6.8	34,638	Sleepy Hollow Br.	RP
1972	Big Cr	Big Cr	smolt	05/09/73	··	6.6	34,648	Dodge Park	RP[f]
1973	Big Cr	Big Cr	smolt	04/29/74	05/02/74	5.7	30,098	Revenue Br.	LP[f]
1973	Big Cr	Big Cr	smolt	04/30/74	05/02/74	5.8	49,688	Sleepy Hollow Br.	LP[f]
1973	Big Cr	Big Cr	smolt	04/29/74	··	6.5	11,376	Oxbow Park	LP[f]
1973	Big Cr	Big Cr	smolt	04/29/74	05/01/74	6.5	40,684	Dodge Park	LP[f]
1973	Cedar Cr	Cedar Cr	smolt	04/04/74	04/05/74	6.1	47,542	Oxbow Park	LP[f]
1974	Big Cr	Big Cr	smolt	04/30/75	··	6.2	69,614	Sleepy Hollow Br.	RP[f]
1974	Big Cr	Big Cr	smolt	04/29/75		6.9	21,389	Oxbow Park	RP[f]
1974	Big Cr	Big Cr	smolt	04/29/75	··	6.9	19,712	Dodge Park	RP[f]
1974	Big Cr	Big Cr	smolt	05/01/75	··	6.7	49,412	Revenue Br.	RP[f]
1975	Big Cr	Big Cr	smolt	05/10/76	05/12/76	7.3	21,329	Dodge Park	--
1975	Big Cr	Big Cr	smolt	05/10/76	05/12/76	7.4	46,296	Revenue Br.	--
1975	Big Cr	Big Cr	smolt	05/10/76	05/14/76	7.4	89,293	Sleepy Hollow Br.	--
1975	Big Cr	Big Cr	smolt	05/12/76	05/13/76	7.3	33,077	Oxbow Park	--
1976	Big Cr	Gnat Cr	smolt	05/11/77	··	6.7	12,730	Oxbow Park	--
1976	Big Cr	Gnat Cr	smolt	05/05/77	05/10/77	6.3	49,172	Revenue Br.	--
1976	Big Cr	Gnat Cr	smolt	05/04/77	05/10/77	6.6	82,748	Sleepy Hollow Br.	--
1976	Big Cr	Gnat Cr	smolt	05/10/77	··	6.6	31,115	Dodge Park	--
1977	gig Cr	Big Cr	smolt	04/10/78	05/11/78	7.2	75,510	Sleepy Hollow Br.	--
1977	Big Cr	Big Cr	smolt	04/10/78	05/11/78	6.8	51,267	Kubitz Rd.	--
1977	Big Cr	Big Cr	smolt	05/08/78	05/09/78	6.9	40,544	Dodge Park	--
1977	Big Cr	Big Cr	smolt	05/14/78	05/17/78	5.2	48,251	Oxbow Park	--
1978	Big Cr	Big Cr	smolt	04/17/79	04/17/79	6.5	30,335	Oxbow Park	--
1978	Big Cr	Big Cr	smolt	04/19/79	04/23/79	6.4	44,440	Sleepy Hollow Br.	--
1978	Big Cr	Big Cr	smolt	04/15/79	04/18/79	5.9	28,054	Dodge Park	--
1978	Big Cr	Big Cr	smolt	04/19/79	04/20/79	6.3	19,833	Kubitz Rd.	--

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1979	Big Cr[g]	Gnat Creek	smolt	04/16/80	04/22/80	6.1	29,518	Sandy River	
1979	Big Cr[g]	Gnat Creek	smolt	04/11/80	04/16/80	6.3	25,712	Sandy River	--
1979	Big Cr[g]	Gnat Creek	smolt	04/21/80	04/24/80	6.5	11,863	Sandy River	
1979	Big Cr[g]	Gnat Creek	smolt	04/21/80	··	6.6	5,610	Sandy River	··
1979	Big Cr[g]	Gnat Creek	smolt	04/16/80	04/24/80	6.8	13,532	Sandy River	··
1979	Big Cr[g]	Gnat Creek	smolt	04/16/80	04/18/80	7.0	41,720	Sandy River	
1979	Big Cr[g]	Gnat Creek	smolt	04/23/80		7.2	6,588	Sandy River	··
1979	Big Cr[g]	Gnat Creek	smolt	04/17/80	04/18/80	7.3	35,712	Sandy River	··
1979	Big Cr[g]	Gnat Creek	smolt	04/24/80	··	7.4	6,216	Sandy River	··
1979	Big Cr[g]	Gnat Creek	smolt	04/17/80		7.5	6,802	Sandy River	
1980	Big Cr[g]	Clackamas	smolt	04/13/81		5.6	2,152	Sandy River	··
1980	Big Cr[g]	Gnat Creek	smolt	05/04/81		4.7	4,912	Sandy River	
1980	Big Cr[g]	Gnat Creek	smolt	05/04/81		4.8	15,384	Sandy River	··
1980	Big Cr[g]	Gnat Creek	smolt	05/05/81		4.9	15,827	Sandy River	··
1980	Big Cr[g]	Gnat Creek	smolt	05/08/81		5:o	4,250	Sandy River	··
1980	Big Cr[g]	Gnat Creek	smolt	05/04/81		5.5	4,453	Sandy River	
1980	Big Cr[g]	Gnat Creek	smolt	05/05/81	··	5.6	9,201	Sandy River	
1980	Big Cr[g]	Gnat Creek	smolt	05/04/81	05/08/81	5.8	26,049	Sandy River	··
1980	Big Cr[g]	Gnat Creek	smolt	05/05/81	··	5.9	22,304	Sandy River	··
1980	Big Cr[g]	Gnat Creek	smolt	05/08/81	05/11/81	6.2	9,727	Sandy River	··
1980	Big Cr[g]	Gnat Creek	smolt	05/08/81		6.3	5,078	Sandy River	
1980	Big Cr[g]	Gnat Creek	smolt	05/06/81		6.7	9,179	Sandy River	··
1980	Big Cr[g]	Gnat Creek	smolt	05/06/81	··	6.8	18,190	Sandy River	··
1980	Big Cr[g]	Gnat Creek	smolt	05/06/81	··	6.9	25,537	Sandy River	··
1980	Big Cr[g]	Gnat Creek	smolt	05/07/81	··	7.1	23,570	Sandy River	··
1981	Big Cr[g]	Gnat Creek	smolt	04/22/82		5.0	7,750	Sandy River	
1981	Big Cr[g]	Gnat Creek	smolt	04/21/82	··	5.1	13,894	Sandy River	--
1981	Big Cr[g]	Gnat Creek	smolt	05/03/82	··	5.2	4,420	Sandy River	··
1981	Big Cr[g]	Gnat Creek	smolt	04/26/82	··	5.3	4,133	Sandy River	··
1981	Big Cr[g]	Gnat Creek	smolt	04/26/82	04/27/82	5.7	13,277	Sandy River	··
1981	Big Cr[g]	Gnat Creek	smolt	05/03/82	05/04/82	6.0	10,794	Sandy River	··
1981	Big Cr[g]	Roaring River	smolt	04/27/82		5.6	12,712	Sandy River	
1981	Big Cr[g]	Roaring River	smolt	04/02/82	04/27/82	5.7	21,393	Sandy River	··
1981	Big Cr[g]	Roaring River	smolt	04/22/82	04/23/82	6:0	30,659	Sandy River	··
1982	Big Cr[g]	Gnat Creek	smolt	05/02/83	05/04/83	5.0	26,212	Sandy River	··
1982	Big Cr[g]	Gnat Creek	smolt	05/02/83	··	5.1	5,304	Sandy River	··
1982	Big Cr[g]	Gnat Creek	smolt	05/02/83	05/04/83	5.2	10,399	Sandy River	··
1982	Big Cr[g]	Gnat Creek	smolt	05/02/83	··	5.3	6,359	Sandy River	··
1982	Big Cr[g]	Gnat Creek	smolt	05/04/83	05/05/83	5.4	15,535	Sandy River	··
1982	Big Cr[g]	Gnat Creek	smolt	05/03/83	05/06/83	5.6	34,009	Sandy River	··
1982	Big Cr[g]	Gnat Creek	smolt	05/10/83	··	5.7	4,155	Sandy River	··

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1982	Big Cr[g]	Gnat Creek	smolt	05/03/83	05/05/83	5.9	10,501	Sandy River	
1982	Big Cr[g]	Gnat Creek	smolt	05/05/83	05/11/83	6.0	27,540	Sandy River	..
1982	Big Cr[g]	Gnat Creek	smolt	05/02/83	05/03/83	6.1	15,490	Sandy River	
1982	Big Cr[g]	Gnat Creek	smolt	05/09/83	..	6.2	10,602	Sandy River	..
1982	Big Cr[g]	Gnat Creek	smolt	05/11/83	--	6.3	4,599	Sandy River	..
1982	Big Cr[g]	Gnat Creek	smolt	05/16/83	05/17/83	6.4	23,328	Sandy River	
1982	Big Cr[g]	Roaring River	smolt	05/18/83	..	4.8	15,349	Sandy River	..
1983	USFWS[h]	STEP	fry	05/01/83	..	1,700	22.950	Beaver Creek	..
1983	Big Cr[g]	Gnat Creek	smolt	05/07/84	..	5.3	18,020	Sandy River	..
1983	Big Cr[g]	Gnat Creek	smolt	05/07/84	..	5.9	5,536	Sandy River	..
1983	Big Cr[g]	Gnat Creek	smolt	05/09/84	05/10/84	6.1	42,735	Sandy River	..
1983	Big Cr[g]	Gnat Creek	smolt	05/03/84	05/04/84	6.4	26,076	Sandy River	..
1983	Big Cr[g]	Gnat Creek	smolt	05/03/84	..	6.5	33,338	Sandy River	..
1983	Big Cr[g]	Gnat Creek	smolt	05/04/84	..	6.6	4,421	Sandy River	
1983	Big Cr[g]	Gnat Creek	smolt	05/04/84	05/16/84	6.7	35,565	Sandy River	..
1983	Big Cr[g]	Gnat Creek	smolt	04/26/84	--	6.9	27,458	Sandy River	..
1984	Big Cr[g]	Gnat Creek	smolt	05/21/85	05/22/85	4.8	17,952	Sandy River	..
1984	Big Cr[g]	Gnat Creek	smolt	05/10/85	05/24/85	4.9	9,358	Sandy River	..
1984	Big Cr[g]	Gnat Creek	smolt	05/10/85	05/28/85	5.0	82,270	Sandy River	..
1984	Big Cr[g]	Gnat Creek	smolt	05/14/85	05/24/85	5.1	51,194	Sandy River	..
1984	Big Cr[g]	Gnat Creek	smolt	05/17/85	..	5.2	4,784	Sandy River	..
1984	Big Cr[g]	Gnat Creek	smolt	05/20/85	..	5.4	22,756	Sandy River	..
1984	Big Cr[g]	Gnat Creek	smolt	05/17/85	..	5.5	4,508	Sandy River	..
1985	Big Cr[g]	Gnat Creek	smolt	04/16/86	..	4.7	6,344	Sandy River	AD
1985	Big Cr[g]	Gnat Creek	smolt	04/18/86	04/25/86	4.9	21,668	Sandy River	AD
1985	Big Cr[g]	Gnat Creek	smolt	04/28/86	..	5.0	6,750	Sandy River	..
1985	Big Cr[g]	Gnat Creek	smolt	04/15/86	04/29/86	5.0	95,689	Sandy River	AD
1985	Big Cr[g]	Gnat Creek	smolt	04/17/86	..	5.1	4,998	Sandy River	AD
1985	Big Cr[g]	Gnat Creek	smolt	04/14/86	04/15/86	5.2	33,446	Sandy River	AD
1985	Big Cr[g].	Gnat Creek	smolt	04/23/86	..	5.3	6,747	Sandy River	AD
1985	Unknown!	Clackamas	smolt	05/14/86	..	5.6	10,051	Sandy River	..
1985	Unknown!	Clackamas	smolt	05/14/86	..	5.7	10,088	Sandy River	..
1985	Unknown!	Clackamas	smolt	05/13/86	..	5.8	5,017	Sandy River	..
1985	Unknown;	Clackamas	smolt	05/13/86	..	5.9	10,119	Sandy River	..
1985	Unknown	Clackamas	smolt	05/13/86	..	6.0	5,009	Sandy River	..
1986	Big Cr[g]	Gnat Creek	smolt	04/06/87	04/17/87	5.3	62,692	Sandy River	AD
1986	Big Cr[g]	Gnat Creek	smolt	04/17/87	04/20/87	5.4	37,122	Sandy River	AD
1986	Big Cr[g]	Gnat Creek	smolt	04/13/87	..	5.5	42,412	Sandy River	AD
1986	Big Cr[g].	Gnat Creek	smolt	04/13/87	04/14/87	5.6	38,279	Sandy River	AD
1986	Unknown'	Clackamas	smolt	04/30/87	..	5.9	11,640	Sandy River	AD

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

Brood Year	Stock	Hatchery	Life Stage	Release Date (1)	Release Date (2)	Fish/ lb	Number Released	Release Location	CWT Code/ Fin Clip[b]
1986	Unknown!	Clackamas	smolt	04/30/87	··	6.0	5,206	Sandy River	AD
1986	Unknown'	Clackamas	smolt	04/30/87	··	6.4	16,799	Sandy River	AD
1987	Big Crg	Gnat Creek	smolt	04/11/88	04/15/88	5.7	77,985	Sandy River	AD
1987	Big Crg	Gnat Creek	smolt	04/18/88	··	6.0	43,138	Sandy River	AD
1987	Big Crg	Gnat Creek	smolt	04/18/88	··	6.0	6,660	Sandy River	RD
1987	Big Crg	Gnat Creek	smolt	04/13/88	04/14/88	6.3	42,456	Sandy River	AD
1987	Big Crg	Gnat Creek	smolt	04/14/88	04/15/88	6.4	47,676	Sandy River	AD
1988	Big Crg	Gnat Creek	smolt	04/06/89	04/07/89	4.9	45,572	Sandy River	AD
1988	Big Crg	Gnat Creek	smolt	04/05/89	04/06/89	5.0	38,592	Sandy River	AD
1988	Big Crg	Gnat Creek	smolt	04/06/89	··	5.1	35,863	Sandy River	AD
1988	Big Crg.	Gnat Creek	smolt	04/03/89	04/05/89	5.3	78,588	Sandy River	AD
1988	Unknown'	Clackamas	smolt	04/24/89	··	6.0	29,368	Sandy River	AD
1989	Big Crg	Gnat Creek	fing.	12/19/89	··	41:o	24,431	Roslyn Lake	··
1989	Big Crg	Gnat Creek	smolt	04/25/90	··	5.5	1,540	Sandy River	AD
1989	Big Crg	Gnat Creek	smolt	04/26/90	··	5.6	4,984	Sandy River	AD
1989	Big Crg	Gnat Creek	smolt	04/18/90	04/25/90	5.8	75,145	Sandy River	AD
1989	Big Crg	Gnat Creek	smolt	04/19/90	04/20/90	5.9	48,779	Sandy River	AD
1989	Big Crg	Gnat Creek	smolt	04/20/90	··	6.1	43.998	Sandy River	AD
1989	Big Crg.	Gnat Creek	smolt	04/16/90	04/17/90	6.2	30,628	Sandy River	AD
1989	Unknown'	Clackamas	smolt	04/24/90	··	6.0	31,590	Sandy River	RV
1990	Bagle Creek	Eagle Creek	fing.	12/06/90		24:0	20,366	Roslyn Lake	··
	g	Gnat Creek	smolt	04/15/91		6.0	4,800	Salmon River	AD
1990	Big Crg	Gnat Creek	smolt	04/16/91		5.4	50,111	Sandy River	AD
1990	Big Crg	Gnat Creek	smolt	04/16/91	04/18/91	5.6	45,182	Sandy River	AD
1990	Big Crg	Gnat Creek	smolt	04/15/91	··	5.7	21,570	Sandy River	AD
1990	Big Crg	Gnat Creek	smolt	04/17/91		5.8	39,527	Sandy River	AD
1990	Big Crg.	Gnat Creek	smolt	04/15/91	··	6:0	38,994	Sandy River	AD
1990	Unknown!	Clackamas	smolt	04/22/91	··	5.4	14,899	Sandy River	RV-RM
1990	Unknown!	Clackamas	smolt	04/22/91		5.5	10,009	Sandy River	RV RM
1990	Unknown'	Clackamas	smolt	04/22/91		5.5	4,840	Sandy River	RV-RM

[a] Modified from Oregon Department of Fish and Wildlife (unpublished data); and Oregon Department of Fish and Wildlife's hatchery production database.

[b] D = dorsal fin clip; AD = adipose fin clip; An = anal fin clip; LV = left ventral fin clip; RV = right ventral fin clip; LP = left pectoral fin clip; RP = right pectoral fin clip; LM = left maxillary fin clip; RM = right maxillary fin clip; AD+ = adipose fin clip plus coded wire tag (tag code unknown); AD-CUT = adipose fin clip plus coded wire tag (tag code unknown); FB = freeze brand; CB = cold brand. For cold brands, the location of the brand follows in parentheses, and the content, if known, is listed after a colon. Cold brand locations are described as being on the right or left side of the fish, and in the anterior, dorsal or posterior position. For example, CB(RP):U4 indicates that a cold brand was applied at the right posterior position, and the actual mark was "U4". The "AU" code has not been identified.

(cont.)

Table 1 (TR). (cont.) Hatchery releases of winter steelhead into the Sandy River subbasin by brood year and if marked, by coded wire tag code[a].

c Month(s) and day(s) of release unknown. Standardized to the first and last day of the year.
d Eagle Cr., Big Cr. and Sandy River stocks.
e Eagle Cr., Big Cr., Sandy River and Alsea stocks.
f Fifty percent of the fish released were marked.
g Big Creek Hatchery stock.
h U.S. Fish and Wildlife Service hatchery stock, excluding fish from Hagerman Fish Hatchery; probably Eagle Creek stock.
i Probably Eagle Creek stock (Oregon Department of Fish and Wildlife 1990).

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Oregon Department of Fish and Wildlife. 1990. Willamette River subbasin: Salmon and steelhead production plan (Sandy River). Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon. (Unpublished Draft.)

Appendix Table 1. Snake River chinook electrophoretic data from Waples et al. (1991).

Allele frequency data for 1988 brood-year samples of juvenile Snake River chinook salmon. Locus abbreviations are explained in Table 1. N is the number of fish scored for each locus. Allele mobility designations are explained in text. Alleles screened but not found in any samples are shown in parentheses after locus names.

Locus/ Allele	Marsh Creek	Johnson Creek	Upper Salmon River	Valley Creek	Secesh River	Lostine River	Imnaha River	McCall Hatchery	Sawtooth Hatchery	Looking. Hatchery	Imnaha Hatchery
*sAAT-1,2** (105)											
(N)		96	99	0.9%	91	100	99	100	99	100	100
100	1.000	0.956	0.977		0.995	1.000	1.000	0.998	0.975	1.000	1.000
85	*0.000*	*0.044*	0.023	0.008	0.005	0.000	0.000	0.003	0.025	0.000	0.000
*sAAT-3** (90)											
(N)	100	97		99	92	99	100	100	89	99	98
100	1.000	1.000	0.9969	0.990	1.000	1.000	0.995	1.000	1.000	0.980	1.000
113	0.000	0.000	0.036	0.010	0.000	0.000	0.005	0.000	0.000	0.020	0.000
*sAAT-4** (130)											
(N)	98	86	89	97	*76*	95	98	66	89	92	95
100	0.985	0.919	1.000	1.000	0.967	0.716	0.959	0.919	0.966	*0.978*	0.974
63	0.015	0.081	0.000	0.000	*0.033*	0.264	*0.041*	0.081	*0.034*	*0.022*	*0.026*
*mAAT-1** (-77)											
(N)	100	96	*99*	98	90	96	100	96	100	94	100
-100	1.000	0.990	*1.000*	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.995
-104	0.000	0.010	*0.000*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
*ADA-1**											
(N)		97	99	*99*	*92*	100	100	100	100	100	100
100	0.100	0.985	0.949	0.894	0.842	*0.970*	0.995	0.940	*0.935*	1.000	1.000
83	0.090	0.015	0.051	0.106	0.158	*0.030*	0.005	0.060	*0.065*	0.000	0.000
*ADH** (-170)											
(N)	99	97	99	*99*	92	100	100	100	100	100	100
-100	1.000	1.000	1.000	1.000	1.000	0.985	0.995	1.000	1.000	1.000	1.000
-52	0.000	0.000	0.000	0.000	0.000	0.016	0.005	0.000	0.000	0.000	0.000
*sAH** (69, 108, 116)											
(N)	100	97	99	99	92	100	100	100	100	100	100
100	1.000	1.000	1.000	1.000	1.000	0.995	1.000	0.990	0.995	1.000	0.985
86	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.010	0.005	0.000	0.015
*mAH-2**											
(N)	*99*	*60*		96	84	100	98	89	98	100	100
100	0.884	0.883	0.9%	0.807	0.958	0.900	0.929	0.933	0.918	0.885	0.915
88	0.116	0.117	0.082	0.193	0.042	0.100	0.071	0.067	0.082	0.115	0.085
*mAH-4** (112)											
(N)	100	94	99	99	91	100	100	100	100	100	100
100	1.000	1.000	1.000	1.000	1.000	0.990	0.990	0.985	1.000	1.000	0.990
119	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.015	0.000	0.000	0.010
*GAPDH-2**											
(N)	100	96	99	98	*85*	100	100	100	100	100	100
100	1.000	1.000	1.000	1.000	*1.000*	0.995	1.000	1.000	1.000	1.000	1.000
22	*0.000*	*0.000*	0.000	0.000	*0.000*	*0.005*	0.000	0.000	0.000	0.000	0.000

Appendix Table 1. Cont.

Locus/ Allele	Marsh Creek	Johnson Creek	Upper Salmon River	Valley Creek	Secesh River	Lostine Rivet	Imnaha River	McCall Hatchery	Sawtooth Hatchery	Looking. Hatchery	Imnaha Hatchery
*GAPDH-4**											
(N)	100	77	99	99	78	100	100		80	99	99
100	1.000	1.000	1.000	1.000	0.974	*0,945*	0.995	0.9%	1.000	1.000	1.000
95	*0.000*	*0.000*	*0.000*	*0.000*	*0.026*	*0.055*	*0.005*	*0.013*	0.000	0.000	0.000
*βGLUA**											
(N)	*94*	*92*	*99*	*96*	86	0.9%	100	100	100	97	98
100	1.000	1.000	0.980	0.922	*0.994*		*0.975*	*0.995*	*0.990*	*0.995*	0.908
60	*0.000*	*0.000*	*0.020*	*0.078*	*0.006*	0,031	*0.025*	*0.005*	*0.010*	*0.005*	*0.092*
*GPI-B2** (24 135)											
				99	92	100	99	100	97	100	100
(N)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.859
60	*0.000*	*0.000*	*0.000*	*0.000*	0.000	0.000	0.000	0.000	0.000	0.000	0.141
*GR** (110)											
			99	99	92	100	100	100	100	100	100
(N)	1.000	0.995	1.000	1.000	1.000	0.956	0.995	*0.985*	1.000	1.000	1.000
85	*0.000*	*0.005*	*0.000*	0.000	0.000	*0.045*	*0.005*	0.015	0.000	0.000	0.000
*HAGH**											
(N)	*97*	*66*	*99*	*99*	89	100	100	100	99	99	100
100	0.902	1.000	0.970	0.949	0.955	0.975	0.990	0.960	*0.939*	*0.944*	*0.950*
143	*0.098.*	*0.000*	*0.030*	0.051	*0.046*	*0.025*	0.010	*0.040*	0.061	0.056	0.050
IDDH-1	59	95									
(N)	0.907	1.000	*57*	*74*	*87*	100	*76*	99	*58*	*100*	*90*
100			0.956	0.980	*0.994*	0.980	*0.947*	0.975	*0.897*	*0.960*	*0.978*
0	*0.093*	0.000	0.044	0.020	*0.006*	*0.020*	*0.053*	*0.025*	0.103	0.040	0.022
*sIDHP-1** (83, 129, 142)									100	100	
(N)	*100*	*97*	*99*	*99*	92	100	100	100	0.840	0.920	0.885 100
100	0.870	0.773	0.742	0.848	0.804	0.815	0.835	0.795			
74	0.125	0.216	0.217	0.091	0.196	0.185	0.140	0.205	0.115	0.050	0.175
94	0.015	0.010	0.040	0.061	0.000	0.000	0.025	0.000	0.046	0.030	0.020
*sIDHP-2** (50)											
				99	92	100	100	100	100	100	100
(N)	1.000	0.990	0.975	0.949	1.000	*0.975*	1.000	1.000	0.945	1.000	1.000
127	0.035	0.010	0.025	0.051	0.000	*0.025*	0.000	0.000	0.055	0.000	0.000
*LDH-B1**											
(N)	100	97	99	99	92	99	100	100	100	100	100
100	1.000	0.990	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
48	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
*LDH-B2** (71. 134)											
(N)	100	97	99	99	92	100	100	100	100	100	100
100	0.985	0.995	0.980	0.970	0.973	1.000	1.000	*0.990*	0.995	0.990	1.000
112	0.015	0.005	0.020	0.030	0.027	0.000	0.000	0.010	*0.005*	0.010	0.000
*LDH-C** (90)									97		
(N)	100	97	99	99	92	99	100	100	0.995	1.000 100	1000 100
100	1.000	0.918	1.000	0.995	0.962	1.000	1.000	0.985			
84	0.000	0.082	0.000	0.000	0.038	0.000	0.000	0.0'15	0.005	0.000	0.000
106	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Appendix Table 1. Cont.

Locus/ Allele	Marsh Creek	Johnson Creek	Upper Salmon River	Valley Creek	Secesh River	Lostine River	Imnaha River	McCall Hatchery	Sawtooth Hatchery	Looking. Hatchery	Imnaha Hatchery
*sMDH-B1,2** (83)											
			99	99	92	100	100	100	100	100	100
100	0.900	0.970	0.985	0.944	0.997	0.988	0.985	0.993	0.980	0.993	0.943
121	0.010	0.015	0.013	0.056	0.003	0.013	0.015	0.008	0.020	0.008	0.057
70	0.000	0.005	0.003	*0.000*	*0.000*	*0.000*	0.000	0.001)	0.000	0.000	0.000
*mMDH-1 **											
(N)	92	49	99	99	13	95	*100*	92	100	100	100
-100	1.000	1.000	1.000	1000	1000	1.000	0.995	1.000	1.000	1.000	1.000
-900	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000
*mMDH-2**											
		97			91	100	98	1.00	97	100	99
100	0.6%	0.598	0.485	0..57	0.753	0.735	0.658	0.735	0.526	0.800	0.697
200	0.354	0.402	0.515	0.443	0.247	0.265	0.342	0.265	0.474	0.200	0.303
*sMEP-1** (105)											
	95		99	97	89	96	98	99	99	100	93
100	0.079	0.077	0.030	0.031	0.017	0.052	0.061	0.035	0.010	0.070	0.043
92	0.921	0.923	0.970	0.969	0.983	0.948	0.939	0.965	0.990	0.930	0.957
*sMEP-2**											
(N)	*100*	97	99	99	91	100	*99*	100	100	100	95
100	0.900	0.898	1.000	1.000	0.790	1.000	*1.000*	1.000	1.000	1.000	1.000
78	0.100	0.102	0.000	0.000	0.210	0.000	*0.000*	0.000	0.000	0.000	0.000
*MPI** (113)											
(N)	100	*95*	99	*99*	91	100	100	100	99	100	100
100	0.860	0.989	0.939	0.889	0.967	*0.770*	0.885	0.920	0.884	0.935	0.780
109	0.120	*0.011*	0.061	0.111	0.033	0.225	0.115	0.080	0.116	0.065	0.220
95	*0.000*	0.000	0.000	*0.000*	*0.000*	*0.005*	0.000	0.000	0.000	0.000	0.000
*PEPA** (86)											
(N)	100	97	99	99	92	100	100	100	100	100	100
100	0.995	1.000	1.000	1.000	l.000	1.000	1.000	1.000	0.995	1.000	1.000
90	0.005	*0.000*	*0.000*	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000
*PEPB-1**											
(N)	100	*94*	99	*99*	92	100	100	100	100	100	99
100	0.945	0.856	0.879	*0.904*	0.902	*0.960*	0.915	0.935	0,870	0.805	0.909
130	0.050	0.027	*0.091*	*0.096*	*0.065*	*0.015*	0.050	0.015	0.090	0.095	0.030
-350	*0.006*	0.117	0.030	*0.000*	0.033	0.025	0.035	0.050	0.040	0.100	0.061
*PEPD-2**											
(N)	100	97	99	99	92	100	100	100	100	100	100
100	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.995	1.000	1.000	1.000
107	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000
*PEP-LT**											
(N)	*100*	*97*	*99*	99	92	100	100	100	100	100	100
100	0.870	0.948	0.985	0.919	0.570	0.925	0.965	0.920	0.885	0.945	0.965
110	0.130	0.052	0.015	0.081	0.130	0.075	0.035	0.080	0.115	0.055	0.045
*PGK-2**											
					92	100	100	100	95	100	100
100	0.065	0.067	0.101	0.189	0.152	0.085	0.100	0.110	0.142	0.085	0.120
90	0.936	0.933	*0.899*	0.813	0.848	0.915	0.900	0.890	0.858	0.915	0.880

Appendix Table 1. Cont.

Locus/ Allele	Marsh Creek	Johnson Creek	Upper Salmon River	Valley Creek	Secesh River	Lostine River	Imnaha River	McCall Hatchery	Sawtooth Hatchery	Looking. Hatchery	Imnaha Hatchery
*PGM-3,4** (88, 108)											
(N)	100	97	96	98	92	98	96	99	95	96	100
100	0.285	0.518	9.326	0.375	0.462	0.510	0.484	0.429	0.338	0.295	0.508
94	0.715	0.482	0.674	0.625	0.538	0.490	0.516	0.571	0.662	0.705	0.493
*sSOD-1** (580, 1260)											
(N)	100	97	97	99	90	99	100	100	100	100	100
-100	0.945	0.974	0.964	0.939	0.956	0.919	0.885	0.980	0.965	0.970	0.890
-260	0.055	0.026	0.036	0.061	0.044	0.081	0.115	0.020	0.035	0.030	0.110
*TPI-2.2**											
(N)	100	97	99	99	92	loo	100	100	100	100	100
100	0.910	0.954	0.924	0.894	0.897	0.875	0.825	0.875	0.890	0.915	0.850
194	0.090	0.046	0.076	0.106	0.193	0.125	0.175	0.125	0.110	0.085	0.150

Allele frequencies at GPI-B2 and sMEP-2* are estimated indirectly and thus subject to higher variance than those for other loci; see text for discussion.

Appendix Table 2, Additional Snake River chinook electrophoretic data cited by Naples et. al. (1991)

Temporal comparisons of allele frequency in Snake River chinook salmon populations for which old data are available (Milner et al. 1983; Milner et al. 1986). Brood years for samples are indicated below population names; other details are as in Appendix Table 1.

Locus/ allele	McCall 1981	Hatchery 1988	Johnson 1981	Creek 1988	Valley 1982	Creek 1988	Looking. Hatchery 1988	Rapid River H. 1981+84	Upper Salmon 1981	River 1988	Sawtooth Hatchery 1988
*sAAT-1,2**											
(N)	50	100	66	98	22	97	100	150	50	100	99
100	1.000	0.998	0.964	0.957	0.977	0.992	1.000	1.000	1.000	0.978	0.975
85	0.000	0.003	0.036	0.043	0.023	0.008	0.000	0.000	0.000	0.023	0.025
*sAAT-3**											
(N)	50	100	56	100	22	99	99	150	50	100	89
100	1.000	1.000	1.000	1.000	1.000	0.990	0.980	0.990	1.000	0.965	1.000
113	0.000	0.000	0.000	0.000	0.000	0.010	0.020	0.010	0.000	0.035	0.000
*ADA-1**											
(N)	50	100	56	100	22	99	100	150	48	99	100
100	0.900	0.940	1.000	0.986	0.932	0.894	1.000	0.990	0.969	0.949	0.935
83	0.100	0.060	0.000	0.015	0.068	0.106	0.000	0.010	0.031	0.051	0.065
*sAH**											
(N)	50	100	53	99	22	99	100	148		100	100
100	1.000	0.990	1.000	1.000	1.000	1,000	1.000	0.993	1.05000	1.000	0.995
86	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.005
*GR**											
(N)	50	100	56	100	22	99	100	150	50	100	100
100	1.000	0.985	1.000	0.995	1.000	1.000	1.000	0.997	1.000	1.000	1.000
85	0.000	0.015	0.000	0.005	0.000	0.000	0.000	0.003	0.000	0.000	0.000
*HAGH**											
(N)	50	100	56	68	22	99	99	144	48	100	99
100	0.970	0.960	0.991	1.000	0.955	0.949	0.944	0.913	0.917	0.970	0.939
143	0.030	0.040	0.009	0.000	0.045	0.051	0.056	0.087	0.083	0.030	0.061

Appendix Table 2. Continued

Locus/ allele	McCall Hatchery 1981	McCall Hatchery 1988	Johnson Creek 1981	Johnson Creek 1988	Valley Creek 1982	Valley Creek 1988	Looking. Hatchery 1988	Rapid River H. 1981+84	Upper Salmon River 1981	Upper Salmon River 1988	Sawtooth Hatchery 1988
*sIDHP-1**											
(N)	50	100	56		22	99	100	150	50	99	100
100	0.740	0.795	0.902	0.7:	0.910	0.909	0.950	0.920	0.840	0.783	0.885
74	0.260	0.205	0.098	0.214	0.090	0.091	0.050	0,080	0.160	0.217	0.115
*sIDHP-2**											
(N)	50	100	66	99	22	99	100	150	50	99	100
100	1.000	1.000	1.000	0.990	0.910	0,949	1.000	1.000	1.000	0.975	0.945
127	0.000	0.000	0.000	0.000	0.090	0.051	0.000	0.000	0.000	0.025	0.055
*LDH-B2**											
(N)	50	100	56	98	22	99	100	150	50	99	100
100	1.000	0.990	1.000	0.995	0.977	0.970	0.990	0.990	0.980	0.980	0.995
112	0.000	0.010	0.000	0.005	0.023	0.030	0.010	0.010	0.020	0.020	0.005
*LDH-C**											
(N)		100	56	100	22	99	100	150	48	100	97
100	0.9%	0.985	0.982	0.920	1.000	0.995	1.000	1.000	1.000	1.000	0.995
84'	0.030	0.015	0.018	0.080	0.000	0.000	0.000	0.000	0,000	0.000	0.005
106	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000
*MDH-B1,2**											
(N)	50	100	56	98	22	99	100	149	49	99	100
100	0.995	0.993	1.000	0.980	0.989	0.944	0.993	1.000	1.000	0.985	0.980
121	0.005	0.008	0.000	0.015	0.011	0.056	0.008	0.000	0.000	0.013	0.020
70	0.000	0,000	0.000	0.005	0.000	0.000	0,000	0.000	0.000	0.003	0.000
MPP											
(N)	50	loo	56	96	22	99	100	150	50	99	99
100	0.960	0.920	0.946	0.990	0.795	0.889	0.935	0.940	0.890	0.939	0.884
109	0.040	0.080	0.054	0.010	0,205	0.111	0.065	0.060	0.110	0.061	0.116
*PEPA**											
(N)	50	100	56	100	22	99	100	150	50	99	100
100	1.000	1.000	1.000	1.000	0.977	1.000	1.000	1.000	0.990	1.000	0.995
90	0.000	0.000	0.000	0.000	0.023	0.000	0.000	0.000	0.010	0.000	0.005

Appendix Table 2. Continued

Locus/ allele	McCall Hatchery 1981	McCall Hatchery 1988	Johnson Creek 1981	Johnson Creek 1988	Valley Creek 1982	Valley Creek 1988	Looking. Hatchery 1988	Rapid River H. 1981+84	Upper Salmon River 1981	Upper Salmon River 1988	Sawtooth Hatchery 1988
*PEPB-1**											
(N)	5 0	100	56	94	22	99	100	148	50	100	***100***
100	0.930	0.985	0.991	0.973	0.818	0.904	0.905	0.892	0.860	0.910	***0.910***
130	0.070	0.015	0.009	0.027	0.182	0.096	0,095	0.108	*0.140*	0.090	***0.090***
*PEP-LT**											
(N)	50	100	56	100	*22*	99	100	150	*50*	100	100
100	0.890	0.920	0.929	0.950	0.341	0.919	0.946	0.963	*0,970*	0.985	0.885
110	0.110	0.080	0.071	0.050	0.159	0.081	0.055	0.037	*0.030*	0.015	0.115
*PGK-2**											
(N)	50	100	56	100	22	99	100	150	50	99	95
100	0.080	0.110	0.045	0.065	0.205	0.187	0.085	0.103	0.090	0.101	***0.142***
90	0.920	0.890	0.955	0.935	0.795	0.813	0.915	0.897	0.910	0.899	***0.858***
*sSOD-1**											
(N)	*50*	100	56	97	22	99	100	150	*48*	98	*100*
-100	*0.980*	0.980	0.973	0.974	0.886	0.939	0,970	0.913	*0.948*	0.964	*0.965*
-260	0.020	0.020	0.027	0.026	0,114	0.061	0.030	0.087	*0.052*	0.036	*0.035*

[a]Includes "94" allele
[b]Includes "90" allele
[c]Includes "-350" allele

Appendix Table 3. Columbia River chinock electrophoretic data from Schreck et al. (1956).

Isoayme gene frequencies and sample sizes (N) as determined by electrophoresis for chinook salmon stocks in Oregon, Washington and Idaho. Numbers at the top of each column are the relative mobilities for each allele present in the enzyme system. Minus signs indicate cathodal migration. An asterisk indicates that an allele was present at a frequency of less than .005. "Form" is the time of freshwater entry (S for spring, F for fall and SUM for summer). A pound sign (#) indicates that data for that stock was obtained from the Genetic Stock Identification Study (Milner et al. 1983).

Chinook salmon gene frequency data.

CHINOOK STOCK	FORM	ACONITATE HYDRATASE				ADENOSINE DEAMINASE			ALCOHOL DEHYDROGENASE		
		N	100	86	116	69	N	100	83	N	-100	-52
COWLITZ HATCHERY #	F	91	.82	.17	.02		98	.99	.01	49	.97	.03
COWLITZ HATCHERY	S	92	.83	.16	.01					95	.96	.04
KALAMA HATCHERY	F	91	.91	.08	.01					88	.88	.12
KALAMA HATCHERY	S	96	[illegible]	.14	.01					100	[illegible]	.04
LEWIS HATCHERY	S	100	.98	.02			84	.92	.08	loo	.98	.02
LEWIS HATCHERY	F	75	.77	.23						61	.94	.06
LEWIS RIVER	F	82	.82	.16	.01					194	.97	.03
CLACKAMAS RIVER	F	47	.69	.30	.01		50	1.00		50	.99	.01
CLACKAMAS RIVER	S	79	.77	.20	.03					80	.99	.01
EAGLE CREEK HATCHERY	S	87	.76	.21	.03		100	1.00		100	.98	.02
EAGLE CREEK HATCHERY 85	S	95	.79	.17	.03	.01	60	1.00		100	.99	.01
MARION FORKS HATCHERY	S	97	.79	.19	.02		100	1.00		100	1.00	
SOUTH SANTIAM HATCHERY	S	98	.72	.27	.01		65	1.00		100	1.00	
THOMAS CREEK	S	95	.83	.16	.01					100	.98	.02
MCKENZIE HATCHERY	S	98	.79	[illegible]	.02		50	1.00		100	1.00	
MCKENZIE HATCHERY 85	S	95	.85	.13	.02	.01	95	1.00		100	1.00	
DEXTER HATCHERY	S	98	.75	.22	.03		100	1.00		100	1.00	
SANDY RIVER	F	56	.94	.03	.03					56	1.00	
SANDY RIVER 85	F	48	.88	.09	.03		49	1.00		49	.96	.04
WASHOUGAL RIVER	F	50	.86	.13	.01		50	.99	.01	50	.95	.05
BONNEVILLE HATCHERY	F	93	1.00				93	1.00		87	.87	.13
CARSON HATCHERY	S	loo	.98	.02						100	1.00	
CARSON HATCHERY 85	S	loo	.99	.01			75	.97	.03	97	[illegible]	.05
LIT.WHITE SALMON HATCH.	S	loo	.98	.02						100	1.00	
LIT.WHITE SALMON HATCH. 85	S	98	.99	.01			88	.99	.01	98	.99	.01
SPRING CREEK HATCHERY	F	100	1.00				loo	1.00		82	.85	.15
KLICKITAT RIVER	F	50	.76	.23	.01		50	.99	.01	50	.96	.04
KLICKITAT HATCHERY #	S	so	.93	.07			50	.98	.02	-		
HOOD RIVER	F	42	.88	.12								
DESCHUTES RIVER	F	85	.87	.06	.07		-			87	.93	.07
DESCHUTES RIVER 85	F	52	.83	.14	.03		54	.98	.02	53	.84	.16
ROUND BUTTE HATCHERY	S	93	1.00				78	1.00		83	1.00	
ROUND BUTTE HATCHERY 85	S	98	.99		.01		'50	100		98	1.00	
WARM SPRINGS RIVER #	S	50	1.00				50	1.00		50	1.00	
JOHN DAY RIVER	S	78	1.00				76	.99	.01	78	.99	[illegible]
JOHN DAY RIVER 85	S	60	.98	.02			60	1.00		60	1.00	
SNAKE RIVER STOCK	F	97	.93	.06	.01					97	.91	[illegible]
TUCANNON RIVER	S	93	.99	.01						93	1.00	
TUCANNON RIVER 85	S	34	.97	.03			38	[illegible]	.03	28	1.00	
GRANDE RONDE RIVER	S	43	.98	.02			43	1.00		43	1.00	
GRANDE RONDE RIVER 84	S	26	.98	.02						36	.99	.01

Chinook salmon gene *frequency* data (continued).

CHINOOK STOCK	FORM	ACONITATE HYDRATASE					ADENOSINE DEAMINASE			ALCOHOL DEHYDROGENASE		
		N	100	86	116	69	N	100	a3	N	-100	-52
WALLOWA-LOSTINE RIVER	S	47	1.00				47	1.00		47	1.00	
WALLOWA-LOSTINE RIVER 84				.01						40	.98	.03
KOOSKIA HATCHERY STOCK		loo	1.00							90	.99	.01
RED R. SF CLEARWATER #	S	40	1.00				40	.98	.03	40	1.00	
IMNAHA RIVER	S	87	.99	.01			87	1.00		87	.99	.01
IMNAHA RIVER 84	S	108	.99	.01						108	1.00	
RAPID RIVER HATCHERY #	S	50	.98	.02			50	.98	.02	50	1.00	
JOHNSON CREEK #	SUM	53	1.00				56	1.00		56	1.00	
McCALL HATCHERY #	SUM	50	1.00				50	.90	.10	50	1.00	
MIDDLE FORK SALMON	S	50	.98	.02						86	1.00	
EAST FK. SALMON R. STOCK	S	50	1.00				50	.98	.02	50	1.00	
VALLEY CREEK	SUM	20	1.00							50	1.00	
VALLEY CREEK #	S	22	1.00				22	.93	.07	22	1.00	
SAWTOOTH STOCK #	S	50	1.00				48	.97	.03	50	1.00	
YAKIMA RIVER	F	36	.97	.03			36	.97	.03	36	.99	.01
YAKIMA RIVER	S	50	.98	.02			42	.96	.04	50	1.00	
NACHES RIVER	S	37	1.00				50	1.00		50	.98	.02
HANFORD REACH	F	53	.89							100	1.00	
HANFORD REACH 85	F	100	.81	.18	.01		100	1.00		100	.97	.04
PRIEST RAPIDS HATCHERY	F	loo	.84	.16			50	1.00		100	.99	.01
WENATCHEE RIVER	S	194	.99	.01			50	.95	.05	199	1.00	
WENATCHEE RIVER	au	440	.81	.19			-			so	1.00	
WENATCHEE RIVER 85	SUM	49	.83	.17			50	.99	.01	50	1.00	
LEAVENWORTH HATCHERY	S	a9	.99	.01			-			100	1.00	
LEAVENWORTH HATCHERY 85	S	loo	1.00				100	.97	.04	100	1.00	
ENTIAT RIVER	S	128	.98	.02			50	.97	.03	133	1.00	
WELLS DAM HATCHERY	SUM	98	.a8	.12			98	1.00		100	1.00	
METHOW RIVER 83	S	53	.97	.03			-					
METHOW RIVER 84	S	50	.99	.01			50	.96	.04	50	1.00	
METHOW RIVER	SUM	85	.82	.18			-					
WINTHROP HATCHERY #	S	50	.92	.07	.01		129	.97	.03	129	.98	.02
OKANAGAN RIVER	SUM	100	.78	.22						90	.97	.03
OKANAGAN RIVER 85	SUM	50	.75	.24	.01		50	1.00		49	.99	.01

Chinook salmon *gene* frequency data (continued).

CHINOOK STOCK	FORM	GLUCOSE PHOSPHATE ISOMERASE-2			GLUCOSE PHOSPHATE ISOMERASE 1-3H			GLUCOSE PHOSPHATE ISOMERASE-3		
		N	100	60	N	STANDARD	VARIANT	N	100	90
COWLITZ HATCHERY #	F	9 9	1.00					99	1.00	
COWLITZ HATCHERY	s	100	1.00		100	.90	.10	loo	1.00	
KALAMA HATCHERY	F	100	1.00		loo	1.00		100	1.00	
KALAMA HATCHERY	s	100	1.00		100	.86	.14	loo	1.00	
LEWIS HATCHERY	s	loo	1.00		100	1.00		100	1.00	
LEWIS HATCHERY	F	%	.90	.10	96	1.00		100	1.00	
LEWIS RIVER	F	100	1.00		100	1.00		100	1.00	
CLACKAMAS RIVER	F	50	1.00		50	1.00		50	1.00	
CLACKAMAS RIVER	S	80	1.00		80	1.00		80	1.00	
EAGLE CREEK HATCHERY	s	100	1.00		loo	1.00		100	1.00	
EAGLE CREEK HATCHERY 85	s	loo	1.00		100	1.00		100	1.00	
MARION FORKS HATCHERY	s	100	1.00		loo	1.00		100	1.00	
SOUTH SANTIAM HATCHERY	S	100	1.00		100	1.00		100	1.00	
THOMAS CREEK	s	loo	1.00		100	.80	.20	loo	1.00	
MCKENZIE HATCHERY	S	95	1.00		95	.90	.10	95	1.00	
MCKENZIE HATCHERY 85	s	loo	1.00		loo	1.00		100	1.00	
DEXTER HATCHERY	s	100	1.00		100	.83	.17	100	1.00	
SANDY RIVER	F	66	1.00		66	1.00		66	1.00	
SANDY RIVER 85	F	49	.96	.04	49	1.00		49	1.00	
WASHOUGAL RIVER	F	50	.80	.20	50	l.m		50	1.00	
BONNEVILLE HATCHERY	F	93	1.00		93	1.00		93	1.00	
CARSON HATCHERY	s	100	1.00		100	1.00		100	1.00	
CARSON HATCHERY 85	S	95	1.00		95	1.00		95	1.00	
LIT.WHITE SALMON HATCH.	s	50	1.00		50	1.00		50	1.00	
LIT.WHITE SALMON HATCH. 85	S	90	.90	.10	98	1.00		98	1.00	
SPRING CREEK HATCHERY	F	100	1.00		loo	1.00		100	1.00	
KLICKITAT RIVER	F	50	1.00		50	1.00		50	1.00	
KLICKITAT HATCHERY #	s	50	1.00					50	1.00	
HOOD RIVER	F	47	.99	.01	47	1.00		47	.99	.01
DESCHUTES RIVER	F	91	1.00		91	1.00		91	1.00	
DESCHUTES RIVER 85	F	51	1.00		51	.94	.06	51	.98	.02
ROUND BUTTE HATCHERY	s	100	1.00		100	1.00		100	1.00	
ROUND BUTTE HATCHERY 85	S.	98	1.00		98	1.00		98	1.00	
WARM SPRINGS RIVER #	S	49	1.00					49	1.00	
JOHN DAY RIVER	s	79	1.00		79	1.00		79	1.00	
JOHN DAY RIVER 85	s	60	1.00		60	1.00		60	1.00	
SNAKE RIVER STOCK	F	100	.90	.10	100	1.00		100	1.00	
TUCANNON RIVER	s	loo	.86	.14	loo	1.00		100	1.00	
TUCANNON RIVER 85	s	44	1.00		44	1.00		44	1.00	
GRANDE RONDE RIVER	S	43	1.00		43	1.00		43	1.00	
GRANDE RONDE RIVER 84	S	36	1.00		36	1.00		36	1.00	

Chinook salmon gene frequency data (continued).

CHINOOK STOCK	FORM	GLUCOSE PHOSPHATE ISOMERASE-2			GLUCOSE PHOSPHATE ISOMERASE 1-3H			GLUCOSE PHOSPHATE ISOMERASE-3		
		N	100	60	N	STANDARD	VARIANT	N	100	90
WALLOWA-LOSTINE RIVER	S	47	.90	.10	47	1.00		47	1.00	
WALLOWA-LOSTINE RIVER 84	S	40	1.00		40	1.00		40	1.00	
KOOSKIA HATCHERY STOCK	S	70	1.00		78	1.00		78	1.00	
RED R. SF CLEARWATER #	S	40	1.00					40	1.00	
IMNAHA RIVER	S	a7	1.00		87	1.00		87	1.00	
IMNAHA RIVER 84	S	108	1.00		100	1.00		100	1.00	
RAPID RIVER HATCHERY #	S	50	1.00					50	1.00	
JOHNSON CREEK #	SUM	56	1.00					56	1.00	
McCALL HATCHERY #	SUM	50	1.00					50	1.00	
MIDDLE FORK SALMON	S	50	1.00		50	1.00		50	1.00	
EAST FK. SALMON R. STOCK	S	50	1.00		50	1.00		50	1.00	
VALLEY CREEK	SUM	48	1.00		48	1.00		48	1.00	
VALLEY CREEK #	S	22	1.00					22	1.00	
SAWTOOTH STOCK #	S	50	1.00					50	1.00	
YAKIMA RIVER	F	36	1.00		36	1.00		36	1.00	
YAKIMA RIVER	S	42	1.00		30	1.00		48	1.00	
NACHES RIVER	S	50	.94	.06	50	1.00		50	1.00	
HANFORD REACH	F	96	1.00		96	.80	.20	96	1.00	
HANFORD REACH 85	F	100	1.00		100	.90	.10	100	1.00	
PRIEST RAPIDS HATCHERY	F	91	1.00		91	.90	.10	91	1.00	
WENATCHEE RIVER	S	194	1.00		194	1.00		194	1.00	
WENATCHEE RIVER	SUM	50	1.00		50	1.00		50	1.00	
WENATCHEE RIVER 85	SUM	50	1.00		50	.96	.04	50	1.00	
LEAVENWORTH HATCHERY	S	95	1.00		95	1.00		95	1.00	
LEAVENWORTH HATCHERY 85	S	93	1.00		93	1.00		93	1.00	
ENTIAT RIVER	S	133	1.00		133	1.00		133	1.00	
WELLS DAM HATCHERY	SUM	97	1.00		97	.83	.17	97	1.00	
METHOW RIVER 83	S	53	1.00		53	1.00		53	1.00	
METHOW RIVER 84	S	50	1.00		40	1.00		50	1.00	
METHOW RIVER	SUM	88	1.00		88	.89	.11	88	1.00	
WINTHROP HATCHERY #	S	129	1.00					129	.98	.02
OKANAGAN RIVER	SUM	100	.90	.10	100	.83	.17	100	1.00	
OKANAGAN RIVER 85	SUM	50	1.00		50	1.00		50	1.00	

Chinook salmon gene frequency data (continued).

CHINOOK STOCK	FORM	ASPARTATE AMINOTRANSFERASE			ISOCITRATE DEHYDROGENASE				L-LACTATE DEHYDROGENASE-4		
		N	100	90	N	100	74	127	N	100	120
COWLITZ HATCHERY #	F	68	1.00		97	.97	.02	.01	99	1.00	
COWLITZ HATCHERY	S	100	1.00		100	.97	.03		100	1.00	
KALAMA HATCHERY	F	100	1.00		73	.98	.01	.01	100	1.00	
KALAMA HATCHERY	S	100	1.00		88	• 93	.07		100	1.00	
LEWIS HATCHERY	S	68	1.00		95	.87	.13		100	1.00	
LEWIS HATCHERY	F	194	1.00		87	.96	.01	.03	98	1.00	
LEWIS RIVER	F	100	1.00		99	.97	.01	.02	100	1.00	
CLACKAMAS RIVER	F	50	1.00		50	.91		.09	50	.99	.01
CLACKAMAS RIVER	S	80	1.00		76	.95	.01	.04	80	1.00	
EAGLE CREEK HATCHERY	S	90	1.00		1001.00				100	1.00	
EAGLE CREEK HATCHERY 85	s	90	1.00		94	.91		.09	loo	1.00	
MARION FORKS HATCHERY	S	100	1.00		100	1.00			100	1.00	
SOUTH SANTIAM HATCHERY	S	90	1.00		100	1.00			100	1.00	
THOMAS CREEK	S	100	1.00		89	.88	.11	.01	100	1.00	
MCKENZIE HATCHERY	S	100	1.00		70	.98	.01	*	100	1.00	
MCKENZIE HATCHERY 85	S	50	1.00		97	.87	.02	.11	100	1.00	
DEXTER HATCHERY	S	100	1.00		100	1.00			85	1.00	
SANDY RIVER	F	66	1.00		56	.96	.02	.01	66	1.00	
SANDY RIVER 85	F	49	1.00		49	.96		.04	47	1.00	
WASHOUGAL RIVER	F	50	1.00		48	.95	• 02	.03	50	1.00	
BONNEVILLE HATCHERY	F	93	1.00						93	1.00	
CARSON HATCHERY	S	100	1.00		87	.97	.03		100	.98	.02
CARSON HATCHERY 85	S	52	1.00		83	.90	.09	.01	100	1.00	
LIT.WHITE SALMON HATCH.	S	100	1.00						100	.98	.02
LIT.WHITE SALMON HATCH. 85	S	38	1.00		87	.92	.08		98	1.00	
SPRING CREEK HATCHERY	F	100	1.00		1001.00				100	1.00	
KLICKITAT RIVER	P	50	1.00		50	.91	.02	.07	50	1.00	
KLICKITAT HATCHERY #	S	49	1.00		50	.90	.03	.07	50	1.00	
HOOD RIVER	F				41	.99	.01		47	1.00	
DESCHUTES RIVER	F	96	1.00		98	.98	.01	*	100	1.00	
DESCHUTES RIVER 85	F	52	1.00		54	.98	.01	.02	54	1.00	
ROUND BUTTE HATCHERY	S	50	1.00		a2	.95	.05	*	93	1.00	
ROUND BUTTE HATCHERY 85	S	42	1.00		97	.86	.14		98	1.00	
WARM SPRINGS RIVER #	S	43	1.00		50	.83	.17		50	1.00	
JOHN DAY RIVER	S	75	1.00		70	.87	.13		95	1.00	
JOHN DAY RIVER 85	S	60	1.00		60	.94	.06	*	59	1.00	
SNAKE RIVER STOCK	F	100	.98	.02	88	.99	.01		100	1.00	
TUCANNON RIVER	S	100	1.00		92	.95	.05		100	.99	.01
TUCANNON RIVER 85	S	50	1.00		34	.94	.03		50	1.00	
GRANDE RONDE RIVER	S	43	1.00		42	.92	.08		43	1.00	
GRANDE RONDE RIVER 84	S	8	1.00		34	.87	.13		36	1.00	

Chinook salmon gene frequency data (continued).

CHINOOK STOCK	FORM	ASP-			ISOCITRATE DEHYDROGENASE				L-LACTATE m - 4		
		N	100	90	N	100	74	127	N	100	120
WALLOWA-LOSTINE RIVER	S	25	1.00		46	.86	.11	.03	47	1.00	
WALLOWA-LOSTINE RIVER 84	S	34	1.00		35	.84	.15	.01	40	1.00	
KOOSKIA HATCHERY STOCK	S	so	1.00		73	.92	.08		100	.99	.01
RED R. SF CLEARWATER #	S	40	1.00		80	.94	.06		40	.95	.05
IMNAHA RIVER	S	87	1.00		84	.91	.09		87	1.00	
IMNAHA RIVER 84	S	100	1.00		89	.87	.13		108	1.00	
RAPID RIVER HATCHERY #	S	50	1.00		50	.97	.04		50	.98	.02
JOHNSON CREEK #	SUM	56	1.00		56	.95	.05		56	1.00	
McCALL HATCHERY #	SUM	50	1.00		50	.87	.13		50	1.00	
MIDDLE FORK SALMON	S	40	1.00		14	.89	.11		50	.96	.04
EAST FK. SALMON R. STOCK	S	37	1.00		50	.97	.03		50	.99	.01
VALLEY CREEK	SUM	45	1.00		40	.98	.02		48	.98	.02
VALLEY CREEK #	S	22	1.00		22	.91	.05	.05	22	.98	.02
SAWTOOTH STOCK #	S	50	1.00		50	.92	.08		50	.98	.02
YAKIMA RIVER	F	36	1.00		30	.91	.03	.06	36	.97	.03
YAKIMA RIVER	S	44	1.00		44	.86	.14		50	1.00	
NACHES RIVER	S	50	1.00		50	.95	.04	.01	50	1.00	
HANFORD REACH	F	loo	1.00		60	.92	.01	.07	100	1.00	
HANFORD REACH 85	F	100	1.00		91	.93	.06	.01	100	1.00	
PRIEST RAPIDS HATCHERY	F				65	.98	.02		92	1.00	
WENATCHEE RIVER	S	180	1.00		160	.86	.14		199	.99	.01
WENATCHEE RIVER	SUM				44	.98	.01	.01	50	1.00	
WENATCHEE RIVER 85	SUM	50	1.00		50	.89	.01	.10	50	1.00	
LEAVENWORTH HATCHERY	S				96	.90	•	.10	100	.97	.03
LEAVENWORTH HATCHERY 85	S	75	1.00		94	.93	.07		100	1.00	
ENTIAT RIVER	S	123	1.00		105	.81	.19		132	.98	.02
WELLS DAM HATCHERY	SUM								98	1.00	
METHOW RIVER 83	S	-50	1.00		39	.89	.02	.09	43	1.00	
METHOW RIVER 84	S	43	1.00		37	.81	.19		50	.99	.01
METHOW RIVER	SUM	20	1.00		71	.95	.04	•			
WINTHROP HATCHERY #	S	50	1.00		129	.97	.03	.01	129	1.00	
OKANAGAN RIVER	SUM				84	.93	.06	.01	96	1.00	
OKANAGAN RIVER 85	SUM	50	1.00		50	.92		.08	50	1.00	

Chinook salmon gene frequency data (continued).

CHINOOK STOCK	FORM	L-LACTATE DEHYDROGENASE-5			MALATE DEHYDROGENASE-1&2				MALATE DEHYDROGENASE-3&4			
		N	100	90	N	100	140	27	N	loo	121	70
COWLITZ HATCHERY #	F	96	.99	.01	99	1.00			99	1.00		
COWLITZ HATCHERY	S	loo	.99	.01	100	1.00			100	.99	.01	
KALAMA HATCHERY	F	100	1.00		100	1.00			100	.98	.02	
KALAMA HATCHERY	S	loo	.99	.01	100	1.00			100	.99	.01	
LEWIS HATCHERY	S	80	1.00		50	1.00			100	.98	.02	
LEWIS HATCHERY	F	98	1.00		100	1.00			90	.99	.01	
LEWIS RIVER	F	100	1.00		100	1.00			94	.98	.02	
CLACKAMAS RIVER	F	50	.99	.01	50	1.00			so	.93	.07	
CLACKAMAS RIVER	S	87	1.00		80	1.00			80	.97	.03	
EAGLE CREEK HATCHERY	S	87	1.00		100	1.00			100	.95	.05	
EAGLE CREEK HATCHERY 85	S	100	.99	.01	100	1.00			100	.97	.03	
MARION FORKS HATCHERY	S	loo	1.00		100	1.00			98	.92	.08	
SOUTH SANTIAM HATCHERY	S	loo	1.00		94	1.00			100	.95	.05	
THOMAS CREEK	S	100	1.00		100	1.00			99	.92	.08	
MCKENZIE HATCHERY	S	100	• 99	.01	100	1.00			99	.93	.07	
MCKENZIE HATCHERY 85	S	loo	1.00		100	1.00			97	.94	.06	
DEXTER HATCHERY	S	85	1.00		100	1.00			100	• 93	.07	
SANDY RIVER	F	66	1.00		66	1.00			66	1.00		
SANDY RIVER 85	F	47	.99	.01	49	1.00			49	.98	.02	
WASHOUGAL RIVER	F	50	1.00		50	1.00			50	.97	.03	
BONNEVILLE HATCHERY	F	83	1.00		93	1.00			88	.92	.08	
CARSON HATCHERY	S	100	1.00		100	1.00			100	1.00	*	
CARSON HATCHERY 85	S	85	1.00		100	1.00			100	.99	.01	
LIT.WHITE SALMON HATCH.	S	92	1.00		100	1.00			100	.98	.02	
LIT.WHITE SALMON HATCH. 85	S	89	1.00		98	1.00			96	.94	.06	
SPRING CREEK HATCHERY	F	loo	1.00		100	1.00			100	.92	.08	
KLICKITAT RIVER	F	50	.96	.04	50	1.00			50	.99	.01	
KLICKITAT HATCHERY #	S	50	1.00		50	1.00			50	.97	.03	
HOOD RIVER	F	47	1.00		47	1.00			47	.99		.01
DESCHUTES RIVER	F	1530	1.00		100	1.00			100	.97	.01	.02
DESCHUTES RIVER 85	F	93	.99	.01	54.	1.00			54	.96	.01	.02
ROUND BUTTE HATCHERY	S		1.00		93	1.00			-100	.99	.01	
ROUND BUTTE HATCHERY 85	S	83	1.00		98	1.00			98	.98	.02	
WARM SPRINGS RIVER #	S	46	1.00		50	.99	.01		4-9	1.00		
JOHN DAY RIVER	S	96	1.00		100	.99	.01		100	1.00		
JOHN DAY RIVER 85	S	59	1.00		60	1.00			60	.96	.04	
SNAKE RIVER STOCK	F	loo	.99	.01	100	1.00			100	.95	.01	.04
TUCANNON RIVER	S	100	1.00		100	1.00			100	1.00		
TUCANNON RIVER 85	S	29	.94	.06					50	1.00		
GRANDE RONDE RIVER	S	43	1.00		43	1.00			43	1.00		
GRANDE RONDE RIVER 84	S	-			36	1.00			36	.98	.02	

Chinook salmon gene frequency data (continued).

CHINOOK STOCK	FORM	L-LACTATE DEHYDROGENASE-1&2 m - 5			MALATE DEHYDROGENASE-1&2				MALATE DEHYDROGENASE-3&4			
		N	100	90	N	100	140	27	N	100	121	70
WALLOWA-LOSTINE RIVER	S	47	1.00		47	1.00			45	.95	.05	
WALLOWA-LOSTINE RIVER 84	s	40	1.00		40	1.00			40	1.00		
KOOSKIA HATCHERY STOCK	S	100	1.00		90	1.00			100	.98	.02	
RED R. SF CLEARWATER #	s	40	1.00		80	1.00			78	.99	.01	
IMNAHA RIVER	S	87	1.00		87	1.00			87	.99	.01	
IMNAHA RIVER 84	S	107	1.00		108	1.00			108	.98	.02	
RAPID RIVER HATCHERY #	s	50	1.00		50	1.00			49	1.00		
JOHNSON CREEK #	SUM	56	.98	.02	56	1.00			56	1.00		
McCALL HATCHERY #	SUM	50	.97	.03	50	1.00			50	.99	.01	
MIDDLE FORK SALMON	s	50	1.00						50	.98	.02	
EAST FK. SALMON R. STOCK	S	37	1.00		50	1.00			50	.98	.02	
VALLEY CREEK	SUM	48	1.00		45	1.00			48	.97	.03	
VALLEY CREEK #	s	22	1.00		22	1.00			22	.99	.01	
SAWTOOTH STOCK #	s	48	1.00		50	1.00			49	1.00		
YAKIMA RIVER	F	36	1.00		36	1.00			36	1.00		
YAKIMA RIVER	s	50	1.00		50	1.00			50	1.00		
NACHES RIVER	s	50	1.00		50	1.00			50	.98	.01	.01
HANFORD REACH	F	100	.97	.03	loo	1.00			98	.97	.01	.01
HANFORD REACH 85	F	100	.99	.01	100	1.00			100	.96	.03	.01
PRIEST RAPIDS HATCHERY	F	100	.98	.02	loo	1.00			100	.98	.01	.02
WENATCHEE RIVER	S	181	1.00		195	1.00	*		95	.97	.03	
WENATCHEE RIVER	SUM	45	.99	.01	50	1.00			48	.97	.01	.02
WENATCHEE RIVER 85	SUM	50	.96	.04	50	1.00			50	.95	.01	.04
LEAVENWORTH HATCHERY	S	100	1.00		loo	1.00			100	.99	.01	
LEAVENWORTH HATCHERY 85	S	97	1.00		95	1.00			99	.97	.03	
ENTIAT RIVER	S	121	1.00		132	1.00	*		31	.99	.01	
WELLS DAM HATCHERY	SUM	90	.99	.01	98	1.00			98	.98	.01	.01
METHOW RIVER 83	s	50	.99	.01	43	1.00			45	.97	.03	
METHOW RIVER 84	S	49	1.00		50	.99	*	*	50	.97	.03	
METHOW RIVER	SUM	80	.99	.01	88	1.00			87	.97	.02	.01
WINTHROP HATCHERY #	S	129	1.00		129	1.00			129	.99	.01	
OKANAGAN RIVER	SUM	100	.93	.07	loo	1.00			95	.97	.02	.01
OKANAGAN RIVER 85	SUM	50	.95	.05	50	1.00			50	.96	.02	.02

Chinook salmon gene frequency data (continued).

CHINOOK STOCK	FORM	MANNOSE PHOSPHATE ISOMERASE					DIPEPTIDASE			TRIPEPTIDE AMINOPEPTIDASE			
		N	loo	109	9s	113	N	100	90	N	-- 100	130	45
COWLITZ HATCHERY #	F	99	.49	.48	.03		99	.92	.08	99	.94	.06	
COWLITZ HATCHERY	S	99	.47	.50	.03		loo	.99	.01	100	.91	.09	
KALAMA HATCHERY	F	56	.63	.37			loo	1.00		loo	.70	.30	
KALAMA HATCHERY	S	100	.57	.43			100	1.00		100	.95	.05	
LEWIS HATCHERY	S	72	.85	.15			100	.98	.02	9s	.95	.05	
LEWIS HATCHERY	F	85	.53	.45	.02		98	.95	.05	95	.93	.07	
LEWIS RIVER	F	loo	.49	.48	.03		100	.84	.16	loo	.96	.04	
CLACKAMAS RIVER	F	49	.45	.55			50	.97	.03	49	.94	.06	
CLACKAMAS RIVER	S	79	.47	.53			80	1.00		80	.96	.04	
EAGLE CREEK HATCHERY	S	84	.61	.38		.01	loo	1.00		99	.92	.08	
EAGLE CREEK HATCHERY 85	S	69	.41	.59			100	1.00		91	.90	.09	.01
MARION FORKS HATCHERY	S	95	.46	.54			100	1.00		98	.91	.09	
SOUTH SANTIAM HATCHERY	S	97	.50	.50			100	1.00		95	.65	.35	
THOMAS CREEK	S	95	.42	.58			loo	1.00		100	.87	.13	
MCKENZIE HATCHERY	S	97	.47	.52	.01		100	1.00		99	.87	.13	
MCKENZIE HATCHERY 85	S	96	.52	.48			96	1.00					
DEXTER HATCHERY	S	88	.53	.47			100	1.00		loo	.83	.17	
SANDY RIVER	F	64	.55	.44	.01		66	1.00		66	.95	.05	
SANDY RIVER 85	F	49	.50	.49	.01		49	.99	.01	49	.93	.07	
WASHOUGAL RIVER	F	49	.50	.48	.02		50	.85	.15	50	.96	.04	
BONNEVILLE HATCHERY	F	87	.59	.40	.01		93	1.00		92	.83	.17	
CARSON HATCHERY	S	99	.90	.10			loo	1.00		100	.91	.09	
CARSON HATCHERY 85	S	97	.89	.11			95	1.00		80	.96	.04	
LIT.WHITE SALMON HATCH.	S	96	.82	.18			loo	.99	.01	99	.94	.06	
LIT.WHITE SALMON HATCH. 85	S	80	.79	.21			71	1.00		93	.95	.os	
SPRING CREEK HATCHERY	F	96	• 54	.43	.03		100	.94	.06	96	.83	.17	
KLICKITAT RIVER	F	50	.68	.31	.01		50	.95	.05	49	.81	.19	
KLICKITAT HATCHERY #	S	50	.73	.26	.01		50	.99	.01	50	.95	.05	
HOOD RIVER	F						47	1.00		47	.93	.07	
DESCHUTES RIVER	F	99	•	.21			100	.97	.03	99	.97	.03	
DESCHUTES RIVER 85	F	53	.79	.21			54	.92	.08	52	.%	•	
ROUND BUTTE HATCHERY	S	93	.84	.16			93	1.00		93	.98	.02	
ROUND BUTTE HATCHERY 85	S						98	1.00		77	.96	.04	
WARM SPRINGS RIVER #	S	50	.84	.16			50	.97	.03	48	.97	.03	
JOHN DAY RIVER	S	93	.91	.09			loo	1.00		85	.99	.01	
JOHN DAY RIVER 85	S	55	.88	.12			60	.99	.01	60	.99	.01	
SNAKE RIVER STOCK	F	100	.82	.18			100	.99	.01	86	.87	.13	
TUCANNON RIVER	S	loo	.90	.10			100	l.w		90	.99	.01	
TUCANNON RIVER 85	S	49	.90	.10			50	1.00		38	.99	.01	
GRANDE RONDE RIVER	S	36	.92	.08			43	1.00		43	.98		.02
GRANDE RONDE RIVER 84	S	36	.90	.10			36	.99	.01	35	.96	.04	

Chinook salmon gene frequency data (continued).

CHINOOK STOCK	FORM	MANNOSE PHOSPHATE ISOMERASE N	-- 100	109	-- 95	113	DIPEPTIDASE N	100	90	TRIPEPTIDE AMINOPEPTIDASE N	100	130	45
WALLOWA-LOSTINE RIVER	S	45	.76	.24			47	1.00		43	.96	.04	
WALLOWA-LOSTINE RIVER 84	S	39	.74	.26			35	1.00		40	.99	.01	
KOOSKIA HATCHERY STOCK	S	74	.95	.05			91	.98	.02	71	.99	.01	
RED R. SF CLEARWATER #	S	40	.95	.05			40	1.00		36	.94	.06	
IMNAHA RIVER	S	86	.80	.20			87	.99	.01	87	.99	.01	.01
IMNAHA RIVER 84	S	99	.82	.18			108	1.00		108	1.00		
RAPID RIVER HATCHERY #	S	50	.95	.05			50	1.00		50	.90	.10	
JOHNSON CREEK #	SUM	56	.95	.05			56	1.00		56	.99	.01	
McCALL HATCHERY #	SUM	50	.96	.04			50	1.00		50	.93	.07	
MIDDLE FORK SALMON	S	50	.96	.04			50	1.00		37	.97	.03	
EAST FK. SALMON R. STOCK	S	50	1.00				50	1.00		50	1.00		
VALLEY CREEK	SUM	35	.87	.13			45	1.00		32	1.00		
VALLEY CREEK #	S	22	.80	.21			22	.98	.02	22	.82	.18	
SAWTOOTH STOCK #	S	50	.89	.11			50	.99	.01	50	.86	.14	
YAKIMA RIVER	F	36	.92	.08			36	1.00		35	.84	.16	
YAKIMA RIVER	S	50	.86	.14			50	.98	.02	47	.95	.05	
NACHES RIVER	S	46	.77	.23			50	1.00		49	.98	.02	
HANFORD REACH	F	99	.72	.27		.01	100	1.00		100	.77	.23	
HANFORD REACH 85	F	99	.54	.46			100	.99	.01	99	.82	.18	
PRIEST RAPIDS HATCHERY	F	88	.74	.26			100	1.00		94	.68	.32	
WENATCHEE RIVER	S	165	.90	.10			191	.99	.01	181	.91	.09	
WENATCHEE RIVER	SUM	34	.66	.34			50	1.00					
WENATCHEE RIVER 85	SUM	50	.63	.37			50	.94	.06	50	.74	.26	
LEAVENWORTH HATCHERY	S	100	.90	.10			100	.99	.01	100	.87	.13	
LEAVENWORTH HATCHERY 85	S	93	.83	.17			100	.99	.01	90	1.00		
ENTIAT RIVER	S	132	.90	.10			132	.99	.01	118	.94	.06	
WELLS DAM HATCHERY	SUM	76	.71	.29			98	1.00		98	.66	.34	
METHOW RIVER 83	S	36	.85	.15			53	1.00		53	.90	.10	
METHOW RIVER 84	S	50	.97	.03			50	1.00		50	.97	.03	
METHOW RIVER	SUM	-					88	1.00		86	.73	.27	
WINTHROP HATCHERY #	S	22	.70	.30			22	1.00		22	.99	.01	
OKANAGAN RIVER	SW	92	.74	.26			100	1.00		96	.68	.32	
OKANAGAN RIVER 85	SUM	50	.63	.37			50	.99		48	.69	.31	

Chinook salmon gene frequency data (continued),

CHINOOK STOCK	FORM	PHOSPHO-GLUCOMUTASE			PHOSPHOGLYCERATE KINASE-2				SUPEROXIDE DISMUTASE			
		N	-100	-60	N	100	90	64	N	-100	-260	125Q
COWLITZ HATCHERY #	F	99	.99	.01	50	.79	.21		98	.65	.35	
COWLITZ HATCHERY	S	100	1.00						99	.57	.43	
KALAMA HATCHERY	F	100	1.00		52	.88	.12		80	.58	.42	
KALAMA HATCHERY	S	loo	1.00						100	.66	.34	
LEWIS HATCHERY	S	100	1.00		100	.14	.86		50	.56	.44	
LEWIS HATCHERY	F	100	1.00						47	.48	.52	
LEWIS RIVER	F	100	1.00						194	.56	.44	
CLACKAMAS RIVER	F	49	1.00		49	.86	.14		49	.86	.14	
CLACKAMAS RIVER	S	80	1.00						28	.84	.16	
EAGLE CREEK HATCHERY	S	100	1.00		95	.06	.94		98	.67	.33	
EAGLE CREEK HATCHERY 85	S	100	1.00		91	.97	.03		99	.74	.26	
MARION FORKS HATCHERY	S	50	1.00		77	.98	.02		100	.80	.20	
SOUTH SANTIAM HATCHERY	S	100	1.00		99	.94	.06		99	.84	.16	
THOMAS CREEK	S	100	1.00		100	.93	.07		100	.81	.19	
MCKENZIE HATCHERY	S	100	1.00		84	.88	.12		100	.81	.19	
MCKENZIE HATCHERY 85	S	loo	1.00		60	.88	.12		98	.79	.21	
DEXTER HATCHERY	S	100	1.00		94	.90	.10		100	.92	.08	
SANDY RIVER	F	66	1.00									
SANDY-85	F	49	1.00		49	.82	.18		49	.56	.44	
WASHOUGAL RIVER	F	50	.96	.04	42	.71	.29		50	.48	.52	
BONNEVILLE HATCHERY	F	93	1.00		93	1.00			83	.52	.48	
CARSON HATCHERY	S	loo	1.00		100	.02	.98		97	.81	.19	
CARSON HATCHERY 85	S	loo	1.00		96	.12	.88		93	.77	.23	
LIT.WHITE SALMON HATCH.	S	100	1.00		72	.12	.88		100	.78	.22	
LIT.WHITE SALMON HATCH. 85	S	98	1.00		98	.09	.91		92	.85	.15	
SPRING CREEK HATCHERY	F	100	1.00		91	.91	.09		80	.58	.42	
KLICKITAT RIVER	F	50	1.00		50	.61	.39		45	.54	.46	
KLICKITAT HATCHERY #	S	50	1.00		50	.57	.43		50	.69	.31	
HOOD RIVER	F	47	1.00									
DESCHUTES RIVER	F	100	1.00						76	.70	.30	
DESCHUTES RIVER 85	F	54	1.00		53	.52	.48		52	.63	.38	
ROUND BUTTE HATCHERY	S	93	1.00		93	.45	.55		81	.56	.44	
ROUND BUTTE HATCHERY 85	S	98	1.00		80	.18	.82		95	.65	.35	
WARM SPRINGS RIVER #	S	50	1.00		50	.32	.68		50	.54	.46	
JOHN DAY RIVER	S	95	1.00		39	.06	.94		81	.73	.27	
JOHN DAY RIVER 85	S	60	1.00		60	.28	.72		60	.70	.30	
SNAKE RIVER STOCK	F	loo	1.00		51	.67	.33		88	.64	.36	
TUCANNON RIVER	S	93	1.00		77	.06	.94		54	.78	.22	
TUCANNON RIVER 85	S	50	1.00		27	.02	.98		40	.86	.14	
GRANDE RONDE RIVER	S	43	1.00		37	.23	.77		43	.79	.21	
GRANDE RONDE RIVER 84	S	36	1.00						36	.85	.15	

Chinook salmon gene frequency data (continued).

CHINOOK STOCK	FORM	PHOSPHO-GLUCOMUTASE N	-100	-60	PHOSPHOGLYCERATE KINASE-2 N	100	90	64	SUPEROXIDE D I - N	-100	-260	1250
WALLOWA-LOSTINE RIVER	S	47	1.00		45	.07	.92	.01	47	.79	.21	
WALLOWA-LOSTINE RIVER 84	S	40	1.00		90		1.00		40	.86	.14	
KOOSKIA HATCHERY STOCK	S	100	1.00		46	.04	.96		99	.84	.16	
RED R. SF CLEARWATER #	S	40	1.00		40	.15	.85		40	.95	.05	
IMNAHA RIVER	S	87	1.00		78	.15	.85		87	.89	.11	
IMNAHA RIVER 84	S	108	1.00		90		1.00		87	.87	.13	
RAPID RIVER HATCHERY #	S	50	1.00		50	.15	.85		50	.96	.04	
JOHNSON CREEK #	SUM	56	1.00		56	.05	.96		56	.97	.03	
MCCALL HATCHERY #	SUM	50	1.00		50	.08	.92		50	.98	.02	
MIDDLE FORK SALMON	S	50	1.00		50	.05	.95		35	.80	.20	
EAST FK. SALMON R. STOCK	S	50	1.00						50	.98	.02	
VALLEY CREEK	SUM	48	1.00		43	.20	.80		48	.94	.06	
VALLEY CREEK #	S	22	1.00		22	.21	.80		22	.89	.11	
SAWTOOTH STOCK #	S	50	1.00		50	.09	.91		48	.95	.05	
YAKIMA RIVER	F	36	1.00		36	.38	.62		36	.85	.15	
YAKIMA RIVER	S	50	1.00		30	.17	.83		50	.76	.24	
NACHES RIVER	S	49	1.00		50	.38	.62		49	.70	.30	
HANFORD REACH	F	loo	1.00		39	.74	.26					
HANFORD REACH 85	F	loo	1.00		100	.65	.36		100	.53	.47	
PRIEST RAPIDS HATCHERY	F	loo	1.00						92	.50	.50	
WENATCHEE RIVER	S	184	1.00		76	.09	.91		170	.82	.18	*
WENATCHEE RIVER	SUM	50	1.00									
WENATCHEE RIVER 85	SUM	50	1.00		50	.58	.42		50	.46	.53	.01
LEAVENWORTH HATCHERY	S	loo	1.00		76	.03	.97		loo	.84	.16	
LEAVENWORTH HATCHERY 85	S	100	1.00		79	.12	.88		94	.71	.29	
ENTIAT RIVER	S	128	1.00		35	.03	.97		130	.76	.24	
WELLS DAM HATCHERY	SUM	98	1.00		74	.64	.36		97	.58	.42	
METHOW RIVER 83	S	53	1.00						36	.67	.33	
METHOW RIVER 84	S	50	1.00		35	.03	.97		50	.77	.23	
METHOW RIVER	SUM	88	.99	.01					76	.49	.51	
WINTHROP HATCHERY #	S	123	1.00		98	.50	.50		129	.74	.26	
OKANAGAN RIVER	SUM	loo	1.00		49	.70	.30		-			
OKANAGAN RIVER 85	SUM	50	1.00		50	.68	.32		50	.52	.48	

Appendix Table 4. Columbia River steelhead electrophoretic data from Schreck et al. (1986).

Isozyme gene frequencies and sample sizes (N) as determined by electrophoresis for steelhead trout stocks in Oregon, Washington and Idaho. Numbers at the top of each column are the relative ❑ abilities for each allele present in the enzyme system. Minus signs indicate cathodal migration. An asterisk indicates that an **allele** was present at a frequency of less than .005. "Form" is the time of freshwater entry (S for summer and W for winter). A pound sign (#) indicates that data for that stock was obtained from the Genetic Analysis of Columbia River Steelhead Trout (Wishard and Seeb 1983) prepared for the Idaho Department of Fish and Game.

Steelhead trout gene frequencydata (continued).

STEELHEAD STOCK	FORM	CREATINE KINASE			GLUCOSE PHOSPHATE ISOMERASE-1				GLUCOSE PHOSPHATE ISOMERASE-2		
		N	100	.70	N	100	130	25	N	100	120
BIG CREEK HATCHERY	W	loo	1.00		loo	1.00			loo	1.00	
BIG CREEK HATCHERY 85	W	95	1.00		95	1.00			95	1.00	
GRAYS RIVER	W	100	1.00		100	1.00			loo	1.00	
ELOCHOMAN HATCHERY	W	loo	1.00		loo	1.00			100	1.00	
COWLITZ HATCHERY NATIVE	w	99	1.00		91	1.00			91	1.00	
COWLITZ HATCHERY CHAMBERS	w	8 3	1.00		95	1.00			95	1.00	
COWLITZ HATCHERY SKAMANIA	s	8 0	1.00		90	1.00			90	1.00	
S.F. TOUTLE RIVER	w	50	1.00		50	1.00			50	1.00	
COWEEMAN RIVER	W	74	1.00		74	1.00			74	1.00	
EAGLE CREEK HATCH.(BIG CRK.)	W	100	1.00		90	1.00			98	1.00	
EAGLE CREEK HATCHERY 85	W	50	1.00		50	1.00			50	1.00	
EAGLE CREEK HATCH.(NATIVE)	W	loo	1.00		80	1.00			80	1.00	
EAGLE CREEK HATCHERY 85	w	06	1.00		88	1.00			88	1.00	
MARION FORKS HATCHERY	W	100	1.00		100	.86	.14		loo	1.00	
THOMAS CREEK 83	w	-			100	1.00			loo	1.00	
THOMAS CREEK 84	W	55	1.00		55	1.00			55	1.00	
THOMAS CREEK 85	W	24	1.00		24	1.00			24	1.00	
WILEY CREEK	W	100	1.00		100	1.00			loo	1.00	
WILEY CREEK 85	W	27	1.00		27	1.00			27	1.00	
SOUTH SANTIAM HATCHERY	S	97	1.00		97	1.00			97	1.00	
CALAPOOYA RIVER	w	-			loo	1.00			loo	1.00	
CALAPOOYA RIVER 84	W	47	1.00		47	1.00			47	1.00	
LEABURG HATCHERY	S	loo	1.00		95	1.00			95	1.00	
LEABURG HATCHERY 85	s	50	1.00		50	1.00			50	1.00	
MCKENZIE RIVER	s	50	1.00		48	1.00			40	1.00	
SANDY RIVER	W	loo	1.00		loo	1.00			loo	1.00	
WASHOUGAL HATCHERY	S	100	1.00		95	1.00			95	1.00	
WASHOUGAL HATCHERY 85	S	100	1.00		100	1.00			loo	1.00	
WASHOUGAL HATCHERY	w	99	1.00		100	1.00			loo	1.00	
HAMILTON CREEK	w	53	1.00		53	.99		.01	53	1.00	
WIND RIVER	s	50	1.00		50	.91		.09	50	1.00	
WIND RIVER 85	s	25	1.00		25	.96		.04	25	1.00	
HOOD RIVER	w	50	1.00		50	1.00			50	1.00	
KLICKITAT RIVER	S	loo	1.00		100	1.00			100	1.00	
FIFTEENMILE CREEK	w	82	1.00		82	1.00			82	.96	.04
[redacted] CREEK 85	w	50	1.00		50	1.00			48	.95	.05
DESCHUTES RIVER	S	170	1.00		170	1.00			178	1.00	
ROUND BUTTE HATCHERY	S	93	.96	.04	loo	1.00			100	1.00	
ROUND BUTTE HATCHERY 85	S	100	.96	.04	100	1.00			100	1.00	
JOHN DAY RIVER	S	100	1.00	*	100	1.00			100	1.00	
JOHN DAY RIVER 85	s	50	.98	.02	50	1.00			50	1.00	

Steelhead trout gene frequency data (continued).

STOCK	FORM	CREATINE KINASE			GLUCOSE PHOSPHATE ISOMERASE-1				GLUCOSE PHOSPHATE ISOMERASE-2		
		N	100	70	N	loo	130	25	N	100	120
UMATILLA RIVER	S	100	1.00		100	1.00			loo	1.00	
UMATILLA HATCHERY	S	100	1.00		100	1.00			100	1.00	
WALLA WALLA RIVER	S	40	1.00		40	1.00			40	1.00	
TOUCHET RIVER	S	50	1.00		50	1.00			50	1.00	
TUCANNON RIVER	S	113	.99	.01	113	1.00			113	1.00	
TUCANNON RIVER 85	S	50	.99	.01	50	1.00			50	1.00	
GRANDE RONDE RIVER	S	50	1.00		50	1.00			50	1.00	
GRANDE RONDE RIVER 84	S	110	1.00		110	1.00			110	1.00	
- - -	S	73	1.00		73	1.00			73	1.00	
WALLOWA-LOSTINE 84	S	62	1.00		62	1.00			62	1.00	
WALLOWA HATCHERY	S	100	.99	.01	loo	1.00			100	1.00	
MISSION CREEK	S	30	1.00		30	1.00			30	1.00	
BIG CANYON/COTTONWOOD CRKS.	S	88	1.00		88	1.00			88	1.00	
DWORSHAK HATCHERY	S	73	1.00		73	1.00			73	1.00	
SELWAY RIVER	s	98	1.00		97	1.00			98	1.00	
LOCHSA RIVER	s	50	1.00		47	1.00			50	1.00	
IMNAHA RIVER	S	81	1.00		96	1.00			96	1.00	
IMNAHA RIVER 84	S	58	1.00		58	1.00			58	1.00	
IMNAHA HATCHERY	s	loo	1.00		100	.90	.10		100	1.00	
SHEEP & BARGAMIN CRKS.	s	120	1.00		120	1.00			120	1.00	
S.F.SALMON (SECESH RIVER)	S	61	1.00		61	1.00			61	1.00	
S.F.SALMON (JOHNSON CREEK)	S	50	.99			1.00			50	1.00	
CHAMBERLAIN CREEK	s	-				.99	.01				
HORSE CREEK	S	51	1.00			1.00			51	1.00	
MIDDLE FORK SALMON RIVER #	s	-			158	.97	.03		158	1.00	
PAHSIMEROI 'B' STOCK	S	50	1.00		50	1.00			50	1.00	
SAWTOOTH 'A' STOCK	s	50	1.00		50	1.00			50	1.00	
HELLS CANYON STOCK	s	loo	1.00		100	1.00			100	1.00	
YAKIMA RIVER	s	48	.99	.01	48	1.00			48	1.00	
YAKIMA RIVER 84	S	49	.99	.01	49	1.00			49	1.00	
WENATCHEE RIVER	s	96	1.00		96	1.00			96	1.00	
ENTIAT RIVER	S	50	1.00		50	1.00			50	1.00	
WELLS HATCHERY	S	81	1.00		81	1.00			81	1.00	
METHOW RIVER	S	55	1.00		58	1.00			58	1.00	

steelhead trout gene frequency data (continued).

STEELHEAD STOCK	FORM	GLUCOSE PHOSPHATE ISOMERASE-3				ASPARTATE AMINO-TRANSFERASE-1,2			ASPARTATE AMINO-TRANSFERASE-3		
		N	loo	120	92	N	100	112	N	loo	77
BIG CREEK HATCHERY	W	loo	1.00						loo	1.00	
BIG CREEK HATCHERY 85	W	95	1.00			85	1.00		89	1.00	
GRAYS RIVER	W	loo	.99		.01				loo	1.00	
ELOCHOMAN HATCHERY	W	100	.98		.02	loo	1.00		100	1.00	
COWLITZ HATCHERY NATIVE	W	91	.96		.04	99	1.00		90	1.00	
COWLITZ HATCHERY CHAMBERS	W	95	.96		.04	80	1.00		loo	1.00	
COWLITZ HATCHERY SKAMANIA	S	90	.98		.02	90	1.00		90	1.00	
S.F. TOUTLE RIVER	W	50	.96	.01	.03	50	1.00		50	1.00	
COWEEMAN RIVER	W	74	.89	.01	.10	74	1.00		74	1.00	
EAGLE CREEK HATCH.(BIG CRK.)	W	98	1.00			100	1.00		loo	1.00	
EAGLE CREEK HATCHERY 85	W	50	1.00			50	1.00		50	1.00	
EAGLE CREEK HATCH.(NATIVE)	W	80	1.00			80	1.00				
E A G L E - - Y 8 5	W	88	1.00			92	1.00		95	1.00	
MARION FORKS HATCHERY	W	100	1.00						loo	1.00	
THOMAS CREEK 83	W	loo	1.00								
m m - 8 4	W	55	1.00						55	1.00	
THOMAS CREEK 85	W	24	1.00			24	1.00		24	1.00	
W I L E Y -	W	loo	1.00						100	1.00	
- CREEK 85	W	27	1.00			27	1.00		27	1.00	
SOUTH SANTIAM HATCHERY	S	97	.95		.05	47	.94	.06	97	1.00	
CALAPOOYA RIVER	W	loo	1.00								
CALAPOOYA RIVER 84	W	47	1.00			47	1.00		47	1.00	
LEABURG HATCHERY	S	95	.96		.04	100	.99	.01	loo	1.00	
LEABURG HATCHERY 85	S	49	.92		.08	42	1.00		50	1.00	
MCKENZIE RIVER	S	48	.93	.07		36	1.00		50	1.00	
SANDY RIVER	W	loo	1.00			100	1.00		loo	1.00	
WASHOUGAL HATCHERY	S	95	.92		.08	50	1.00		loo	1.00	
WASHOUGAL HATCHERY 85	S	97	.94		.06	85	1.00		89	1.00	
WASHOUGAL HATCHERY	W	100	.99		.01	loo	1.00		loo	1.00	
HAMILTON CREEK	W	53	.98		.02				53	1.00	
WIND RIVER	S	50	.92		.08				50	1.00	
WIND RIVER 85	S	25	.94		.06	25	1.00		25	1.00	
HOOD RIVER	W	50	1.00			50	1.00		50	1.00	
KLICKITAT RIVER	S	loo	.98	.02	*				100	1.00	
FIFTEENMILE CREEK	W	82	1.00								
FIFTEENMILE CREEK 85	W	50	1.00			45	1.00		37	1.00	
DESCHUTES RIVER	S					178	1.00		178	1.00	
ROUND BUTTE HATCHERY	S	100	.99		.01				loo	1.00	
ROUND BUTTE HATCHERY 85	S	loo	1.00			93	1.00		99	1.00	
JOHN DAY RIVER	S	100	1.00		*				78	1.00	
JOHN DAY RIVER 85	S	50	1.00			47	1.00		45	1.00	

Steelhead trout gene frequency data (continued).

STOCK	FORM	GLUCOSE PHOSPHATE ISOMERASE-3 N	100	120	92	ASPARTATE AMINO-TRANSFERASE-1,2 N	100	112	ASPARTATE AMINO-TRANSFERASE-3 N	loo	77
UMATILLA RIVER	S	loo	1.00			loo	1.00				
UMATILLA HATCHERY	S	100	1.00						loo	.98	.02
WALLA WALLA RIVER	S	40	1.00			34	1.00		30	1.00	
TOUCHET RIVER	S	50	1.00			44	1.00		50	1.00	
TUCANNON RIVER	S	113	1.00			103	1.00		103	1.00	
TUCANNON RIVER 85	S	50	1.00			50	1.00		50	1.00	
GRANDE RONDE RIVER	S	50	1.00			50	1.00		50	1.00	
GRANDE RONDE RIVER 84	S	110	.99	.01		110	1.00		60	1.00	
WALLOWA-LOSTINE	S	73	1.00			36	1.00				
WALLOWA-LOSTINE 84	S	62	1.00						62	1.00	
WALLOWA HATCHERY	S	100	1.00			100	1.00		100	1.00	
MISSION CREEK	S	30	1.00						30	1.00	
BIG CANYON/COTTONWOOD CRKS.	S	88	1.00						88	1.00	
DWORSHAK HATCHERY	S	73	1.00						72	.91	.09
SELWAY RIVER	S	97	.99		.01	-			97	1.00	
LOCHSA RIVER	S	50	1.00						50	.99	.01
IMNAHA RIVER	S	96	1.00			86	1.00		96	1.00	
IMNAHA RIVER 84	S	58	1.00			58	1.00		58	1.00	
IMNAHA HATCHERY	S	loo	1.00			loo	1.00		83	1.00	
SHEEP & BARGAMIN CRKS.	S	120	.99		.01	-			116	1.00	
S.F.SALMON (SECESH RIVER)	S	61	.99	.01							
S.F.SALMON (JOHNSON CREEK)	S	50	1.00			50	1.00		50	.99	.01
CHAMBERLAIN CREEK	S	97	.99	.01							
HORSE CREEK	S	50	1.00						50	1.00	
MIDDLE FORK SALMON RIVER #	S	277	.99	.01							
PAHSIMEROI 'B' STOCK	S	50	1.00			50	1.00		47	1.00	
SAWTOOTH 'A' STOCK	S	50	1.00			50	.99	.01	50	1.00	
HELLS CANYON STOCK	S	95	.97	.03		75	.99	.01	94	1.00	
YAKIMA RIVER	S	48	1.00			48	1.00		48	1.00	
YAKIMA RIVER 84	S	49	1.00			49	1.00		49	.98	.02
WENATCHEE RIVER	S	96	.97	.03		96	1.00		96	1.00	
ENTIAT RIVER	S	50	1.00			50	1.00				
WELLS HATCHERY	S	81	.98	.01	.01	50	1.00		100	.99	.01
METHOW RIVER	S	58	.96	.04					58	1.00	

Steelhead trout gene frequency data (continued).

STEELHEAD STOCK	FORM	ISOCITRATE DEHYDROGENASE-3,4					LACTATE DEHYDROGENASE-4				MALATE DEHYDROGENASE-1,2			
		N	100	40	120	71	N	100	76	111	N	100	140	70	40
BIG CREEK HATCHERY	W	98	.70	.14	*	.16	100	.96	.04		100	1.00			
BIG CREEK HATCHERY 85	W	71	.64	.12	.01	.23	92	.95	.05		95	1.00			
GRAYS RIVER	W	94	.69	.12		.19	100	.80	.20		100	1.00			
ELOCHOMAN HATCHERY	W	89	.75	.13		.11	99	.85	.15		100	.99	.01		
COWLITZ HATCHERY NATIVE	W	90	.68	.12	.01	.19	99	.90	.10		99	1.00			
COWLITZ HATCHERY CHAMBERS	W	100	.65	.16	.02	.17	100	.90	.10		100	.99	.01		
COWLITZ HATCHERY SKAMANIA	S	88	.66	.14	.01	.19	90	.88	.12		90	1.00			
S.F. TOUTLE RIVER	W	39	.61	.19	.02	.18	50	.80	.20		50	1.00			
COWEEMAN RIVER	W	72	.69	.16	*	.17	74	.87	.13		74	1.00			
EAGLE CREEK HATCH.(BIG CR.)	W	95	.64	.20	.06	.10	100	.92	.08		100	1.00			
EAGLE CREEK HATCHERY 85	W	47	.65	.12	.08	.15	50	.81	.17	.02	50	1.00			
EAGLE CREEK HATCH.(NATIVE)	S	94	.70	.12	.03	.15	80	.78	.22		70	1.00			
EAGLE CREEK HATCHERY 85	S	70	.61	.14	.06	.19	91	.91	.09		100	1.00			
MARION FORKS HATCHERY	W	94	.64	.13	.02	.21	100	.53	.47		100	1.00			
THOMAS CREEK 83	W	58	.72	.04		.24	100	.60	.40		50	.98	.02		
THOMAS CREEK 84	W	52	.73	.12		.15	55	.71	.29		55	.98	.02		
THOMAS CREEK 85	W	23	.62	.15		.23	24	.50	.50		24	1.00			
WILEY CREEK	W	-					100	.55	.45	.01	100	1.00			
WILEY CREEK 85	W	26	.62	.22		.16	27	.76	.24		27	.97	.03		
SOUTH SANTIAM HATCHERY	S	89	.70	.18	.02	.10	96	.80	.20		94	.99	.01		
CALAPOOYA RIVER	W	68	.74	.04	.01	.21	98	.41	.59		100	.99	.01		
CALAPOOYA RIVER 84	W	46	.71	.12		.17	47	.48	.52		47	1.00			
LEABURG HATCHERY	S	97	.62	.19	.05	.14	100	.88	.12		90	1.00			
LEABURG HATCHERY 85	S	50	.66	.15	.02	.18	50	.81	.19		50	1.00			
MCKENZIE RIVER	S	44	.71	.18	.01	.10	50	.70	.30		50	1.00			
SANDY RIVER	W	97	.74	.13		.13	100	.90	.10		100	1.00			
WASHOUGAL HATCHERY	S	95	.64	.21	*	.15	100	.80	.20		100	1.00			
WASHOUGAL HATCHERY 85	S	76	.65	.19	.01	.15	100	.80	.20		100	1.00			
WASHOUGAL HATCHERY	W	69	.68	.11	.03	.18	99	.91	.09		100	1.00			
HAMILTON CREEK	W	50	.72	.13		.16	53	.88	.12		53	.99	.01		
WIND RIVER	S	42	.66	.18		.16	50	.79	.20	.01	50	1.00	*		
WIND RIVER 85	S	24	.58	.32	.01	.08	25	.78	.22		25	1.00			
HOOD RIVER	W	43	.62	.18		.20	50	.91	.09		50	1.00			
KLICKITAT RIVER	S	92	.71	.13	.01	.15	100	.60	.40		100	1.00			
FIFTEENMILE CREEK	W	82	.68	.09	.01	.22	81	.65	.35		82	1.00			
FIFTEENMILE CREEK 85	W	50	.73	.08	.01	.19	50	.56	.44		50	1.00			
DESCHUTES RIVER	S	231	.69	.13	*	.18	266	.39	.61		267	1.00	*		
ROUND BUTTE HATCHERY	S	97	.68	.15		.17	100	.44	.56		100	1.00			
ROUND BUTTE HATCHERY 85	S	95	.60	.20	.01	.20	100	.42	.53	.06	100	.99	.01		
JOHN DAY RIVER	S	73	.71	.12	.01	.17	100	.30	.70		100	1.00	*		
JOHN DAY RIVER 85	S	47	.67	.13	.02	.18	50	.40	.60		50	1.00			

Steelhead troutgene frequency data (continued).

STEELHEAD STOCK	FORM	ISOCITRATE DEHYDROGENASE-3,4					LACTATE DEHYDROGENASE-4				MALATE DEHYDROGENASE-1,2			
		N	loo	40	120	71	N	100	76	111	N	100	140	70 40
UMATILLA RIVER	s	98	.66	.19		.15	99	.42	.58		100	.99	.01	
UMATILLA HATCHERY	s	90	.66	.12		.22	loo	.57	.43		100	1.00		
WALLA WALLA RIVER	S	40	.62	.16		.23	40	.36	.64		40	.99		.01
TOUCHET RIVER	s	49	.61	.17		.21	50	.45	.55		50	.99	.01	
TUCANNON RIVER	S	106	.64	.17		.19	112	.33	.67		113	1.00		
TUCANNON RIVER 85	s	49	.62	.19		.19	50	.29	.70	.01	50	.99	.02	
GRANDE RONDE RIVER	s	50	.70	.15		.14	49	.25	.75		50	.98	.02	
GRANDE RONDE RIVER 84	s	74	.72	.12		.17	109	.39	.61		110	1.00		
- - -	S	72	.75	.14		.12	73	.34	.66		73	.99		.01
- - - 8 4	s	57	.71	.12	*	.17	62	.36	.64					
WALLOWA HATCHERY	s	92	.67	.16		.17	100	.24	.77		100	1.00		
MISSION CREEK +	s	30	.64	.13		.23	30	.42	.58		30	.99	.01	
BIG CANYON/COTTONWOOD CRKS.+	S	86	.58	.15		.28	88	.16	.84		88	.99	.01	
DWORSHAK HATCHERY +	s	71	.65	.22		.13	73	.23	.77		73	.99	.01	
SELWAY RIVER +	S	96	.62	.15		.24	98	• 34	.66		98	1.00		
LOCHSA RIVER +	s	43	.68	.12		.20	50	.27	.73		50	.99	.01	
IMNAHA RIVER	s	96	.70	.14		.16	96	.29	.71		96	1.00		
IMNAHA RIVER 84	S	57	.72	.13		.15	58	.28	.72		58	1.00		
IMNAHA HATCHERY	s	87	.74	.08	*	.18	99	.39	.61		50	1.00		
SHEEP & BARGAMIN CRKS. +	S	94	.57	.18		.25	120	.29	.70	.02	120	1.00		
S.F.SALMON (SECESH RIVER)	S	56	.64	.24		.12	61	.25	.75		61	1.00	*	
S.F.SALMON (JOHNSON CREEK)	s	47	.57	.33	.01	.10	50	.28	.72		50	1.00		
CHAMBERLAIN CREEK +	s	97	.67	.15	.01	.18	97	.24	.73	.03	97	1.00		
HORSE CREEK +	s	40	.68	.07	.01	.24	50	.28	.72		50	1.00		
MIDDLE FORK SALMON RIVER #	S	158	.67	.15		.18	277	.33	.66	.01	277	1.00		
PAHSIMEROI 'B' STOCK	s	38	.68	.09	.01	.22	50	.29	.71		50	.99	.01	
SAWTOOTH 'A' STOCK	s	28	.73	.08	.02	.17	50	.43	.56	.01	50	1.00		
HELLS CANYON STOCK	S	67	.63	.19		.18	100	.21	.74	.06	100	1.00		
YAKIMA RIVER	S	46	.65	.15	.02	.18	48	.68	.32		48	1.00		
YAKIMA RIVER 84	S	46	.62	.16		.22	49	.61	.39		49	.99	.02	
WENATCHEE RIVER	S	73	.62	.21	.01	.17	95	.38	.61	.01	96	1.00		
ENTIAT RIVER	s	50	.60	.19	*	.21	50	.29	.69	.02	50	.99	.01	
WELLS HATCHERY	s	81	.66	.18		.16	81	.26	.74		81	.98	.02	
METHOW RIVER	s	53	.66	.14		.20	58	.29	.71		58	.99	.01	

Steelhead trout gene frequency data (continued).

STEELHEAD STOCK	FORM	MALATE D - 3			, 4			NADP+ MALATE DEHYDROGENASE			MANNOSE PHOSPHATE ISOMERASE			
		N	100	83	110	90		N	100	85	N	100	94	110
BIG CREEK HATCHERY	W	100	.92	.08				100	.80	.20	loo	1.00		
BIG CREEK HATCHERY 85	W	92	.90	.10		*		67	.90	.01	95	1.00		
GRAYS RIVER	W	99	.88	.10	.01	.01		90	.83	.17	100	1.00		
ELOCHOMAN HATCHERY	W	94	.89	.08		.03		100	.95	.05	57	1.00		
COWLITZ HATCHERY NATIVE	W	86	.91	.09				77	.62	.38	99	1.00		
COWLITZ HATCHERY CHAMBERS	W	99	.93	.07				98	.84	.16	100	1.00		
COWLITZ HATCHERY SKAMANIA	S	88	.82	.17	.01			85	.78	.22	90	1.00		
S.F. TOUTLE RIVER	W	50	.88	.11		.02		50	.63	.37	50	1.00		
COWEEMAN RIVER	W	74	.87	.04		.09		74	.80	.20	74	1.00		
EAGLE CREEK HATCH. (BIG CR.)	W	100	.89	.11				98	.83	.17	100	1.00		
EAGLE CREEK HATCHERY 85	W	50	.86	.11	.04			45	.94	.06	50	1.00		
EAGLE CREEK HATCH. (NATIVE)	W	95	.85	.15		.01					90	1.00		
EAGLE CREEK HATCHERY 85	W	88	.84	.10	.06			63	.98	.02	100	1.00		
MARION FORKS HATCHERY	W	100	.96	.04				1001.00			76	1.00		
THOMAS CREEK 83	W	97	.93	.07				80	1.00					
THOMAS CREEK 84	W	46	.93	.07				55	1.00		55	1.00		
THOMAS CREEK 85	W	24	.97	.03				24	1.00		24	1.00		
WILEY CREEK	W	97	.90	.10	*			100	1.00		loo	1.00		
WILEY CREEK 85	W	26	.90	.01		.09		27	1.00		27	1.00		
SOUTH SANTIAM HATCHERY	S	95	.91	.07	.02			92	.96	.04	-			
CALAPOOYA RIVER	W	89	.99	.01							50	1.00		
CALAPOOYA RIVER 84	W	46	.96	.04				47	1.00		47	1.00		
LEABURG HATCHERY	S	loo	.84	.13	.03			100	.96	.04	100	1.00		
LEABURG HATCHERY 85	S	50	.83	.15	.02	.01		50	.92	.08	50	1.00		
MCKENZIE RIVER	S	50	.87	.12		.01		50	.96	.04	50	1.00		
SANDY RIVER			.92	.08	•			95	.88	.12	loo	1.00		
WASHOUGAL HATCHERY	S	94	.82	.18				92	.82	.18	-			
WASHOUGAL HATCHERY 85	S	100	.91	.09				loo	.96	.04	95	1.00		
WASHOUGAL HATCHERY	W	100	.88	.12				1001.00			loo	1.00		
HAMILTON CREEK	W	51	.89	.06	.04	.01		53	.89	.11	53	1.00		
WIND RIVER	S	49	.96	.04				50	.84	.16	50	1.00		
WIND RIVER 85	S	25	.97			.03		25	.83	.17	25	1.00		
HOOD RIVER	W	50	.91	.09	.01			50	.94	.06	50	1.00		
KLICKITAT RIVER	S	91	.91	.06	.02	.01		100	1.00		100	1.00		
FIFTEENMILE CREEK	W	82		.01	.02			50	.94	.06	-			
FIFTEENMILE CREEK 85	W	50	.96	.03	.01			50	1.00		45	.99	.01	
DESCHUTES RIVER	S	267	.96	.04	*	*		267	1.00					
ROUND BUTTE HATCHERY	S	98	.96	.04	*			100	1.00		100	1.00		
ROUND BUTTE HATCHERY 85	S	100	.99	.01				98	1.00		100	.98	.01	.02
JOHN DAY RIVER	S	100	.99	•	*	*		50	1.00		100	1.00		
JOHN DAY RIVER 85	S	50	.99	.01	.01			50	.99	.01	50	.99	.01	

Steelhead trout gene frequency data (continued).

STEELHEAD STOCK	FORM	MALATE DEHYDROGENASE-3,4 N	100	83	110	90	NADP+ MALATE DEHYDROGENASE N	100	85	MANNOSE PHOSPHATE ISOMERASE N	100	94	110
UMATILLA RIVER	S	100	.98		.02		100	1.00		100	1.00		
UMATILLA HATCHERY	S	100	.98	.01	.01		100	1.00		50	1.00		
WALLA WALLA RIVER	S	40	.98	.02			40	1.00		30	.99	.01	
TOUCHET RIVER	S	50	.97	.01	.01	.02	50	1.00		50	1.00	.01	
--	S	112	.98	.01	.01		113	1.00					
TUCANNON RIVER 85	S	50	.99	.01			50	1.00		50	.96	.03	.01
GRANDE RONDE RIVER	S	50	.99	.01			50	1.00					
GRANDE RONDE RIVER 84	S	110	.99	*		.01	110	1.00		50	1.00		
WALLOWA-LOSTINE	S	73	.95	.01	.04		73	1.00		73	.99	.01	
WALLOWA-LOSTINE 84	S	62	.95	.01	.04	.01	62	1.00		62	1.00		
WALLOWA HATCHERY	S	100	.96	.01	.03		100	1.00		100	1.00		
MISSION CREEK	S	30	1.00							30	.95	.05	
BIG CANYON/COTTONWOOD CRKS.	S	88	1.00							88	.90	.10	
DWORSHAK HATCHERY	S	73	.99		.01					73	1.00		
SELWAY RIVER	S	98	1.00		*					98	.95	.04	.01
LOCHSA RIVER	S	50	.99		.01					40	1.00		
IMNAHA RIVER	S	96	1.00				94	1.00		96	.98	.01	.01
IMNAHA RIVER 84	S	58	1.00				58	1.00		58	1.00		
IMNAHA HATCHERY	S	100	1.00				100	1.00		100	1.00		
SHEEP & BARGAMIN CRKS.	S	120	.99		.02					120	.99	.02	
S.F.SALMON (SECESH RIVER)	S	61	.98		.02		61	1.00		61	1.00		
S.F.SALMON (JOHNSON CREEK)	S	50	.99	.01			50	1.00		50	.99	.01	
CHAMBERLAIN CREEK	S	97	.98		.01	.01				97	.98	.02	
HORSE CREEK	S	50	.99		.01	.01				so	1.00		
MIDDLE FORK SALMON RIVER #	S	277	.98	.02						277	1.00		
PAHSIMEROI 'B' STOCK	S	50	1.00				50	1.00		50	1.00		
SAWTOOTH 'A' STOCK	S	50	.99	.01			50	1.00		50	.95	.05	
HELLS CANYON STOCK	S	loo	.98	.02			96	1.00		100	.99	.01	
YAKIMA RIVER	S	48	.98	.02	.01		48	1.00		48	1.00		
YAKIMA RIVER 84	S	49	1.00				49	1.00		49	1.00		
WENATCHEE RIVER	S	96	.94	.02		.04	96	1.00		96	.99	.01	
ENTIAT RIVER	S	50	.99	*	*		40	1.00		50	1.00		
WELLS HATCHERY	S	76	.99		.01		76	1.00		81	1.00		
METHOW RIVER	S	58	.98	.01	.01		58	1.00		58	.99	.01	

Steelhead trout gene frequency data (continued).

STOCK	FORM	DIPEPTIDASE					TRIPEPTIDE AMINOPEPTIDASE					PHOSPHO-GLUCOMUTASE-1				
		N	100	110	85	95	N	100	129	74	50	N	-100	-115	-85	
BIG CREEK HATCHERY	W	100	1.00				100	1.00				100	1.00			
BIG CREEK HATCHERY 85	W	95	1.00				95	1.00				95	.99		.01	
GRAYS RIVER	W	100	.99	.01			100	1.00				100	1.00			
ELOCHOMAN HATCHERY	W	99	1.00				90	1.00				100	1.00			
COWLITZ HATCHERY NATIVE	W	99	1.00				99	1.00				99	1.00			
COWLITZ HATCHERY CHAMBERS	W	100	1.00				100	1.00				100	1.00			
COWLITZ HATCHERY SKAMANIA	S	90	1.00				90	1.00				90	1.00			
S.F. TOUTLE RIVER	W	50	1.00				50	.99		.01		50	1.00			
COWEEMAN RIVER	W	74	1.00				73	.99	.01			74	1.00			
EAGLE CREEK HATCH. (BIG CR.)	W	100	1.00				100	1.00				100	1.00			
EAGLE CREEK HATCHERY 85	W	50	1.00				50	.95	.05			50	1.00			
EAGLE CREEK HATCH. (NATIVE)	W	100	1.00				40	1.00				70	1.00			
EAGLE CREEK HATCHERY 85	W	100	1.00				95	.94	.06			100	1.00			
MARION FORKS HATCHERY	W	90	.94	.06			85	1.00				100	1.00			
THOMAS CREEK 83	W	100	.99	.01			100	1.00				68	1.00			
THOMAS CREEK 84	W	55	.96	.04			55	1.00				55	1.00			
THOMAS CREEK 85	W	24	.94	.06			24	1.00				24	1.00			
WILEY CREEK	W	100	.96	.04			100	1.00				100	1.00			
WILEY CREEK 85	W	27	.96	.04			27	.98	.02			27	1.00			
SOUTH SANTIAM HATCHERY	S	97	.94	.06			97	1.00				47	1.00			
CALAPOOYA RIVER	W	100	1.00				-					100	1.00			
CALAPOOYA RIVER 84	W	47	.99	.01			47	1.00				47	1.00			
LEABURG HATCHERY	S	95	.95	.05			100	1.00				95	1.00			
LEABURG HATCHERY 85	S	47	.99	.01			43	1.00				50	1.00			
MCKENZIE RIVER	S	50	.97	.03			50	1.00				50	.98		.02	
SANDY RIVER	W	100	.96	.04			100	1.00				100	1.00			
WASHOUGAL HATCHERY	S	100	.95	.01		.04	100	1.00				100	.98	.02		
WASHOUGAL HATCHERY 85	S	89	.99	.01			82	.99		.01		100	1.00			
WASHOUGAL HATCHERY	W	100	1.00				100	1.00				100	1.00			
HAMILTON CREEK	W	53	.97	.03			53	.99	.01			53	1.00			
WIND RIVER	S	50	1.00				50	1.00				50	1.00			
WIND RIVER 85	S	25	1.00				25	1.00				25	1.00			
HOOD RIVER	W	50	.99	.01			50	.99	.01			50	.99		.01	
KLICKITAT RIVER	S	100	.91	.05	.04		60	1.00				100	1.00			
FIFTEENMILE CREEK	W	82	1.00				82	1.00				82	.96	.01	.03	
FIFTEENMILE CREEK 85	W	50	.98	.02			49	.98		.02		50	1.00			
DESCHUTES RIVER	S	264	.92	.06	.01	.01	267	1.00		*		262	.99	*	.01	
ROUND BUTTE HATCHERY	S	97	.93	.07			100	.99	.01			78	1.00			
ROUND BUTTE HATCHERY 85	S	98	.91	.08	.01		93	.97		.03		100	.97	.01	.03	
JOHN DAY RIVER	S	100	.91	.09			100	1.00				100	.96		.04	
JOHN DAY RIVER 85	S	49	.92	.08			51	.98			.02	50	.99		.01	

Steelhead trout gene frequency data (continued).

STEELHEAD STOCK	FORM	DIPEPTIDASE				TRIPEPTIDE AMINOPEPTIDASE					PHOSPHO-GLUCOMUTASE-1		
		N	100	110	85	95	N	100	129	74	50	N	-100	-115	-85
UMATILLA RIVER	S	98	.90	.10			100	1.00				100	1.00		
UMATILLA HATCHERY	S	100	.95	.05			100	.99	.01			100	1.00		
WALLA WALLA RIVER	S	40	.83	.18			40	.90	.04		.06	40	1.00		
TOUCHET RIVER	S	47	.93	.07			48	.98	.02			50	.97	.03	
TUCANNON RIVER	S	112	.88	.11	*		112	1.00	*			100	.99	.01	
TUCANNON RIVER 85	S	50	.90	.10			50	.99	.01			50	1.00		
GRANDE RONDE RIVER	S	50	.93	.04	.03		50	1.00				50	.99		.01
GRANDE RONDE RIVER 84	S	110	.90	.09	.01		110	.99		.01		110	1.00		
WALLOWA-LOSTINE	S	73	1.00				73	1.00				73	1.00		
WALLOWA-LOSTINE 84	S	62	.93	.07			52	1.00				62	1.00		
WALLOWA HATCHERY	S	100	.93	.06	.01		100	1.00				100	1.00		
MISSION CREEK	S	30	.80	.20			30	1.00				30	.98		.02
BIG CANYON/COTTONWOOD CRKS.	S	88	.89	.09	.02		88	1.00				88	.99		.01
DWORSHAK HATCHERY	S	73	.54	.45			73	1.00				73	1.00		
SELWAY RIVER	S	98	.82	.18			98	1.00				95	1.00		
LOCHSA RIVER	S	46	.71	.29			50	1.00				49	1.00		
IMNAHA RIVER	S	100	.97	.03			100	1.00				96	1.00		
IMNAHA RIVER 84	S	58	.94	.06			58	1.00				58	1.00		
IMNAHA HATCHERY	S	100	.99	.01			100	1.00				100	1.00		
SHEEP & BARGAMIN CRKS.	S	120	.97	.04			120	1.00				120	1.00		
S.F.SALMON (SECESH RIVER)	S	61	.98	.02			57	1.00				61	1.00		
S.F.SALMON (JOHNSON CREEK)	S	50	.83	.16		.01	50	1.00				50	1.00		
CHAMBERLAIN CREEK	S	92	.95	.04		.01	97	1.00							
HORSE CREEK	S	50	.96	.04			51	1.00				50	1.00		
MIDDLE FORK SALMON RIVER #	S	277	.96	.04			277	.99	.01			277	1.00		
PAHSIMEROI 'B' STOCK	S	50	.54	.46			50	1.00				50	1.00		
SAWTOOTH 'A' STOCK	S	50	.95	.05			50	1.00				50	1.00		
HELLS CANYON STOCK	S	96	.96	.04	.01		100	.99	.01			100	1.00		
YAKIMA RIVER	S	48	.91	.09			48	1.00				48	1.00		
YAKIMA RIVER 84	S	49	.82	.18			49	1.00				49	1.00		
WENATCHEE RIVER	S	96	.94	.06			96	1.00				96	1.00		
ENTIAT RIVER	S	49	.96	.04			40	1.00				50	1.00		
WELLS HATCHERY	S	81	.91	.09			81	1.00				61	1.00		
METHOW RIVER	S	58	.95	.05			58	1.00				58	1.00		

Steelhead trout gene frequency data (continued).

STOCK	FORM	PHOSPHO-GLUCOMUTASE-2			L-IDITOL DEHYDROGENASE			SUPEROXIDE DISMUTASE			
		N	-100	-140	N	100	195	N	100	152	48
BIG CREEK HATCHERY	w	loo	1.00		100	1.00		98	.60	.40	
BIG CREEK HATCHERY 85	w	95	1.00					86	.60	.40	
GRAYSRIVER	w	loo	1.00		100	1.00		96	.68	.32	.01
ELOCHOMAN HATCHERY	w	loo	1.00		100	1.00		98	.68	.32	
COWLITZ HATCHERY NATIVE	W	99	1.00		99	1.00		88	.61	.39	
COWLITZ HATCHERY CHAMBERS	w	loo	1.00		100	1.00		100	.66	.34	
COWLITZ HATCHERY SKAMANIA	S	90	1.00		90	1.00		90	.78	.22	
S.F. TOUTLE RIVER	w	50	1.00		50	1.00		49	.58	.42	
COWEEMAN RIVER	W	74	1.00					66	.66	.34	
EAGLE CREEK HATCH. (BIG CR.)	w	100	1.00		100	1.00		99	.65	.35	
EAGLE CREEK HATCHERY 85	w	50	1.00					50	.75	.25	
EAGLE CREEK HATCH. (NATIVE)	W	70	1.00		loo	1.00		64	.74	.26	
EAGLE CREEK HATCHERY 85	w	100	1.00					80	.74	.26	
MARION FORKS HATCHERY	w	loo	1.00		loo	1.00		97	.45	.55	
THOMAS CREEK 83	W	68	1.00					58	.58	.43	
THOMAS CREEK 84	W	55	1.00		55	1.00		55	.63	.37	
THOMAS CREEK 85	W	24	1.00					24	.56	.44	
WILEY CREEK	w	loo	1.00		100	1.00		100	.62	.38	
WILEY CREEK 85	W	27	1.00		27	1.00		27	.65	.35	
SOUTH SANTIAM HATCHERY	S	47	1.00		97	1.00		97	.72	.28	
CALAPOOYA RIVER	w	loo	1.00					59	.57	.43	
CALAPOOYA RIVER 84	W	47	1.00		47	1.00		47	.59	.41	
LEABURG HATCHERY	S	95	1.00		100	1.00		97	.78	.22	
LEABURG HATCHERY 85	s	50	.97	.03	50	1.00		50	.66	.34	
MCKENZIE RIVER	s	50	1.00		50	1.00		50	.65	.35	
SANDY RIVER	w	loo	1.00		100	1.00		99	.76	.24	
WASHOUGAL HATCHERY	s	loo	1.00		93	1.00		96	.82	.18	
WASHOUGAL HATCHERY 85	S	100	1.00		100	1.00		98	.69	.31	
WASHOUGAL HATCHERY	w	loo	1.00					92	.60	.40	
HAMILTON CREEK	W	53	1.00		53	1.00		53	.71	.29	
WIND RIVER	s	50	1.00		50	1.00		50	.70	.30	
WIND RIVER 85	S	25	1.00					25	.82	.18	
HOOD RIVER	w	50	1.00					47	.73	.27	
KLICKITAT RIVER	s	100	.96	.04	100	1.00		99	.78	.21	.01
FIFTEENMILE CREEK	w	82	1.00		82	1.00		76	.93	.06	.01
FIFTEENMILE CREEK 85	w	50	1.00		50	1.00		50	.79	.15	.06
DESCHUTES RIVER	s	267	1.00					266	.92	.04	.04
ROUND BUTTE HATCHERY	s	78	.99	.01				100	.91	.05	.04
ROUND BUTTE HATCHERY 85	s	100	1.00		100	1.00		98	.87	.09	.05
JOHN DAY RIVER	s	loo	1.00					93	.96	.03	.01
JOHN DAY RIVER 85	s	50	1.00		50	1.00		50	.98		.02

Steelhead trout gene frequency data (continued).

STEELHEAD STOCK	FORM	PHOSPHO-B-2			L-IDITOL DEHYDROGENASE			SUPEROXIDE DISMUTASE			
		N	-100	-140	N	100	195	N	100	152	48
UMATILLA RIVER	S	100	1.00		100	1.00		96	.95		.05
UMATILLA HATCHERY	S	100	1.00		100	1.00		100	.98	.02	
WALLA WALLA RIVER	S	40	1.00		40	1.00		40	.86	.01	.13
TOUCHET RIVER	S	50	1.00		50	1.00		50	.99		.01
TUCANNON RIVER	S	113	.99	.01	113	1.00		113	.93	.06	.02
TUCANNON RIVER 85	S	50	1.00		50	1.00		50	.94		.06
GRANDE RONDE RIVER	S	50	1.00		50	.93	.07	50	.90	.10	
GRANDE RONDE RIVER 84	S	110	1.00		110	1.00		110	.93	.01	.06
WALLOWA-LOSTINE	S	73	1.00		73	1.00		73	.95	.03	.02
WALLOWA-LOSTINE 84	S	62	.99	.01	62	1.00		62	.90	.03	.07
WALLOWA HATCHERY	S	100	1.00		100	1.00		100	.99		.01
MISSION CREEK	S	30	1.00					30	.92	.07	.02
BIG CANYON/COTTONWOOD CRKS.	S	88	.98	.02				08	.93	.01	.06
DWORSHAK HATCHERY	S	73	1.00					73	1.00		
SELWAY RIVER	S	98	.97	.03				98	.91	.04	.05
LOCHSA RIVER	S	50	1.00					50	.90		.10
IMNAHA RIVER	S	87	1.00		96	1.00		86	.95	.04	.01
IMNAHA RIVER 84	S	58	1.00		58	1.00		58	.90	.02	.09
IMNAHA HATCHERY	S	loo	1.00		100	1.00		89	.91	.03	.06
SHEEP & BARGAMIN CRKS.	S	120	.99	.01				120	.87	.01	.13
S.F.SALMON (SECESH RIVER)	S	61	1.00		61	.99	.01	61	.89		.11
S.F.SALMON (JOHNSON CREEK)	S	50	1.00					49	.89	.04	.07
CHAMBERLAIN CREEK	S	97	1.00					97	.96	.01	.03
HORSE CREEK	S	50	1.00					50	1.00		
MIDDLE FORK SALMON RIVER #	S	277	1.00					277	.91	.01	.08
PAHSIMEROI 'B' STOCK	S	50	.99	.01				50	1.00		
SAWTOOTH 'A' STOCK	S	50	1.00					50	.91	.01	.08
HELLS CANYON STOCK	S	100	.99	.01				100	.95	.01	.04
YAKIMA RIVER	S	48	.98	.02	48	1.00		47	.92	.04	.04
YAKIMA RIVER 84	S	49	1.00		49	1.00		49	.86		.14
WENATCHEE RIVER	S	96	1.00					96	.91	.03	.06
ENTIAT RIVER	S	50	1.00		50	1.00		49	.96		.04
WELLS HATCHERY	S	61	1.00					81	.90	.01	.09
METHOW RIVER	S	58	1.00		50	1.00		50	.97	.01	.02