DETAILED FISHERY OPERATING PLAN

with

1985 OPERATING CRITERIA

ANNUAL PUBLICATION, 1985

Prepared Jointly by

Malcolm Karr, Water Budget Manager for the

COLUMBIA RIVER BASIN TRIBES

and

Mark Maher, Water Budget Manager for the

STATE AND FEDERAL FISH AND WILDLIFE AGENCIES

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Dick Harper, Project Manager

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DFOP

INTRODUCTION

Development of this Detailed Fishery Operating Plan (DFOP) was a joint undertaking by the Columbia Basin fish and wildlife agencies and tribes. The DFOP is designed as a working document to guide decisions and actions for achieving Columbia Basin Fish and Wildlife Program measures and fishery objectives to Improve the survival of migrant salmon and steelhead. The DFOP outlines current fishery objectives, research findings, and systems operational constraints in the Columbia River Basin. Together, program measures, fishery objectives, research findings, and system constraints form the foundation for the project specific operations recommendations In the DFOP.

During the downstream migration season the DFOP will provide guidance to the Water Budget Center (WBC) in making decisions related to specific project operations and in preparing operations requests. The DFOP also will be useful to CoE, BPA, and utility personnel by presenting the basis and purpose of particular requests and recommendations in terms of fishery needs and objectives. This should allow better understanding of fishery agencies and tribal recommendations and requests.

The DFOP will be used during post season review to assess the success of the preceding year operations, especially the extent to which fishery goals and objectives and program measures were achieved.

The actual mechanics of implementing the DFOP will be through flow, spill, and project operations requests from the WBC. Each request will be discussed with BPA and the CoE or IPCo dependent on specific projects involved. The resulting request will be submitted to the Corps RCC, for implementation. The Corps may review the request in earlier discussions with WBC and BPA relative to affects on flood control, recreation and navigation. Each request will consider, from the fishery agencies objectives perspective, best available information on fish movement and location, runoff and stream flow, power demand, special program requirements such as transportation, and special research requirements. The purpose, basis, and justification for each request will be discussed in advance with BPA and RCC personnel before official submittal and documentation in writing. This will insure that the status of water availability, project operational constraints, and all available options for achieving the specific request purpose, are taken into account.

FISHERY GOAL AND OBJECTIVES

The following goal and objectives were developed jointly by the state and federal fishery agencies and tribes. The coordinated fishery goal and objectives are based upon the best available information from research and experience In the basin. In addition, the goal and objectives described below are consistent with those of the Columbia Basin Fish and Wildlife Program.

OVERALL GOAL: TO INCREASE UPRIVER RUNS OF SALMON AND STEELHEAD.

DOWNSTREAM PASSAGE OBJECTIVE

The primary downstream passage objective of the fishery agencies and tribes is to achieve at least an 85% passage efficiency for all downstream migrating fish at each project throughout the year, and to minimize delays at projects and travel time through the reservoir system. Eighty-five percent passage efficiency means that 85% of the fish approaching the project will pass the project through non-turbine routes. This will be achieved by implementing the best state-of-the-art passage techniques at each project, and maintaining suitable streamflow levels. Means of achieving 85% passage efficiency at each project differ because of unique project features and physical facilities. Modifications to physical facilities might be required at some projects while modified operations may be required at other projects, or some combination of both.

The fishery agencies and tribes streamflow objective, including the water budget management, is to minimize delay by decreasing migration time, managing spill for passage, and controlling dissolved gas levels, therefore enhancing overall survival.

UPSTREAM PASSAGE OBJECTIVE

The primary objective of fishery agencies and tribes is to provide 100% passage efficiency without delay for all upstream migrants throughout the migration period.

NPPC - COLUMBIA BASIN FISH AND WILDLIFE PROGRAM OBJECTIVE

A general basin-wide fishery objective is the achievement of all the anadromous fish measures in the Columbia Basin Fish and Wildlife Program. In particular, the DFOP reflects actions to achieve the objectives concerning downstream passage, upstream passage, and the water budget measures, which requires some project specific operations and activities.

DISSOLVED GAS CONTROL OBJECTIVE

The mechanisms involved in causing nitrogen supersaturation in the Columbia and Snake Rivers are well understood (Ebel et al, Columbia River Supersaturation, NOAA, 1975). It also is known that gas bubble-caused mortality in fish is a function of the dissolved gas saturation level, depth of the fish, and exposure time. For example, a fish at a given depth may be more seriously affected by a relatively long-term exposure to water with 115% supersaturation than by a short-term exposure to 125% supersaturation.

These variables make it difficult to specify site-specific dissolved gas thresholds with present knowledge. During 1984 a nitrogen monitoring system was established. Problems in data handling and reporting were experienced. The Corps of Engineers has not made any progress in

analysis of the nitrogen data collected. During 1985 the nitrogen monitoring system will continue. WBC will facilitate progress on the analysis and modeling components of the nitrogen monitoring system.

In the interim, the best existing knowledge about the effects of spill on dissolved gas saturation levels are the results of past monitoring, past research and practical operations experience. The rating curves developed by the CoE and included in the 1984 DFOP have been eliminated in the 1985 DFOP because they proved to have no value in spill management during 1984. Development of the systemwide dissolved gas analytical program should make it possible to develop and use more precise operational criteria in subsequent years.

Past experience has shown that dissolved gas concentration generated at upriver projects during periods of high spill will carry downstream through the chain of reservoirs with little dissipation. Special attention will therefore be given to monitoring dissolved gas into and out of Grand Coulee Reservoir on the mid-Columbia, and Lower Granite Reservoir on the Snake.

If control of dissolved gas at these upriver projects is not sufficient to keep the N, supersaturation level below the potentially harmful level--about 115% throughout the system--spill management for dissolved gas control will be requested at other projects to the extent needed under the particular circumstances.

GENERAL SYSTEMWIDE SPILL MANAGEMENT OBJECTIVES

Spill management requests have three purposes:

1. For juvenile passage.
2. For adult passage.
3. For dissolved gas control.

The amount of spill requested at a specific project will be dependent upon project specific factors that relate to these purposes, The locations for which spill is requested and the amount requested will depend upon the following criteria:

1. Distribution and timing of the juvenile and adult migrations.
2. Magnitude of runoff and associated spill in the system.
3. Operational success of existing bypass systems.
4. Results of on-going nitrogen monitoring program.
5. Whether or not bypass means other than spill are available.
6. On-going programs, research, or other agreed upon activities which may conflict with implementation of spill.

DEFINITIONS

Fish Guiding Efficiency - that percentage of the total number of fish moving into the turbine intake, over the test period, which are deflected out of the intake (usually into a gatewell) by the fish guidance device.

Fish Passage Efficiency - that percentage of the total number of fish passing a project which do not pass through the turbine units.

Orifice Passage Efficiency - the ratio of the number of fish which exit a gatewell through the orifices into the bypass to the number of fish remaining in the gatewell for a specified test period. This does not give any indication of project passage but only gives a relative measure or indication of delay in the bypass.

Collection Efficiency - an indirect estimate of the proportion of the total number of fish approaching a project which enter the powerhouse collection/bypass system. Collection efficiency is a function of many Interacting variables such as project operations, flow and spill conditions, fish distribution and specific fish facilities.

1985 INTERIM SPILL PLAN

Introduction

Beginning in October of 1984, the fishery agencies and tribes have met with the Corps to discuss the development of a joint juvenile passage plan as required by the Northwest Power Planning Council Fish and Wildlife Program. The NPPC program includes an interim survival standard of 90% for each Corps project and an 85% passage efficiency standard for Bonneville Dam.

After extensive discussion and comparison of alternatives, it was clear that both the Corps proposal and agencies' and tribes' proposal met the NPPC requirements when mortality in the reservoir is not considered. The Corps and agencies and tribes (A&T) proposals were compared through a modelling process utilizing identical parameters with only amount of spill and mangement of spill varying. This comparison showed that system survival resulting from the Corps proposal provided a small increase over the "no intentional spill" scenerio, In the same comparison, the A&T proposal provides an approximate 20% increase in system survival over the Corps proposal. The Corps rejected the agencies and tribes proposal on the basis that the cost of providing protection was too high. Agreement has not been reached with the Corps, and a joint passage plan was not achieved.

The Water Budget Center, representing the fishery agencies and tribes, will request passage operations according to the following joint fishery agencies and tribes spill plan.

The agencies' and tribes' spill plan incorporates several factors which are intended to economize the spill required at individual projects. These factors, as well as the entire spill plan, are interim for 1985, and do not set a precedent for spill plans for future years.

In an attempt to reach agreement with the Corps and to economize spill, the agencies and tribes (A&T) incorporated the following several compromises into the 1985 plan which reduce the amount and cost of spill.

Cap on Spill Passage - The A&T plan utilizes a cap on spill passage which limits fish passage in spill to 50% of the migration.

Migration Window - The A&T plan utilizes a migration window to efficiently manage spill. After reviewing past migration data the agencies believe 80% of the spring and 80% of the summer migrants can be provided protection by concentrating spill during the following periods.

Spring:			
	Upper Snake	4/l -	5/15
	Lower Snake	4/15 -	6/15
	Lower Columbia	4/15 -	6/15
Summer:			
	Lower Snake	6/15 -	7/15
	Lower Columbia	6/15 -	8/31

Methods for identifying start and end points will be determined by the Water Budget Center.

Die1 Passage - The A&T plan utilizes die1 passage patterns as another means of increasing fish protection while decreasing spill. The A&T plan concentrates spill during peak daily passage. It is important to note that die1 passage patterns vary. The agencies and tribes will attempt to concentrate spill during the primary daily passage periods, determined by monitoring or by historical data.

Use of Fish Guidance Efficiency Values - In determining spill levels, the A&T plan credits projects with operational bypass systems. Fish collection efficiency values are lower than fish guidance efficiency values. The use of fish guidance efficiency values gives the highest credit to bypass system efficiency and lowers the spill requirement at that project.

Ice Harbor Sluiceway Efficiency - The A&T plan utilizes a sluiceway guidance efficiency of 41.5%. Research conducted at Ice Harbor resulted in two estimates of guidance efficiency: 24% and 51%. Studies conducted at Bonneville and The Dalles indicate that the 51% efficiency for Ice Harbor is overly optimistic. Studies at Bonneville Dam have shown sluiceway efficiencies of about 20%. Studies at The Dalles have indicated efficiencies of 40%. Ice Harbor is more similar to Bonneville than The Dalles. The agencies and tribes believe the efficiency of Ice Harbor is closer to 24% than 51% but have selected a value of 41.5% in an attempt to reach compromise with the Corps.

Lower Granite - The spill period at Lower Granite is April 1 through May 15. Spill will be initiated as determined by WBC, based upon sampling at the Snake giver trap catches at Lewiston. Because of low guidance efficiency at Lower Granite and Little Goose Dams, spill will be requested in accord with special operations required for research and in accord with the agreed upon FTOT work plan. Approximately 31% of daily average flow as spill will be utilized within the previously stated constraints.

Little Goose - Approximately 31% daily average flow spilled will be utilized to provide passage to spring chinook prior to the maximization of transportation, as determined in the FTOT work plan. Expanded daily collection totals of fish at this project will provide the basis for initiating spill at Lower Monumental and Ice Harbor, with some lag time for travel between projects as determined by monitoring and past data.

Lower Monumental - Approximately 31% daily average flow will be spilled according to die1 and other passage information determined by monitoring at the project. The passage goal at this project is passing 50% of the migration.

Ice Harbor - The ice and trash sluiceway will be operated at an assumed efficiency of 41% and 50% of the migration will be passed in 41% of the daily average flow spilled, to reach a project passage efficiency of 71%.

McNary - Juvenile fish passage operations at McNary will be managed according to the 1985 FTOT workplan and the 1985 sampling guidelines. Spill will not usually be requested but inadvertent spill is expected to occur.

John Day - The 30,000 fish per day passage criteria will be utilized to initiate spill at John Day. The appropriateness of this criteria is being scrutinized since the project is scheduled to be partially screened and past monitoring techniques may not result in comparable data. Approximately 31% of the daily average flow will be spilled to provide an alternate passage route to the unscreened turbine units. This operation is dependent upon the assumption that one half of the operating powerhouse units will be screened. The total effectiveness of this operation is unknown, since spill will probably draw fish from the screened as well as unscreened units.

The agencies and tribes planned operation at John Day is aimed at providing a 73% project passage efficiency.

The Dalles - The ice and trash sluiceway will be operated at Its maximum efficiency, as determined by criteria established by studies conducted by ODFW. The agencies and tribes are assuming a 40% sluiceway efficiency at no spill conditions. Forty one percent of the daily average flow will be spilled to reach a project bypass efficiency of 84%.

Bonneville - The A&T goal is to reach the 85% bypass efficiency standard established by the NPPC. Fifty three percent of the daily average flow will be spilled with a 75 kcfs daytime, 7 a.m. to 8 p.m. spill limit. The agencies will request that operation of the second powerhouse be limited to daytime operation, to maintain best adult fish passage conditions within the desired spill restriction plus the conduct of the planned juvenile bypass study.

PROJECT DATA

I. BONNEVILLE DAM

FISH PASSAGE INFORMATION

The location of fish passage facilities is shown on the following site plan for Bonneville Lock and Dam.

JUVENILE PASSAGE FACILITIES

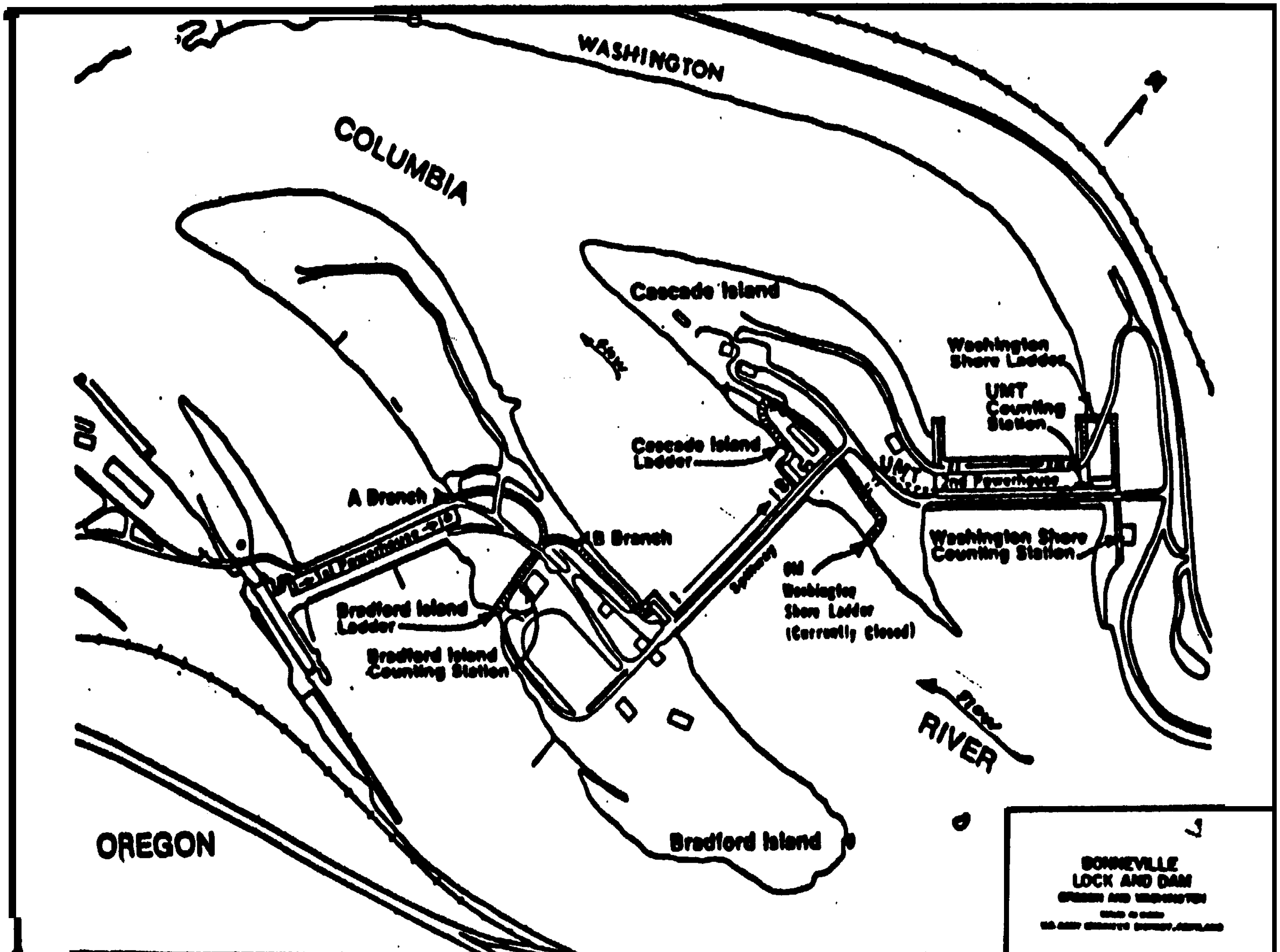
1st Powerhouse

Juvenile facilities at Bonneville first powerhouse are comprised of turbine intake travelling screens, gatewell orifices, fish collection channel, excess water elimination facility, and a fish transport pipe to tailrace. All 10 turbine units have submersible travelllng screens. Fish guidance efficiency at Bonneville 1 was tested on a limited scale in prototype in 1981 and found to be 76% for spring chinook, 77% for steelhead, 81% for coho, 71% for fall chinook, 81% for sockeye. The average fish guidance efficiency was 74% with a range of 71% to 81%.[1] Problems were experienced at the Bonneville I facility which was completed in 1984. Problems with the juvenile sampling and dewatering facilities occurred throughout 1984. High velocities, fish Impingement and debris loading at the sampling facility precluded operation of that system. Mechanical problems with the inclined plane screen and It's cleaning mechanism. For most of the spring migration season the Bonneville I juvenile bypass was operated with the sluiceway outfall to the south, while the sampling and dewatering facilities were repaired, modified and tested. To date the facility is not completely operational.

2nd Powerhouse

Juvenile facilities at Bonneville 2nd powerhouse are comprised of turbine intake travelling screens, 2-12" orifices per gatewell (with only one operating per gatewell) flowing into a fish collection channel, an excess water elimination facility, and a fish transport pipe to tailrace. A juvenile sampling facility is included in the bypass. All 8 main turbine units at Bonneville 2nd are screened.

Fish guidance efficiency at Bonneville 2nd Powerhouse has been tested. Guidance efficiency was found to be 34% for steelhead, 21-24% for spring chinook, and 14% for sockeye.[2] This is very low compared to other projects and much lower than anticipated. Tests of vertical distribution of juvenile migrants entering the turbine intake showed that only 42.4% of yearling chinook and 63.6% of steelhead were found in the top 15 feet of the intake. At other projects, 70-80% of the migrants are found within 15 feet of the ceiling of the intake resulting in higher fish guidance efficiency,


WASHINGTON
COLUMBIA
Cascade Island
Cascade Island
Ladder
Washington
Shore Ladder
UMT
Counting
Station
A Branch
B Branch
2nd Powerhouse
Washington Shore
Counting Station
Bradford Island
Ladder
Bradford Island
Counting Station
Flow
RIVER
OREGON
Bradford Island
BONNEVILLE
LOCK AND DAM

Preliminary tests were conducted at Bonneville II in 1984 to determine Fish Guidance Efficiency with various flow deflectors. Vertical distribution tests were also conducted to determine if any of the deflection devices increased vertical distribution. Only one test showed an increase in fish guidance. Vertical distribution tests showed that deflection devices increase vertical distribution but do not increase fish guidance.

These tests were not replicated and can not be considered conclusive. There is some indication that the deflectors tested, while increasing vertical distribution by creating a certain hydraulic condition, may have decreased expected FGE with that hydraulic condition.

Model studies were also conducted in 1984, testing various deflector options. However, model study results were not completed prior to prototype tests. Final results of model studies are not available.

The Corps conducted limited hydroacoustic surveys of the Bonneville II forebay in 1984. The results of these surveys were not conclusive. The Corps plans to conduct comprehensive hydroacoustic monitoring at Bonneville in 1985.

Serious problems occurred in 1984 at the Bonneville II incline plane screen in the juvenile bypass facility. The screen was totally inoperative by September and October, due to failure of the screen fabric. Replacement of screen fabric with stainless steel woven screen is planned.

JUVENILE MIGRATION TIMING

Maintenance of juvenile fish facilities is scheduled for the period of December 15 through February to reduce the impact on downstream migrants until additional juvenile passage data is obtained. The period required for facility operation will be reviewed based on actual sampling data of fish passing the project. Juvenile trapping data was collected at Bonneville Dam from 1946-1956. Juvenile monitoring has not been conducted at Bonneville Dam in recent years. Historically, chinook salmon juveniles were present at Bonneville Dam from January through December with peak passage from March through June. Steelhead juveniles were present at Bonneville from January to December with peak downstream passage occurring in April through May. Coho juveniles were present from January to December with peak passage in March, May and October. Sockeye salmon juveniles were present at Bonneville from January to August with peak passage in January and April through June.
Die1 passage was studied at Bonneville Dam from 1946 Through 1956. In general, peak daily passage occurred at 6 am and 8 pm.

ADULT PASSAGE FACILITIES

Adult facilities at Bonneville Dam are composed of two main segments. The first powerhouse collection system with A branch ladder, and the south spillway collection system with B branch ladder join together in the Bradford Island ladder to provide the south segments of the facilities. The second powerhouse collection system and the north spillway collection system join together in the Washington Shore (or north shore ladder) segment. Both the Bradford Island and the Washington Shore ladders have counting stations. The second powerhouse system has a fish sampling facility. All four collection systems have auxiliary attraction water supplies.

Studies conducted in 1983 by the Corps of Engineers indicated that substantial adult fallout occurred in the Bonneville II powerhouse collection system. Adult passage studies continued in 1984, with improved transportation channel lighting and weir gate settings.

ADULT MIGRATION TIMING

Upstream migrants are present at the project year around. Limited facility shutdown for repair and maintenance purposes is scheduled to take place from December 1 through February to reduce the impact on upstream migrants. One ladder is to be open at all times.

Adult migration count data for Bonneville Dam has been collected since 1938. The following table summarizes adult timing through 1982. Primary passage period and the earliest and latest peak of migration recorded are listed for each species, from fish counts compiled by the CoE.

ADULT MIGRATION TIMING FROM FISH COUNTS 1938-1983

Species	Passage Period	Earliest Peak	Latest Peak
Spring Chinook	3/14-5/31	4/16	5/27
Summer Chinook	6/l-7/31	6/5	8/15
Fall Chinook	8/l-11/15	9/l	9/17
Steelhead	3/15-11/15	7/16	9/10
Coho	7/ - 11/15	8/29	9/16
Sockeye	5/ - 8/	6/24	7/13

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operation which is included in Appendix A. This water budget implementation plan was developed and endorsed by all parties including the fishery agencies and tribes for use on a trial basis during 1985.

The Corps, BPA, the Fishery Agencies and Tribes have agreed upon a Water Budget Implementation Plan for 1985. The flows in the Lower Columbia will be the sum of the Snake River, the mid-Columbia and local in-flow. Weekend flows at Lower Columbia projects will not average less than 80% of the average flow for the previous five week days during the 1985 agreed upon water budget period from April 20 through June 9. The average of the four weekdays following Memorial Day will be used to establish the average flow for the following weekend.

SPILL MANAGEMENT FOR JUVENILE PASSAGE

1. Spill will be provided according to the migration timing of juvenile migrants. The primary downstream passage period is considered to be March 1 through December 15.
2. High levels of spill will be requested until the guidance and bypass problems are corrected at the second powerhouse. No set amount of spill is designated at the outset.
3. Spill will be managed according to the 1985 passage plan on pages 5-8 of this plan.
4. If one or more screens fail, the affected unit will be shut down until repairs are completed or until an operational screen is in place. If there is significant failure in guidance or collection systems resulting in injuries to large numbers of fish, that system will be shut down and spill will be provided as an alternative bypass.
5. Spill requests will be based upon the agency and tribal objective of obtaining 85 percent passage efficiency at this project. It is recognized that this bypass objective may be difficult to attain until the guidance and bypass problems at the second powerhouse have been resolved.

SPILL MANAGEMENT FOR ADULT PASSAGE

1. When spill occurs during the daytime hours, spill shall be shaped in accordance with the criteria established by the agencies and tribes shown in the following spill schedules.
2. Spill requests will be based upon the tribes and agencies objective of obtaining 100 percent passage efficiency and avoidance of delays at this project.
3. During periods of peak adult passage we will attempt to limit daytime spill to 75 KCFS according to results of adult passage studies conducted by ODFW.
4. Unit loading criteria for juvenile and adult passage is given in the following section. The following current spill schedules shall be followed during the spill period. The schedules were developed through studies and upon agreement of fishery agencies and reviewed by tribal representatives.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Spill management requests will be based in part upon dissolved gas monitoring data and the observed condition of migrant juveniles and adults, along with juvenile migration monitoring data. Total dissolved gas monitoring during 1985 will be from a station located about six miles below Bonneville Dam (Warrendale). There is a potential that this station will be automated for the 1985 season. Dissolved gas data will be reported every four hours from the first week of March through September 30 if automated, otherwise from April 1 through August 31. Related data for Bonneville Dam reported at the same time will be spill volume, total project flow, and spill gates open.

Spill Schedule for Flows at Bonneville Dam
(Gate Opening in dogs) 1/ Revised June 5, 1975 - Reviewed 1985

Gate Number																		Total	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Dogs	KCFS 2/
4"	1															1	4"		
	1	1													1	1			
	1	1	1											1	1	1			
	1	1	1	1									1	1	1	1			
	1	2	1	1									1	1	2	1		10	35.3
	1	2	1	1	1							1	1	1	2	1			
	1	2	1	1	1	1					1	1	1	1	2	1			
	1	2	1	1	1	1	1			1	1	1	1	1	2	1			
	1	2	1	1	1	1	1	1		1	2	1	1	1	2	1			
	2	2	1	1	1	1	1	1		1	2	1	1	1	2	2		20	68.6
	2	2	1	1	1	1	2	1	1	1	2	1	1	1	2	2			
	2	2	1	1	1	1	2	2	2	1	2	1	1	1	2	2			
	2	2	1	1	1	1	2	3	3	1	2	1	1	1	2	2			
	2	2	1	1	2	1	2	3	3	1	2	1	1	1	2	3			
	2	2	1	1	2	1	2	3	4	1	2	1	1	1	2	3		30	100.8
	2	3	1	1	2	1	2	5	4	1	2	1	1	1	2	3			
	2	3	2	2	3	2	3	5	5	1	2	1	1	1	2	3			
	2	3	1	1	2	1	3	6	5	1	2	1	1	1	3	3			
	2	3	1	1	2	1	3	6	6	1	2	1	1	1	3	4			
	2	3	1	1	2	1	4	6	7	1	2	1	1	1	3	4		40	139.7
	2	3	2	3	3	2	4	6	7	2	2	1	1	1					
	3	3	1	2	2	1	4	6	7	2	2	1	2	1	3	4			
	3	3	2	2	2	1	4	7	7	2	2	1	2	1	3	4			
	3	4	2	2	2	2	4	7	7	2	2	1	2	1	3	4			
	3	4	2	2	2	2	4	7	7	2	2	1	2	1	3	4			
	3	4	2	2	3	2	4	7	7	3	2	1	2	1	3	4		50	176.0
	3	4	2	2	3	3	4	7	8	3	2	1	2	1	3	4			
	3	4	3	2	3	3	4	7	8	3	3	1	2	1	3	4			
	3	4	3	3	3	3	4	7	8	3	3	2	2	1	3	4			
	3	4	3	4	3	3	4	7	8	3	3	2	2	2	3	4			
	3	4	3	4	3	4	4	7	9	3	3	2	2	2	3	4		60	211.5
	3	4	3	4	4	4	4	7	9	4	3	2	2	2	3	4			
	3	4	4	4	4	4	4	7	1	0	4	3	2	2	2	3	4		
	3	4	4	4	4	4	4	8	1	0	4	4	2	2	2	3	4		
	3	4	4	4	4	4	4	8	1	0	5	4	2	3	2	3	4		
	3	4	4	4	4	4	4	9	1	0	6	4	2	3	2	3	4	70	246.5
	3	4	4	4	4	4	5	9	1	0	6	4	3	3	2	3	4		
	3	4	4	4	4	4	5	1	0	1	0	6	4	3	3	3	3	4	
	3	4	4	4	4	4	6	1	0	1	1	6	4	3	3	3	3	4	
	4	4	4	4	4	4	6	1	0	1	1	7	4	3	3	3	3	4	
	4	4	4	4	4	4	6	1	1	1	2	7	4	3	3	3	3	4	80	281.0
	4	4	4	4	4	5	6	1	1	1	2	7	5	3	3	3	3	4	
	4	5	4	4	4	5	6	1	1	1	2	8	5	3	3	3	3	4	
	4	5	4	5	4	5	6	1	1	1	2	8	5	4	3	3	3	4	
	4	5	4	5	4	5	6	1	2	1	2	8	5	4	3	3	4	4	
	4	5	4	5	4	5	7	1	2	1	2	8	5	4	3	4	4	4	90	316.1
	4	5	4	5	5	5	7	1	2	1	2	8	5	4	4	4	4	4	
	4	5	5	5	5	5	7	1	2	1	2	8	5	4	4	4	4	5	
	4	5	5	5	5	5	8	1	2	1	2	8	6	4	4	4	4	5	
	4	5	5	5	5	6	8	1	2	1	2	8	6	5	5	4	4	5	
	4	5	5	5	5	6	8	1	2	1	2	8	6	5	5	4	5	5	100	351.2

1/ Circled values may be one dog less than value shown. Example: 1 means 0 or 1 dog; 2 means 1 or 2 dogs, etc.

2/ KCFS-approximate values were calculated using a forebay elevation of 76.0 feet.

OPERATING STANDARDS FOR JUVENILE PASSAGE FACILITIES

Revised JANUARY 1985

FIRST POWERHOUSE

Operating criteria will be subject to exception and modification several years due to on-going fisheries research and fish facility construction.

Prior to March 1 each year

Forebay Area and Intakes

Remove debris from forebay and gatewell slots.

Rake trash racks.

Inspect and clean orifices, orifice lights, and assure that orifice valves operates.

Inspect vertical barrier screens for damage, holes, debris accumulations and protrusions (video inspection acceptable). A single pass with the camera should show a build up of debris. A more detailed exmination will be required if problems are noted.

STS

Inspect each Submersible Traveling Screen (STS) and operate on trial run (dogged off on deck). Log trial runs.

Inspect and clean gatewell lighting system,

Inclined screen clean with no holes or protrusions.

Debris sweep in good operating condition, including brushes. All water level control valves and weir in good operating condition.

Fish Collection Gallery

Orifice lights operational and lens clean, orifices clean, orifice valves operational.

Inclined screen clean with no holes or protrusions.

Debris sweep in good operating condition, including brushes. All water level control valves and weir in good operating condition.

March 1 to December 1 (STS Operation)

Forebay Area and Intake

Remove debris from forebay and trashracks as required to maintain less than 1 foot of additional drawdown in gateslots. Additional raking may be required when heavy debris loads are present in the river. Fish quality will also be an indicator of potential debris buildup on the trach racks.

Coordinate cleaning effort with personnel operating downstream migrant facilities.

STS

Inspect STS a minimum of once every two months, preferably once a month (video inspection acceptable). Log inspections and repair screen(s) as necessary.

During the period October 15 to December 1, STS's may be removed for maintenance as long as at least one-half of the units are screened at all times. Only fully screened units will be operated.

Inspect each shift and record any abnormal STS amp gauge readings. If STS failure occurs, shift load (according to the project fishway mainatenance plan) to other available units when possible until STS is repaired.

Inspect gate slots daily and clean as necessary to avoid orifice blockages. Check gatewell drawdown differentials once per week and record.

Operate gate slot orifices. Orifices operation will be inspected daily by monitoring the orifice control panel. If panel indicates there is a problems the work'should be completed in one day. The orifices should be backflushed each day or as debris is detected.

Fish Collection Gallery

Water surface should be maintained at a level which will allow continual sampling if required.

SECOND POWERHOUSE

Operating criteria will be subject to exception and modification for several years because of on-going fisheries research and facility evaluation.

Prior to March 1 each year

Forebay Area and Intakes

Remove debris from forebay and gatewell slots.

Rake trash racks.

Inspect vertical barrier screens for damage, debris, holes or protrusions. (video inspection acceptable.) A single pass with the camera should show a build up of debris. A more detailed examination will be required if problems are noted.

STS

Inspect each screen and operate on one trial run (dogged off on deck.) Log trial runs.

Fish Collection Gallery

Orifice lights operational and lens clean, orifices clean, orifice valves operational.

Inclined screen clean with no holes or protrusions.

Debris sweep in good operating condition, including brushes. All water level control valves and weir in good operating condition.

March 1 to December 1 (STS Operation)

Forebay Area and Intake

Remove debris from forebay and trashracks as required to maintain less than 1 foot of additional drawdown in gateslots. Additional raking may be required when heavy debris loads are present in the river. Fish quality will also be an indicator of potential debris buildup on the trash racks.

Inspect gate slots daily and clean as necessary to reduce orifice blockages. Check gatewell drawdown differentials once per week and record.

Coordinate cleaning effort with personnel operating downstream migrant facilities.

STS

Inspect screens a minimum of once every two months, preferably once a month, (video inspection acceptable). Log inspections and repair screen(s) as necessary.

Inspect each shift and record any abnormal STS amp gauge readings. If STS failure occurs, shift load according to the project fishway maintenance plan to other available units when possible until STS is repaired.

During the period October 15 to December 1, STS's may be removed for maintenance as long as at least one-half of the units are screened at all times. Only fully screened units will be operated.

Fish Collection Gallery

Orifice lights operational and lens clean, orifices clean, orifice valves operational.

Inclined screen clean with no holes or protrusions.

Debris sweep in good operating condition, including brushes. All water level control valves and weir in good operating condition.

Maintain water surface at unit #18 orifices between elevations 64.5-65.0.

Maintain water surface on dewatering screen between elevations 60.8-61.2.

Maintain water surface in downwell at approximately 58.0 feet elevation.

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

FIRST POWERHOUSE AND SPILLWAY

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet. From May 15 to July 31, 1.3 feet will be maintained to facilitate shad passage.

Head on All Entrances

1.0 to 2.0 feet (prefer 1.5')

North and South Spillway Entrances

Spillway bay gates 1 and 18 open 4".

Side entrances SW-X-5 and SO-SG-7 and downstream entrances SW-SG-l and SO-SG-2 shall operate as free flowing vertical slots. Downstream entrances SW-SG-3 and SO-SG-4 (adjacent to shore) shall close 1 sluice gate each at tailwater elevations from 8.5 to 15.0 and close both sluice gates at each entrance for tailwater elevations above 15.0.

This operation should maintain a head of 1.5' on the entrances for all tailwater elevations up to 32.5 feet.

North Powerhouse Entrances (gates 64 & 65)

Entrance gate 65 operates as an adjustable height submerged weir with crest elevation 8 feet below tailwater for tailwater elevations above 17. For tailwater elevations below 17, the weir is fully lowered with crest at elevation 8.5.

Entrance gate 64 operates as a submerged orifice entrance for tailwater elevations below 17 to maintain a constant combined entrance flow through entrances 64 and 65.

Main Powerhouse Entrances (gates 5 thru 62)

Gates operating are 9, 21, 34, 58 & 62.

Orifice A (lower sluicegate) operates from tailwater elevation 7 to 16 on a rising tailwater and elevation 15 to 7 on a falling tailwater.

Orifice B (higher telescoping gate) operates from tailwater elevation 16 to 38 on a rising tailwater and elevation 38 to 15 on a falling tailwater.

South Powerhouse Entrances (gates 1 & 2)

Entrance gate 1 operates as an adjustable height submerged weir which acts as the primary control to regulate head differential between collection channel and tailrace (head on all entrances). Entrance gate 2 is a submerged orifice entrance which operates only when entrance gate 1 is in completely lowered position to regulate head differential between collection channel and tailrace (head on all entrances) at lower tailwater elevations. .

Transportation Velocity

A transportation velocity of 1 to 4 feet per second (prefer 2 fps) shall be maintained in the powerhouse collection channel and the submerged lower ends of the fishways.

Head on Trashracks

Maximum of 0.6 feet on ladder exits and attraction water intakes.

Maximum head on picketed leads shall be 0.4 feet. Significant amounts of accumulated debris shall be removed.

Staff Gauges & Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

SECOND POWERHOUSE

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet. From May 15 to July 31, 1.3 feet will be maintained to facilitate shad passage.

Head on all Entrances

Head range: 1.0 to 2.0 feet (prefer 1.5 ft.)

North Shore Entrances (NSUE 6 NSDE) and South Shore Entrances (SSUE 6 SSDE)

Operate all 4 entrances. Operate weir crests at elevation 1.0 (fully lowered position) for tailwater elevations up to 14. For tailwater elevations above 14, operate weir crests 13 ft. below tailwater.

Powerhouse Collection System

Operate all 12 floating orifices.

Transportation Velocity

A transportation velocity of 1 to 4 feet per second (prefer 2 fps) shall be maintained in the powerhouse collection channel, the submerged lower end of the fishway, and the adult transportation channel.

Head on Trash Racks

Maximum head of 0.6 foot on ladder exist and 0.4 foot on picketed leads. Significant amounts of accumulated debris shall be removed.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

BONNEVILLE DAM 1st and 2nd POWERHOUSE

Turbine Unit Operating Priorities

Unit operation will be: 1 or 2, 10, 9, 18, 17, 1 or 2, 11, (3-8), 12. This operation will be in effect until juvenile passage (collection efficiency) is improved at the 2nd powerhouse. Then unit 16*, and (13-15) can be operated.

*Unit 16 will follow Unit 17 in priority if Unit 18 is out of service.

Spillway Operations

The preceding spill schedules shall be followed during the spill period. The schedules were developed through contract with Corps of Engineers and Oregon Department of Fish and Wildlife DACW 68-75-C-0129.

1985 PROJECT RESEARCH

The following research activities are planned for the Bonneville Project in 1985. All sampling will be conducted according to adopted sampling guidelines for 1985. Little Goose and Bonneville Dam will collect fish at a combined rate of less than 3% of the entire run.

1. Evaluate Improved Collection, Handling and Transport Techniques to Materally Improve Survival of Transported Juvenile Chinook Salmon
   Funding Agency: CoE
   Contracting Agency: NMFS
   Principal Investigator: Donn L. Park

2. Continuing Studies to Improve and Evaluate the Fingerling Collection and Bypass System at Bonneville Dam
   Funding Agency: CoE
   Contracting Agency: NMFS
   Principle Investigator: Richard Krcma

FOOTNOTES

'Evaluation of Submersible Travelling Screens, Passage of Juvenile Salmonids through the Ice Trash Sluiceway, and Cycling of Gatewell Orifice Operations at the Bonneville First Powerhouse, 1981, Krcma,DeHart, Gessel, CZES, May 1982.

[2]Evaluation of the Juvenile Collection and Bypass System at Bonneville Dam - 1983, Krcma, Gessel, Muir et al. CZES, October 1983.

[3]Effect6 of Power Peaking on the Survival of Juvenile Fish at the Lower Columbia, Bell, Parkhurst et al, April 1976, USCoE, NPD.

[4]Downstream movement of Salmonids at Bonneville Dam, Gauley, Anas, Schlotherbeck, BCF, USFWS, Jan. 1958 special scientific report - Fisheries No. 236.

PROJECT DATA

II. THE DALLES DAM

FISH PASSAGE INFORMATION

The location of fish passage facilities is shown on the following General Site Map for the Dalles Dam.

JUVENILE PASSAGE FACILITIES

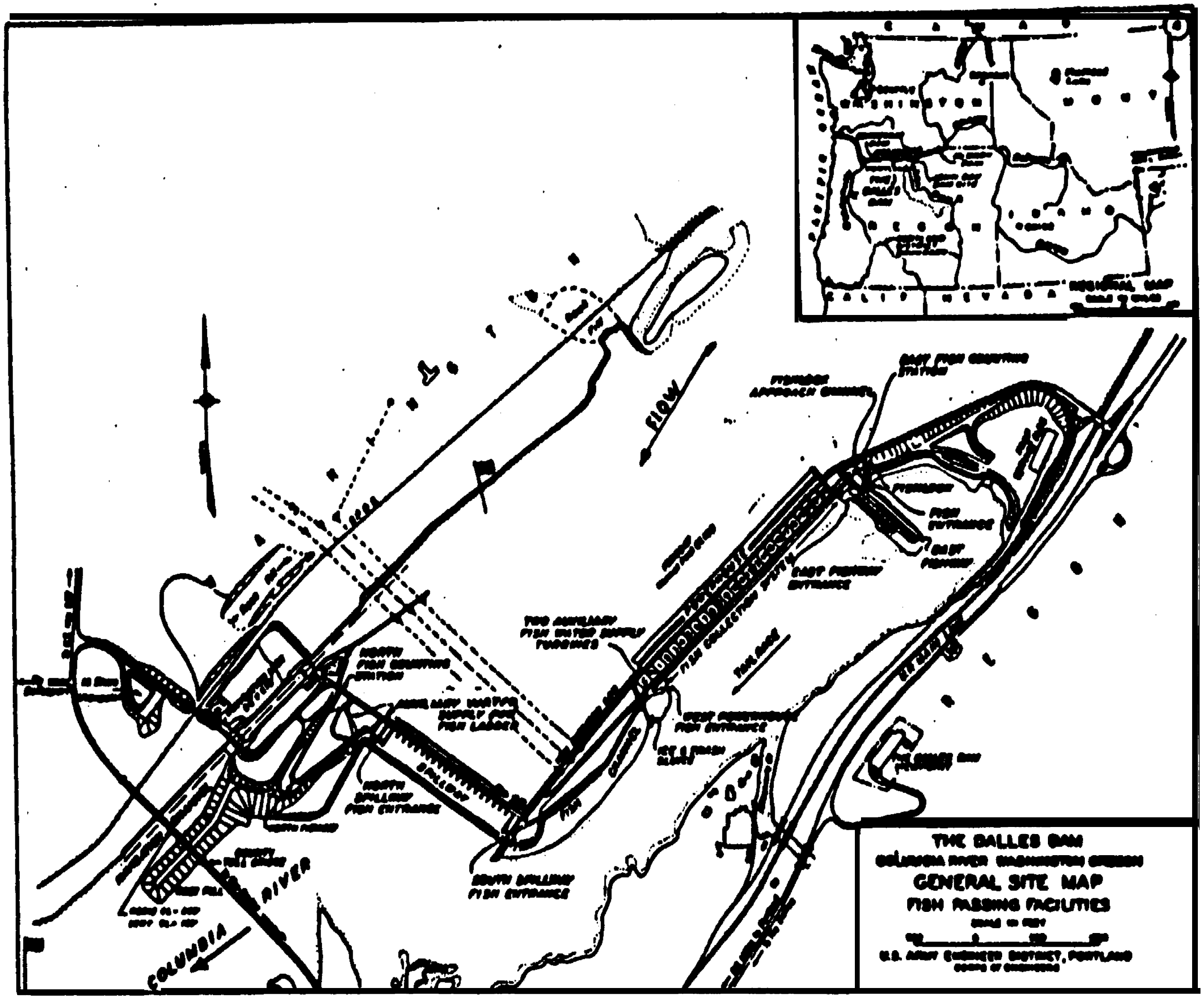
Juvenile fish passage facilities at The Dalles Dam consist of the ice and trash sluiceway, which is a rectangular channel extending the length of the 22 unit powerhouse. When sluiceway gates are opened, water and migrants are skimmed from the forebay and deposited in the tailrace downstream of the project. Turbine units at The Dalles are not screened. Eight inch gatewell orifices flow into the sluiceway, providing a potential means of passing fish from the gatewells to the sluiceway to tailwater.

Data on horizontal and vertical distribution of migrants at The Dalles Dam has been collected in past years. Prototype tests of guidance devices have not be conducted at The Dalles nor has turbine passage versus sluiceway passage been addressed. The efficiency of the ice and trash sluiceway as a downstream migrant bypass has been studied. The sluiceway is currently utilized as a downstream migrant bypass system. During 1982 and 1983, maximum sluiceway passage efficiency was directly evaluated using mark recapture techniques. Using these results, sluiceway efficiency under no-spill conditions is projected to be 40% at this project. Studies show sluiceway bypass efficiency is inversely related to percentage spill at the project, decreasing from 40% with increasing spill. [1]

NMFS, through a contract with the Corps of Engineers, will conduct prototype submersible travelling screen tests at The Dalles. The objectives of the research are to: 1.) develop fish guidance efficiency estimates 2.) determine orifice passage efficiency into the sluiceway.

JWENILE MIGRATION TIMING

The date of peak passage of Snake River steelhead at The Dalles has ranged from May 11 in 1978 to June 21 in 1977. Peak passage of Snake River spring chinook at The Dalles Dam ranged from May 8 in 1976 to June 17 in 1977. Travel time from the upper Snake River to The Dalles Dam ranges from 12 to 39 days for yearling chinook and 10 to 40 days for steelhead. [2] The primary juvenile passage period at the Dalles is April through November. The following passage timing data was generated from studies of The Dalles sluiceway in 1977, 1978, 1979, 1981 and 1982. The data includes Snake River and Columbia River migrants.


FLOW
COLUMBIA RIVER
THE DALLES DAM
GENERAL SITE MAP
FISH PASSING FACILITIES

JUVENILE MIGRATION TIMING

PERCENT OF MIGRATION	1977	1978	1979	1981	1982
Spring Chinook					
10%	4/30	5/6	5/6	5/2	5/2
90%	6/5	6/11	6/11	5/31	5/30
Sockeye					
10%	5/2	5/l	5/7	5/8	5/2
90%	5/31	6/5	6/5	6/6	5/30
Steelhead					
10%	5/16	4/27	4/15	5/l	5/l
90%	6/8	5/30	5/26	5/31	5/30

Note: Sampling did not occur throughout the fall chinook migration

Source: ODFW sluiceway passage research 1977, 1978, 1979, 1981, 1982.

Monitoring conducted at John Day Dam in 1982 showed that 500,000 juvenile fish passed John Day after the end of September 4. Juvenile passage has been documented at Bonneville Dam through December 1. Juvenile fish are probably present at The Dalles Dam through November, based on monitoring at John Day and Bonneville. Comprehensive monitoring of the juvenile migration should be undertaken at The Dalles and John Day Dams through the fall to establish actual juvenile migration timing. Presently it appears that a significant portion of the juvenile migration receives little or no protection. John Day monitoring will provide the primary basis of operations at The Dalles.

Die1 passage at The Dalles sluiceway is affected by spill and flow cond tions. In 1977, peak passage occurred from 5:00 p.m. to 10:00 p.m. [3]; in 1981, from noon to 1:00 p.m.; in 1982 from 6:00 a.m. to 10:00 a.m. In years of consistent high flow and spill, fish may be distributed higher in the forebay and daytime passage may increase.

During 1985 hydroacoustic monitoring will be conducted at The Dalles to determine migration timing, die1 passage, vertical distribution, and horizontal distribution.

ADULT PASSAGE FACILITIES

Adult facilities at The Dalles are comprised of a north shore fish ladder which passes fish collected at the north end of the spillway, and an east fish ladder which passes those fish collected at the south end of the spillway and across the downstream face of the powerhouse. A fish lock exists at the east end of the powerhouse but is not operated. Most adults pass through the east ladder, particularly during periods of non-spill when few fish are attracted to the north end of the spillway.

ADULT MIGRATION TIMING

Upstream migrants are present at The Dalles Dam throughout the year. Maintenance of upstream facilities is scheduled to take place from December through February to minimize impacts on upstream migrants. The following table shows the passage period by species and the earliest and latest recorded dates of peak passage. These figures are taken from CoE fish counting records from 1957-1982.

MIGRATION TIMING FROM

1957-1982 FISH COUNTS

Species	Passage Period	Earliest Peak	Latest Peak
Spring Chinook	4/l - 6/3	4/17	5/13
Summer Chinook	6/4 - 8/3	6/6	7/16
Fall Chinook	8/4 - 10/31	9/3	9/10
Sockeye	6/ - 9/	6/25	7/10
Steelhead	4/ - ll/	7/9	9/18
Coho	8/ - lO/	9/3	9/21

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operation which is included in Appendix A. This water budget implementation plan was developed and endorsed by all parties including the fishery agencies and tribes for use on a trial basis during 1985.

The Corps, BPA, the Fishery Agencies and Tribes have agreed upon a water budget implementation plan for 1985. The flows in the Lower Columbia will be the sum of the Snake River, the mid-Columbia and local in-flow. Weekend flows at Lower Columbia projects will not average less than 80% of the average flow for the previous five weekdays during the 1985 agreed upon water budget period from April 20 through June 9. The average of the four weekdays following Memorial Day will be used to establish the average flow for the following weekend.

SPILL MANAGEMENT FOR JUVENILE PASSAGE

1. Spill will be provided as specified in the Interim Spill Plan for 1985 starting on page 5 of this report. Monitoring conducted in 1982 at John Day Dam showed 500,000 juveniles passed John Day after the end of Sept. 1982. A comprehensive monitoring program will be conducted at The Dalles in 1985.

2. Spill will be requested until the bypass achieves the 85% passage efficiency. Present sluiceway bypass efficiency is estimated to be 40% with no spill. A functional relationship developed by ODFW shows that sluiceway bypass efficiency (Y) decreases as spill (X) is applied:

$$\ln Y = 3.7038 - .0348X$$
$$Y = 40.60 \exp - 0.0348 X$$

Percent passage over the spillway (S) is calculated by the equation:

S=100% - 2.5Y. Spill bypass efficiency can be added to the sluiceway bypass efficiency to calculate total bypass efficiency (E):

$$E = Y [Q_{p.h.}] + S [X]$$

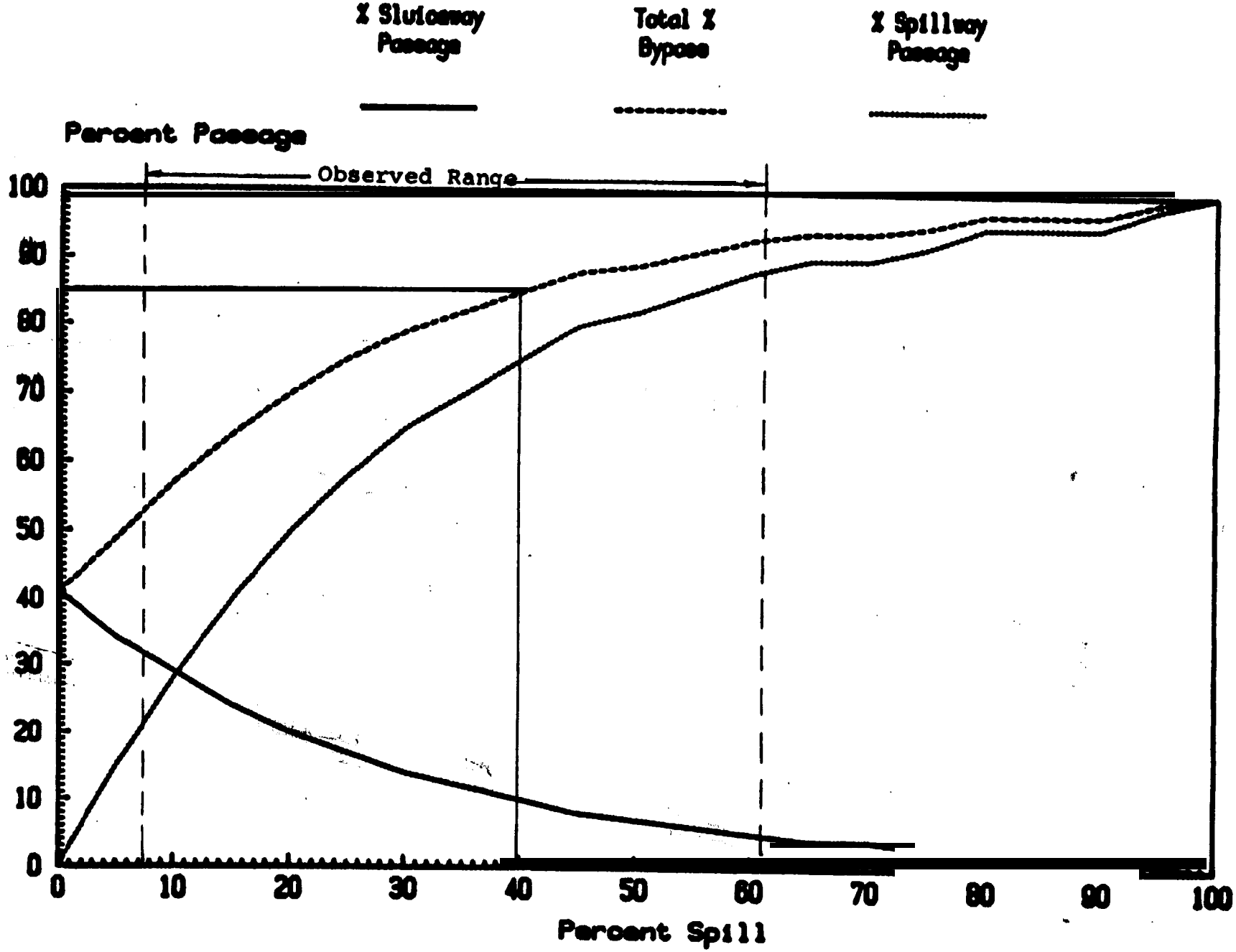
Tabulating:

SPILL	$Q_{Powerhouse}$	Sluiceway Efficiency	Bypass Efficiency
100	0	1.3	100
90	10	1.8	97
80	20	2.5	97
70	30	3.5	94
60	40	5.0	93
50	50	7.1	89
40	60	10.1	85
30	70	14.3	79
20	80	20.2	70
10	90	28.7	57
5	95	34.1	49
0	100	40.6	41

As illustrated in the above table and the following figure, project bypass efficiency can be increased by spilling in addition to sluiceway operation. Bypass efficiency can be increased above the maximum measured sluiceway efficiency with as little as 5% spill. Bypass efficiency equal to 85% is estimated to occur with 40% daily average spill.

The Dalles Dam Smolt Passage

Yearling Chinook



Past years data show that the sluiceway is more effective during the day than at night since migrants appear to be distributed deeper in the water column at night. Assuming that increased sluiceway passage correlates with increased powerhouse passage, peak spill should be correlated with peak sluiceway passage from 5:00 p.m. to 10:00 p.m. The sluiceway should operate under optimum conditions during daylight hours.

3. Spill will be required at The Dalles project to augment the low collection efficiency (approximately 40 percent) of the ice and trash sluiceway. Spill amounts up to 40 percent of the daily average flow at The Dalles, may be needed, as illustrated in the preceding figure .
4. Sluiceway operations have been determined to be ineffective for passing sub-yearling migrants. Spill remains the only passage alternative for these fish.
5. Deviations from the spill specified in 2 will be determined on a case- by- case basis by the Water Budget Center, and will be reflected in operations requests to the Reservoir Control Center.
6. Monitoring at The Dalles will provide the die1 and timing information for spill operations.

SPILL MANAGEMENT FOR ADULT PASSAGE

The following current spill schedules shall be followed during the spill period. The schedules were developed through studies funded by the COE and agreed upon by fishery agencies with review by tribal representatives.

SPILL MANAGENENT FOR DISSOLVED GAS

Dissolved gas monitoring data and the observed condition of migrant juveniles and adults along with migration montoring data will provide a basis for spill management requests. Spill management requests will be based in part upon dissolved gas monitoring data and the observed condition of migrant juveniles and adults, along with juvenile migration monitoring data. Total dissolved gas monitoring during 1985 will be at the The Dalles forebay and reported every four hours from April 1 through August 31. Related data reported at the same time will be spill volume, total project flow, and spill gates open.

ling Schedule at The Dalles Dam Adjusted for Expanded Powerhouse(openings in ft.) Reviewedl/8

Pool Elevation 159.6′

2	3	4	5	6	7	Gate Number 8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23.	kcfs
																					1	3.
(1)																				1	1	6.
1	(1)																		1	1	1	9.
1	1	(1)																1	1	1	1	12.
1	1	1	(1)														1	1	1	1	1	15.
1	1	1	1	(1)												1	1	1	1	1	1	18.
1	1	1	1	1	(1)										1	1	1	1	1	1	1	21.
1	1	1	1	1	1	(1)								1	1	1	1	1	1	1	1	24.
1	1	1	1	1	1	1	(1)						1	1	1	1	1	1	1	1	1	27
1	1	1	1	1	1	1	1	(1)				1	1	1	1	1	1	1	1	1	1	30
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2	3	3	3	3	4	4	5	(5)	5	5	5	5	5	4	4	3	3	2	3	2	1	120

Gate Number																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
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1	2	4	5	5	6	6	6	6	6	(7)	6	6	6	6	6	6	6	5	5	4	4	2	
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1	2	4	5	5	6	7	7	7	7	7	(7)	7	7	7	6	6	6	5	5	4	4	2	
1	2	4	5	5	6	7	7	7	7	7	7	7	(7)	7	6	6	6	5	5	4	4	2	
1	2	4	5	(6)	6	7	7	7	7	7	7	7	7	7	6	6	6	6	5	4	4	2	
1	2	(5)	5	6	6	7	7	7	7	7	7	7	7	7	6	6	6	6	5	5	4	2	
1	3	5	5	6	6	7	7	7	7	7	7	7	7	7	7	6	6	6	5	5	4	2	
1	3	5	5	6	7	7	7	7	7	7	7	7	7	7	7	(7)	6	6	5	5	4	2	
1	3	5	6	6	7	7	7	7	7	7	7	7	7	7	7	7	(7)	6	5	5	4	2	
1	3	5	3	6	7	7	7	7	7	8	7	7	7	7	7	(8)	7	6	5	5	4	2	
1	3	5	6	6	7	7	7	8	7	8	7	(8)	7	7	7	8	7	6	5	5	4	2	
1	3	5	6	6	7	8	7	8	7	8	7	8	7	(8)	7	8	7	6	5	5	4	2	
1	3	5	6	6	7	8	8	8	8	(8)	8	7	8	7	8	7	6	5	5	4	2	
1	3	5	6	6	7	8	8	8	3	8	8	8	7	8	7	8	7	6	(6)	5	4	2	
1	3	5	6	7	7	x	8	8	8	8	8	8	7	8	7	8	7	(7)	6	5	4	2	
1	3	5	7	1	7	7	8	8	8	8	8	8	(8)	8	7	8	7	7	6	5	4	2	
1	3	5	1	7	8	8	8	8	8	8	8	8	8	8	(8)	8	7	7	6	5	4	2	

Values in parenthesis may be 1 foot less than the values shown.
For example : (1) means 0 or 1 foot
(2) means 1 or 2 feet

An approved spill schedule which incorporates raising spillbay gates in blocks of four will implemented when-changes in spill discharge are frequent.

OPERATING STANDARDS FOR JUVENILE PASSAGE FACILITIES

Prior to April 1 each year:

Remove debris from forebay, rake trash racks, and clean gatewell slots.

Inspect and clean orifices of debris.

Inspect, test, and lube chain gates for operation as needed.

Inspect and correct any deterioration of epoxy on walls and floor of trash sluice raceway.

April 1 to November 1 (Passage Period)

Remove debris from forebay and trashracks as required to maintain less than 1 foot of additional drawdown in gate slots. Additional raking may be required when heavy debris loads are present in the river.

Operate all gate slot orifices full time and set top of bottom end gate at 142 elevation to create orifice plunge pool.

April 15 to November 1:

Operate chain gates $1_1, 1_2, 1_3$, at least 16 hours per day, sunrise to sunset, with full surface flow (lower or raise gates completely).

Operate end gate full open from sunrise to sunset.

During period when skimmer gates do not operate set top of bottom end gate at 142 elevation to create orifice plunge pool.

General

Try to maintain forebay level between elevation 158-160 during skimmer gate operations.

Check orifice flow periodically and maintain orifices clear of debris.

Inspection

Inspect facilities once each shift.

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES
Revised January 1985

Fishway Ladders

Water depth over weirs: 1.0 to 1.5 feet with a target depth of 1.2 feet.

North Fishway Entrance

No spill period: operate gate N-l (gate closest to shore) at a weir depth of 8 feet below the tailrace surface with a net head of 1.0 to 1.5 feet. Tainter gate to be open about 1.5 feet to provide attraction water.

Total head range:[4] 1.0 to 1.5 feet.

Spill period: Operate both N-l and N-2 at a weir depth of 8 feet below the tailwater surface with a net head of 1.0 to 1.5 feet. Tainter gate to be open about 3.0 feet to provide attraction water.

Weir depth: 8 feet below tailwater or greater. Weirs lowered to bottom when 8 feet depth is not possible.

South Fishway Entrances

Operate both downstream entrances (S-l and S-2)
weir depth: 8 feet below tailwater or greater. Weirs lowered to bottom when 8 feet depth is not possible.

Velocity head range: l/ 1.0 to 1.5 feet.

West and East Entrances

Weir depth: 8 feet or greater below tailwater. Weirs lowered to bottom when 8 feet depth is not possible.

Total head range: 1.0 to 1.5 feet

West entrance: Operate at least one entrance located on outboard of array (W-l).

East entrance: Operate all three entrances (E-l, E-2, E-3)

Powerhouse Collection System

Operate 14 submerged orifices along the powerhouse collecting system.

Orifice numbers are: 3, 12, 24, 39, 51, 57, 71, 78, 90, 102, 111, 117, 123, and 129.

Transportation Velocity

1 to 4 fps.

Head on Trashracks

Maximum of 0.6 feet on ladder exists and attraction water intakes. Maximum head on picketed leads shall be 0.4 feet.

Cul-de-sac Entrance

The entrance will remain closed to avoid attraction of upstream migrants to the cul de Sac and causing migration delay.

Staff Gauges & Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be: 1, 2, 21, (22, 60-70 mw) 3, 4, 5, 7 or 8, 20, and then 6 through 19 with even flow distribution among these turbines.

1985 PROJECT RESEARCH

Title: Studies to Evaluate Alternative Methods of Bypassing Juvenile Fish at the Dalles Dam
Funding Agency: CoE
Principal Investigator: Dick Krcma

Title: Seasonal, Diel, and Spatial Distribution of Downstream Migrant Juvenile Salmon and Steelhead at The Dalles Dam.
Funding Agency: BPA
Principal Investigator: BioSonics, Inc.

FOOTNOTES

[1] Indexing of Juvenile Salmonids Migrating Past the Dalles Dam, 1982, Annual Progress Report, Fish Research Project, Oregon Department of Fish and Wildlife, 1982.

[2] Migrations of Juvenile Chinook Salmon and Steelhead Trout in the Snake River from 1973 to 1979, A Research Summary, Sims & Ossiander, June 1981, CZES.

[3] Evaluation of The Dalles Dam Ice-Trash Sluiceway as a Downstream Migrant Bypass 1977, Nichols, ODFW.

[4] Head as used in these criteria refers in some cases to total head and in others to velocity head and will be so designated for specific entrances. The conventional method of measuring the entrance velocity (velocity head) is with head differential gauges (still gauges or elaborate mechanical gauges). These gauges indicate only the velocity created between them (velocity head) and do not include any velocity that may be upstream from gauges (velocity of approach). Total entrance velocity (effective head) includes both velocities since their sum is the velocity that the fish encounter when entering the fishway. At entrances with relatively wide entrance pools, there is no appreciable velocity of approach. Where width of entrance pool is close to the width of entrance, the velocity of approach may be considerable. This velocity must be added to velocity developed from entrance gauge readings. The sum of these velocities is the total entrance velocity; i.e.; the velocity that the fish encounter when entering the entrance. This concept applies to overflow entering the entrance. This concept applies to overflow weirs, vertical slots or orifices type entrances.

[5] The Dalles Dam Powerhouse, Fish Collection System Studies, 1974 & 1975 USCOE, Feb. 1978, Portland District.

[6] Development of The Dalles Dam Trash Sluiceway as a Downstream Migrant Bypass System, 1980, Jan. 1980-Dec. 1980, Nichols 6 Ransom, ODFW.

PROJECT DATA

III. JOHN DAY DAM

FISH PASSAGE INFORMATION

The location of fish passage facilities is shown on the following General Site Plan for John Day Lock and Dam.

JUVENILE PASSAGE FACILITIES

Juvenile facilities at John Day Dam include an orifice system from the gatewell to an enclosed pipe conduit bypass. Turbine units at John Day are presently unscreened. This system is not operated as a primary bypass.

Construction of a new juvenile bypass system including turbine intake screening began in 1984. Completion is scheduled For April 1988 or sooner. During bypass construction, NMFS, under contract with CoE, salvaged juvenile migrants from gatewells by dipnetting and releasing them into the existing bypass pipe at the north end of the powerhouse forebay deck. During 1984 the salvage operation began on May 1 and ended on total numbers of fish salvaged were not recorded.

The smolt salvage operation will continue in 1985. Construction at John Day will continue through the 1985 fish migration season. Present construction schedules indicate that orifice drilling and bypass mining will continue through the 1985 migration season. These construction activities may affect or completely preclude conducting a consistent unit 3 gatewell sampling effort.

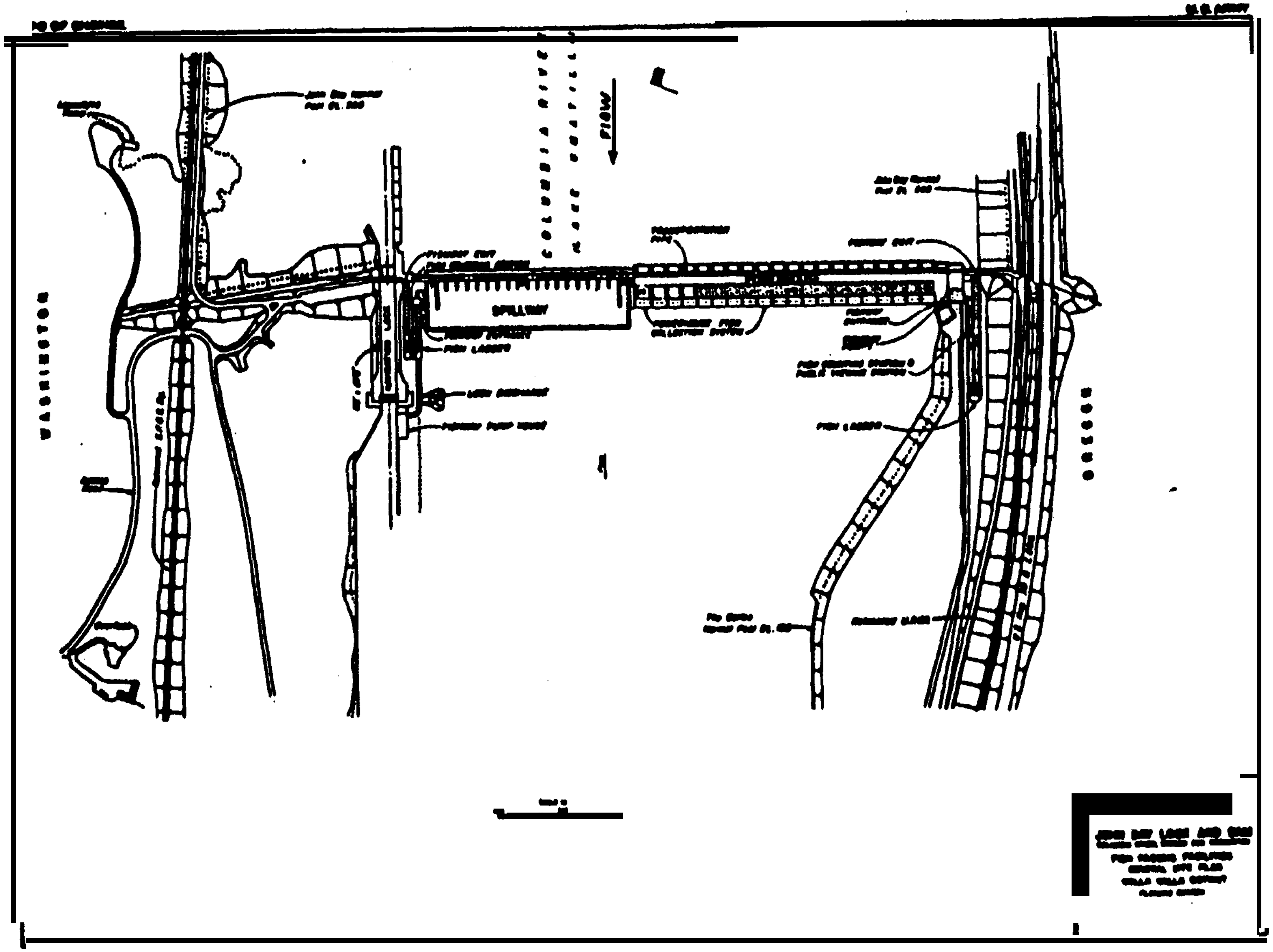
Research at John Day has shown that flow in the orifice bypass system is not sufficient to attract fish from the gatewells into the bypass. An airlift pump is utilized in unit 3 gatewells as a sampling system. Hydroacoustic monitoring of turbine intakes and spill has been conducted at John Day for the last several years.

Sampling efficiency has been estimated for the unit 3 airlift sample to develop a sampling index. In general, gatewell sampling and hydroacoustic monitoring correlate.

JUVENILE MIGRATION TIMING

Juvenile passage has been determined by gatewell sampling at John Day. Maintenance of juvenile fish facilities is scheduled for November 16 through March to minimize impact on downstream migrants. Monitoring conducted at John Day Dam in 1982 showed that 500,000 juvenile fish passed John Day after September 4. Juvenile passage through December 1 has been documented at Bonneville.

Juvenile monitoring in 1984 as a basis for providing spill was stopped prematurely on August 31 while more than 30,000 fish per day were passing the project. This will be avoided in 1985 by continuing comprehensive monitoring through the fall at John Day, both to provide the necessary juvenile passage protection and to establish juvenile migration timing.



SPILLWAY

Comprehensive monitoring through the fall should be undertaken at John Day to establish the actual juvenile migration timing. Presently it appears that significant numbers of juvenile migrants do not receive any passage protection.

JUVENILE MIGRATION TIMING

% PAST PROJECT	DATE	
	1982	1983
Yearlings		
10%	4/22	5/l
90%	5/27	5/24
Steelhead		
10%	5/2	5/3
90%	6/16	6/13
Sub-Yearlings		
10%	no data	
90%	no data	5/24
Coho		
10%		no data
90%	6/4	no data
Sockeye	no data	

The average duration of the spring migration at John Day is 45 days.

Die1 passage has been monitored by hydroacoustics and gatewell sampling. Peak passage occurs between the hours of 10:00 pm and 11:OO pm with a long period of elevated passage until dawn when passage decreases. Passage increases dramatically at dusk -- about 8:00 pm. During 1984 a variation in this die1 passage pattern was seen. Beginning on May 13 daytime passage at John Day increased. During the peak of the spring juvenile migration period at John Day, 40% of the spring chinook and steelhead daily passage occurred between 0700 and 2200 hours. Both unit 3 gatewell sampling and hydroacoustic sampling confirmed the Die1 pattern.

During 1985 juvenile migration monitoring will be affected by construction activity. A Unit 3 airlift sample will not be possible. To maintain some montioring, fish collected in the salvage operation should be inspected for brands and counted by species. At least one gatewell should be monitored consistently throughout the spring through fall migration. Hydroacoustic monitoring should continue through fall (November).

Smolt behavior and passage studies were conducted in 1983 in the John Day forebay by NMFS. Very preliminary findings of this study indicate that smolt distribution in the John Day forebay may be affected by the John Day River plume. This may increase spill effectiveness for some species. However these data can not be considered conclusive at the present time.

ADULT PASSAGE FACILITIES

The adult facilities at John Day are comprised of a north shore fish ladder which passes fish from a collection facility at the north end of the spillway, and a south shore fish ladder which passes fish from a collection facility at the south end of the spillway.

There is a collection channel across the downstream face of the powerhouse and the south shore. Auxiliary water is provided to all collection systems by pumping from the tailrace. Counting stations are provided in both ladders.

Radio tracking studies have shown that delays of up to 5 days can occur to migrants passing John Day Dam. Research has shown that noxious chemicals, primarily fluorides and heavy metals from an aluminum plant discharge upstream from John Day, are present in the north shore fish ladder. On days of high wind, these chemicals have also been detected in the south shore ladder. This may have an adverse affect on upstream fish passage by causing delay to upstream migrants. Ladder entrance location, and operations have also been reviewed as a possible cause of delay to upstream migrants.

Construction activity and associated modification in operations have potential for impact on adult passage at John Day. Corps construction schedules and activities will be reviewed in advance to limit this potential. Activities which have a high probability of affecting passage will be scheduled during night time hours.

ADULT MIGRATION TIMING

Fish are present at John Day throughout the year. Adult passage facilities are operated the year around. Maintenance of adult fish facilities is scheduled for December through February to minimize the impact on upstream migrants. The following table shows passage period by species and earliest and latest recorded dates of peak passage, from fish count data compiled by the CoE.

ADULT PASSAGE TIMING

From Fish Count Data 1968-1983

Species	Passage Period	Earliest Peak	Latest Peak
Spring Chinook	4 - 6/5	4/22	5/22
Summer Chinook	6/6 - 8/5	6/6	7/19
Fall Chinook	8/6-10/31	9/8	9/25
Steelhead	4/1-10/31	9/6	9/30
Sockeye	6/-8/	6/27	7/10
Coho	8/-10/	9/4	10/12

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operation which is included in Appendix A. This water budget implementation plan was developed and endorsed by all parties including the fishery agencies and tribes, for use on a trial basis during 1985.

The flows in the lower Columbia will be the sum of the Snake River, the mid-Columbia, and local in-flow. Weekend flows at lower Columbia projects will not average less than 80% of the average flow for the previous five week days duriong the agreed upon water budget period of April 20 through June 9. The average of the four weekdays following Memorial Day will be used to establish the average flow for the following weekend.

SPILL MANAGEMENT FOR JUVENILE PASSAGE

1. Spill will be provided as specified in the Interim Spill Plan for 1985 on pages 5-8 of this plan. The passage period is March 1 through September 30. This period will be adjusted based upon the actual needs of the juvenile migrants as identified in the Interim Plan.
2. Spill will be required at the John Day project based upon monitoring and the status of the bypass system under construction. Generally, spill will be requested at the rate of 50% or greater of the instantaneous project flow through the unscreened units during the passage period. The Water Budget Center and the Reservoir Control Center will adjust spill levels based upon the status of the migrgtion.
3. The determination of when to spill will be made based upon available information from all sources including counts at the McNary project, hydroacoustic counts, and Unit 3 gatewell counts.
4. Spill volumes will take into account maximum spill levels as determined by dissolved gas monitoring.
5. When more than 30,000 juvenile per day are estimated to be passing the project, spill will be scheduled to be provided beginning one hour before sunset. Spill is scheduled during evening hours to avoid adverse impact on upstream migrants. If after several hours, the sonar index and gatewell counts do not show hourly juvenile passage of 30,000 fish or limited spillway passage, spill may be terminated. This item may be modified pending data analysis.
6. The Reservoir Control Center working with the Water Budget Center shall make every attempt to provide spill for all juveniles throughout the year, as addressed in the Interim Spill Plan for 1985, which includes spring and summer/fall migrants.
7. Spill in bays 15-20 will be used for the juvenile passage as long as operational constraints permit. When more spill is required, bays 14 through 1 shall be opened in that order.

SPILL MANAGEMENT FOR ADULT PASSAGE

The following current spill schedule shall be followed during the spill period. This schedule was developed through studies funded by the COE and by agreement of fishery agencies and with review by tribal representatives.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Dissolved gas monitoring data and the observed condition of migrant juveniles and adults along with migration monitoring data will be used as a basis for spill management requests.

Spill management requests will be based in part upon dissolved gas monitoring data and the observed condition of migrant juveniles and adults, along with juvenile migration monitoring data. Total dissolved gas monitoring during 1985 will be at the John Day forebay automated station and reported every four hours from early March through September 30. Related data reported at the same time will be spill volume, total project flow, and spill gates open.

During the 1984 monitoring period, total dissolved gas at John Day forebay ranged from 100 to 122 percent saturation. Spill during the same period, not correlated with dissolved gas occurrences, ranged from 10,300 to 180,500 cfs. No juvenile or adult migrants were observed with nitrogen gas bubble symptoms.

Spill Schedule for John Day Dam (Openings)
in stops

Gate Number									
1	2	3	4	5 to 10	10 to 16	17	18	19	20
1									(1)
1	1							(1)	1
1	1	1					(1)	1	1
1	1	2					(2)	1	1
1	1	2	1			(1)	2	1	1
1	1	2	2			(2)	2	1	1
1	2	2	2			2	2	(2)	1
1	2	2	2	0 or 2	0 or 2	2	2	2	1
1	2	3	3	(3)	2 or 3	2	2	2	1
1	2	2	2	3	3	(3)	2	2	1
1	2	3	3	3	3	3	(3)	2	1
1	2		3	(4)	(4)	3	3	2	1
2	3	4	4	(4)	(4)	4	4	3	2
2	3	4	4	(5)	(5)	4	4	3	2
2	4	4	5	(6)	(6)	4	4	3	2
2	4	5	5	6	6	(5)	4	3	2
2	4	5	6	6	6	5	(5)	3	2
2	4	6	6	6	6	(6)		3	2
2	4	6	6	6	6	6	(6)	4	2
2	4	5	6	(7)	(7)	6	6	4	2
2	4	6	7	7	7	(7)	6	4	2
2	4	6	7	(8)	(8)	7	6	4	2
2	4	6	8	8	8	(8)	6	4	2
2	4	6	8	(9)	(9)	8	6	4	2
2	4	6	9	(10)	(10)	8	6	4	2
2	5	6	9	10	10	(9)	6	4	2
2	5	6	9	(11)	(11)	9	6	4	3

Continue as in rows above, opening from ends towards the center and using 1 stop increments on innermost gate of gates 5 to 16 if necessary.

Gates 1, 2, 18, 19, and 20 limits at 9 stops.
Circled values may be 1 stop less than value shown.
Each stop equals about 1.6 kcfs.
Night time spill will follow juvenile spill schedule.

Powerhouse

Forebay Area and Intakes

Remove debris from forebay,

Clean trash racks prior to the juvenile spring migration, April 1 and thereafter to maintain less than 1 foot additional drawdown in gatewell slots. Additional cleaning may be required when debris loads in the river are heavy. Trash racks in Units l-6 (especially L-3) collect more debris than other slots and should be cleaned on a regular basis. Fish quality will also be an indicator of potential debris buildup on the trash racks.

Gatewells and Bypass System - If North end of the bypass system is out of commission due to construction, fish will be salvaged from Units 10-16. The plan to use the original system may or may not be used depending again on construction.

Inspect and clean orifices prior to April 1 each season. (Video inspection acceptable.) Operate sluice gate on bypass at full open and regulate with orifice (port) openings.

Use trap capacity as regulating gauge on port openings, about 12 ports should be open to maintain full pipe flow in 1985.

Inspect gatewell slots daily (preferably early in day shift) and remove debris when needed.

Rotate port openings (April 1 to October 1): In 1985, orifice ports in Units 10-13 will be operated and cycled on alternate days with ports in Units 14-16.

Rotate port openings (October 1 to April 1): As necessary to pass fish from gatewells not affected by the juvenile bypass construction.

Dipnetting gatewells: This activity will be necessary during the construction of the John Day juvenile bypass. Gatewells impacted by the reconstruction will be dipped under a contract.

Operate one orifice, per gatewell in Units l-9, if constuction is completed.

STS's should be monitored daily and inspected by video camera once during the season (about mid-July).

Fish will be monitored and sampled at the new juvenile facility when the new bypass system is operating.

Original Water Separator and Bypass Outfall – Provisional use only

Check trap – main migration period:
A. Minimum – once per hour shift – prefer 2-3 times per shift.
B. During period of major turbine load changes.

Remove debris, check pot for normal flow, adjust make-up valve as required.

Provide necessary protection devices over and around screen and pots for predator control.

Outfall Bypass

Operations –
A. Operate Unit 1 turbine low to moderate load whenever possible.
B. Operate bypass 24 hours/day.
C. During period of no or low spill, outfall should be at south end of powerhouse. Discharge into spillway bay (north end of powerhouse) during periods of significant longterm spill.

Spillway Gates

Operate spillgates in accordance with DFOP.

Bulkheads - Gates may trap fish on ledges when raised; fishery biologists sould be notified when gates will be raised and coordinate removal of trapped fish with project personnel.

Inspection

Inspect facilities daily during main migration period.

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladders

Water depth over wiers: 1.0 to 1.2 feet except from May 20 through July 31 when 1.3 feet will be allowed to facilitate better shad passage through pool areas.

Head on All Entrances

Effective head range: 1.0 to 1.7 feet.

North Shore Entrances

Operate 2 downstream gates (1 & 2).
Weir depth: 8 feet below tailwater or greater (or all the way down to elevation 153.0).

North Powerhouse Entrances

Operate NE1 and 2 (downstream gates).
Weir depth: 8 feet below tailwater or greater.
When there is insufficient auxiliary water to operate both entrance weirs at 8 feet below tailwater, one should be raised enough to maintain head providing it is not less than 4 feet below tailwater, in which case only one entrance should operate.

Powerhouse Collection Svstem

Operate 10 floating orifices numbers 1, 2, 3, 6, 9, 12, 15, 17, 18, 19.

South Shore Entrance

Operate wier SE1.
Weir depth: 8 feet below tailwater or greater.

Transportation Velocity

1 to 4 feet per second.

Head on Trashracks

Maximum head of 0.6 feet on ladder exits and attraction water intakes.
Maximum head on picketed leads shall be 0.4 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish **passage** period.

John Day Turbine and Spillway Operations

Turbine Unit Operating Priority

Unit operation will be: 1, 2, 3 and (4-16 with even flow distribution among these turbines). Whenever possible, powerhouse turbine unit #1 shall be operated in the range of 80 to 100 megawatts to facilitate best entrance condition for adult fish passage.

Spillway Operations

The following current spill schedule shall be followed during the spill period. This schedule was developed through contract with U.S Army Corps of Engineers DACW 68-74-C-0500 & Oregon Department of Fish & Wildlife.

1985 PROJECT RESEARCH

1. Title: Adult Salmonid Delay at John Day Dam
   Funding Agency: COE
   Contracting Agency: NMFS
   Principal Investigator: David Daemkier

2. Title: Hydroacoustic Monitoring of Downstream Migrant Juvenile Salmonids at John Day Dam
   Funding Agency: COE
   Principal Investigator: Bob Magne

3. Title: Evaluation of the John Day Bypass System
   Funding Agency: COE
   Contracting Agency: NMFS
   Principal Investigator: Carl Sims

4. Title: Feeding Activity, Rate of Consumption, Daily Ration and Prey Selection of Major Predators in the John Day Reservoir Pool.
   Funding Agency: BPA
   Contracting Agency: USFWS
   Principal Investigator: Bill Nelson

5. Title: Estimate Abundance and Growth Characteristics of Squawfish and Walleye in John Day Reservoir and Tailrace
   Funding Agency: BPA
   Contracting Agency: ODFW
   Principal Investigator: Tony Nigro

FOOTNOTES

[6]Hydroacoustic Monitoring of Downstream Migrant Juvenile Salmonids at John Day Dam 1980-81, USACoE, Feb. 1983.

[7]Head as used in these criteria refers in some cases to total head and in others to velocity head and will be so designated for specific entrances. The conventional method of measuring the entrance velocity (velocity head) is with head differential gauges (still gauges or elaborate mechanical gauges), These gauges indicate only the velocity created between them (velocity head) and do not include any velocity that may be upstream from gauges (velocity of approach). Total entrance velocity (effective head) includes both velocities since their sum is the velocity that the fish encounter when entering the fishway. At entrances with relatively wide entrance pools, there is no appreciable velocity of approach. Where width of entrance pool is close to the width of the entrance, the velocity of approach may be considerable. This velocity must be added to velocity developed from entrance gauge readings. The sum of these velocities is the total entrance velocity; i.e., the velocity that the fish encounter when entering the entrance. This concept applies to overflow weirs, vertical slots or orifice type entrances.

PROJECT DATA

IV. McNARY DAM

FISH PASSAGE INFORMATION

The location of fish passage facilities is shown on the following General Site Plan for McNary Lock and Dam.

JUVENILE PASSAGE FACILITIES

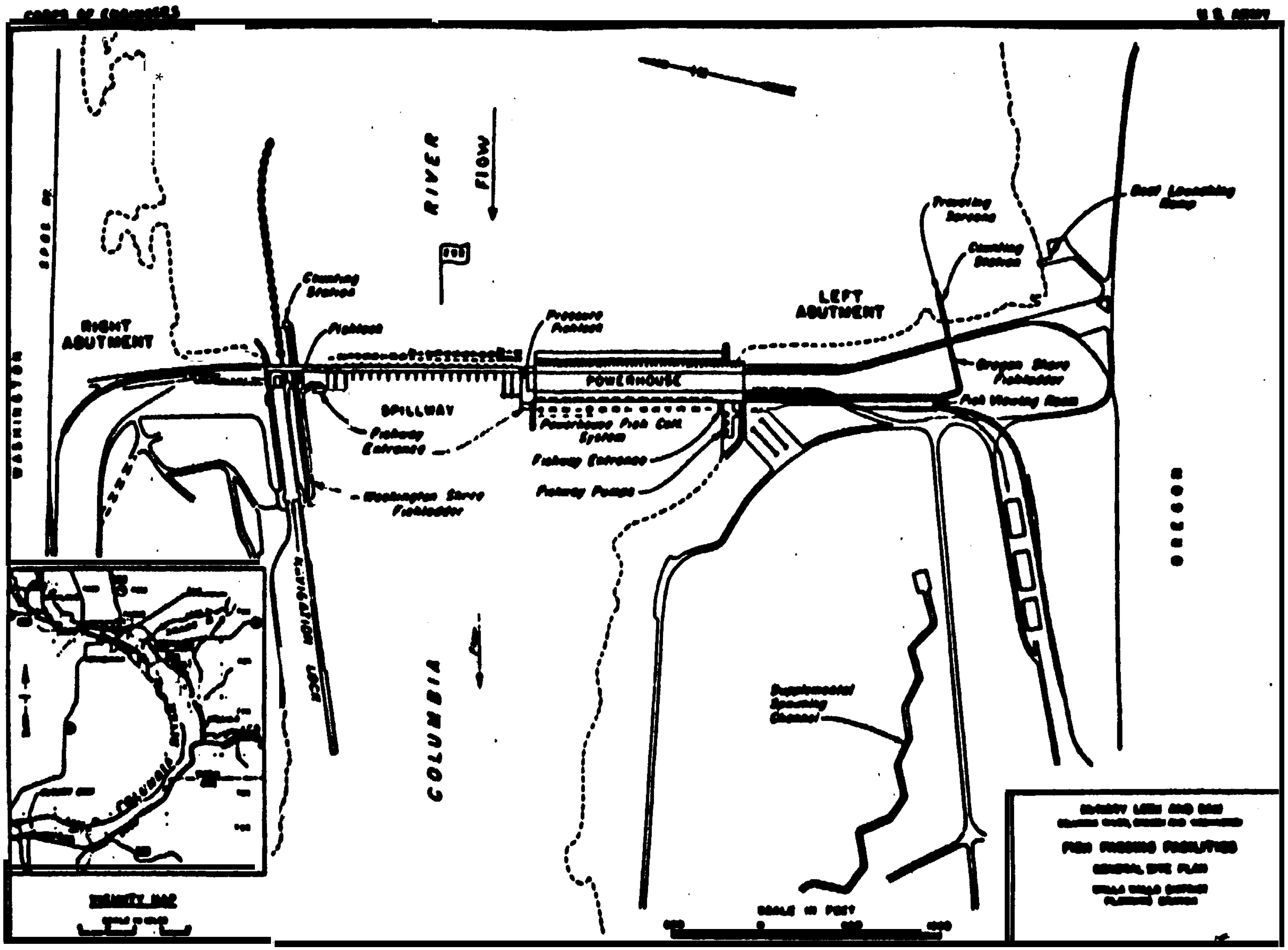
Juvenile facilities at McNary Dam are comprised of traveling screens, gatewell orifice system, and a bypass flume. Juvenile transportation facilities at McNary include: an upwell and fish size separator structure; conduits for distributing fish in raceways; raceways for holding fish; a sampling and marking building; barge and truck loading facilities; and water supply conduits.

Research was conducted at McNary Dam in 1982 for the purpose of developing and testing components of a bypass system for John Day Dam. Fish guidance efficiency was estimated for two different conditions, the present McNary condition with stored gates and the John Day condition without stored gates. Fish guidance efficiency with the John Day condition for spring chinook was 88%. Fish guidance efficiency for steelhead with the John Day condition was 87%. With the McNary condition, fish guidance efficiency was 83% for spring chinook and 76% for steelhead. Balanced flow vertical barrier screens were also tested. Limited testing suggests that fish guidance efficiency may improve with use of balanced flow vertical barrier screens over standard vertical barrier screens.[1]

Fish collection efficiency has been estimated at McNary Dam. Collection efficiency in no spill conditions is estimated to be approximately 40% for spring chinook and 77.6% for steelhead.[1,2] Collection efficiency is the indirect estimate of the total number of fish approaching a project which enter the powerhouse collection/bypass system. The reasons for the discrepancy between fish guidance efficiency and fish collection efficiency have not been resolved. Fish collection efficiency incorporates many variables which do not affect estimates of fish guidance efficiency.

1. The juvenile fish size separator system is a central component of the smolt transportation program at McNary Dam. The FTOT workplan for transportation in 1984 was largely based upon the successful operation of this facility. The separator facility did not meet operating efficiency criteria during 1984. Spring chinook were not successfully separated from steelhead. Transportation criteria for spring chinook versus steelhead were met in spite of low separator efficiency because of high spill levels which occurred throughout the spring migration. However, separation efficiency approached 75-80% by the end of the migration season.

   Modifications to the separator system to improve separation are expected to be completed before the 1985 spring migration.


CORPS OF ENGINEERS
U.S. ARMY
RIVER
FLOW
RIGHT ABUTMENT
LEFT ABUTMENT
WASHINGTON
OREGON
Counting Station
Fishlock
Pressure Fishlock
POWERHOUSE
SPILLWAY
Fishway Entrance
Powerhouse Fish Coll. System
Fishway Entrance
Fishway Pumps
Washington Shore Fishladder
NAVIGATION LOCK
COLUMBIA
Traveling Screens
Counting Station
Boat Launching Ramp
Oregon Shore Fishladder
Fish Viewing Room
Supplemental Spawning Channel
VICINITY MAP
SCALE IN FEET
FISH PASSING FACILITIES

JUVENILE MIGRATION TIMING

% MIGRATION PAST PROJECT	1983	DATE 1982	1984
Yearling Chinook			
10%	4/30	4/28	4/23
90%	5/21	5/20	5/25
Steelhead			
10%	4/30	5/23	4/27
90%	5/23	6/l	6/5
Sub-Yearlings			
10%	6/11	6/8	6/5
90%	7/26	7/20	8/6
Sockeye			
10%	5/3	no data	no data
90%	7/6	no data	no data

ADULT PASSAGE FACILITIES

Adult fish passage facilities at McNary Dam are made up of a north shore fish facility and south shore facility. The north shore facility includes a fish ladder with a counting station, a collection facility at the north end of the spillway, and gravity flow auxiliary water supply. The south shore facility includes a fish ladder, counting station, two south shore entrances, a collection system across the downstream face of the powerhouse, two north powerhouse entrances, and gravity and pumped auxiliary water supplies.

ADULT MIGRATION TIMING

Upstream migrants are present at McNary Dam year around. Upstream passage facilities maintenance is scheduled for January through February to minimize impacts on upstream migrants. The following table shows primary passage periods by species and the earliest and latest dates of peak passage on record, from fish count data compiled by the Corps of Engineers.

ADULT MIGRATION TIMING FROM
FISH COUNTS 1954-1983

SPECIES	PASSAGE PERIOD	EARLIEST RECORDED DATE OF PEAK PASSAGE	LATEST RECORDED DATE OF PEAK PASSAGE
spring chinook	4/l-6/8	4/23	5/26
summer chinook	6/9-8/8	7/17	7/26
fall chinook	8/9-10/31	9/10	9/25
steelhead	3/l-10/31	7/9	10/3
coho	7/l-10/	9/5	10/5
sockeye	6/- l0/	7/l	7/16

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operation which is included in Appendix A. This water budget implementation plan was developed and endorsed by all parties, including the fishery agencies and tribes for use on a trial basis during 1985. The flows in the lower Columbia will be the sum of the Snake River, the mid-Columbia and local in-flow. Weekend flows at lower Columbia projects will not average less than 80% of the average flow for the previous five weekdays during the agreed upon water budget period of April 20 through June 9. The average of the four weekdays following Memorial Day will be used to establish the average flow for the following weekend.

SPILL MANAGEHENT FOR JUVENILE PASSAGE

Spill at McNary will be managed according to the Interim Spill Plan for 1985 on page 5 of this document. This plan, along with the FTOT workplan and the sampling guidelines, will form the basis for spill requests.

Spring chinook collection efficiency estimates at McNary Dam are low compared to estimated fish'guidance efficiency. Under the present bypass system configuration, substantial amounts of spill would be necessary during the spring chinook migration period in order to achieve the goal of 85% passage efficiency. Steelhead collection efficiency is estimated to be similar to the estimated fish guidance efficiency, and significantly less spill would be required during the steelhead migration period. Based on projected collection efficiency, the following figures show that approximately 78% daily average spill would be required during the spring chinook migration period, and 26% during the steelhead migration period. However, project operations at McNary for fish passage are affected by many concurrently operating factors such as hydraulic capacity, transportation policy, and dissolved gas levels. For instance, 26% spill during the steelhead migration period conflicts with the policy to maximize collection and transportation of steelhead smolts.

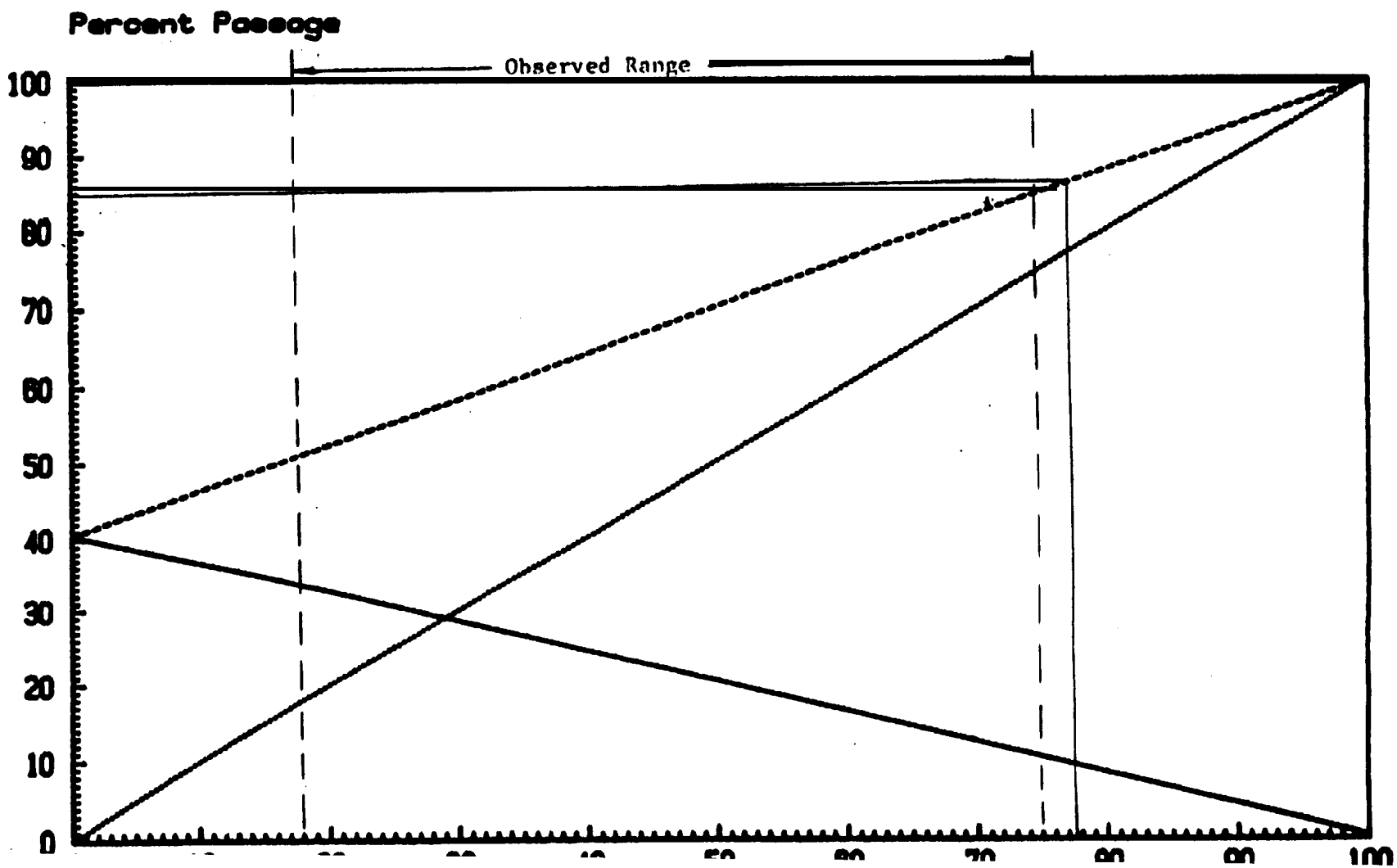
Powerhouse bypass systems and surplus spill are to be used during the spring season to pass yearling migrants.

It is recognized that the limited hydraulic capacity of the McNary powerhouse, and the anticipated high runoff in 1985 will result in substantial forced spill which will serve to increase the overall passage efficiency. For these reasons, it will not usually be necessary to call for supplemental bypass spill. Spill at McNary should be distributed in accordance with the schedules shown in the following figures.

Mark recapture study requirements result in a request that the ratio of spill flows to powerhouse flows be kept constant throughout the study period. The actual powerhouse to spillway discharge ratio will be time dependent based on flow conditions during the study period.

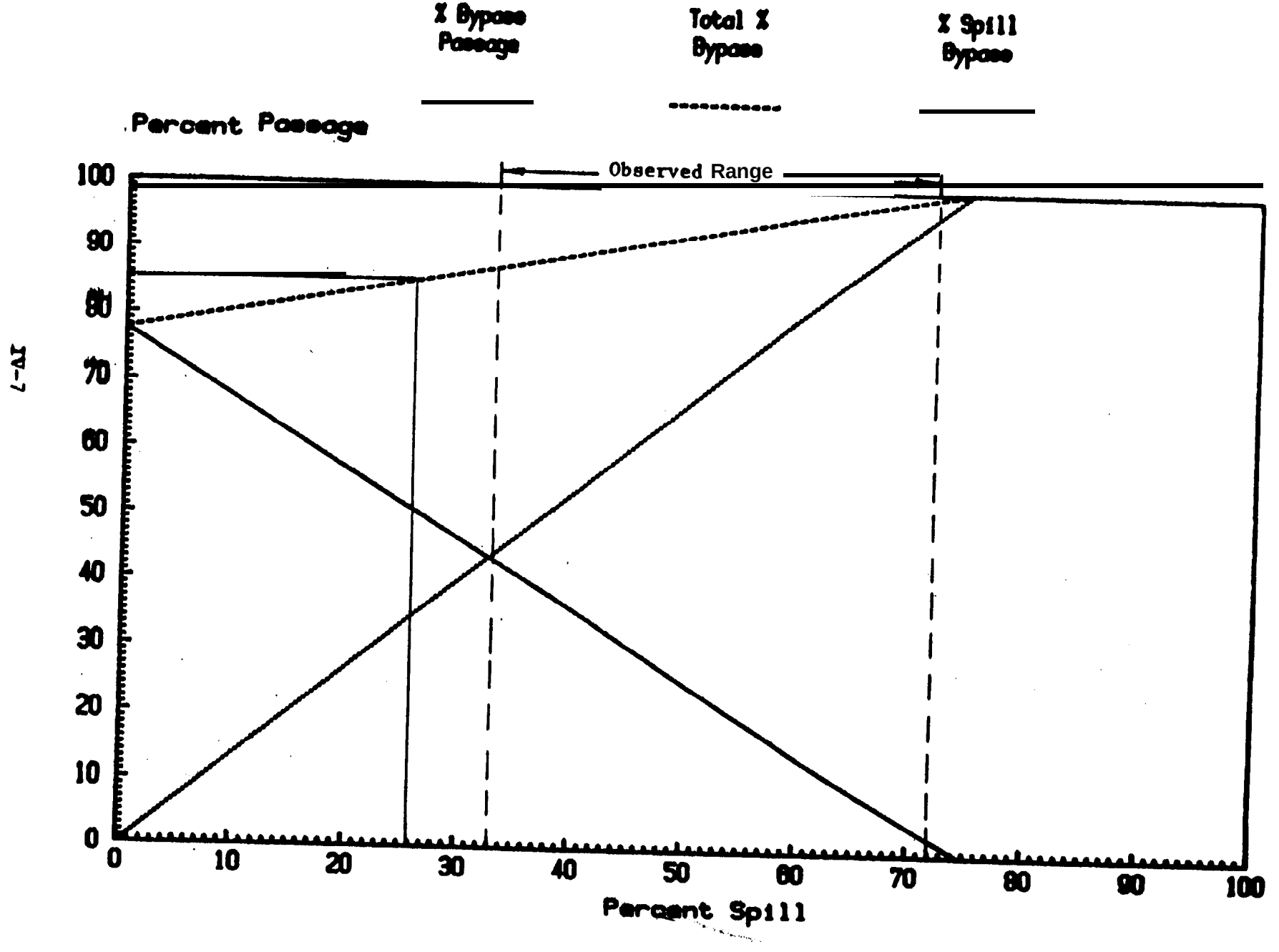
McNary Dam Smolt Passage

Yearling Chinook



McNary Dam Smolt Passage

Steelhead



Recommended Spilling Schedule for Higher Spills at McNary Dam
Reviewed January 1984, (Openings in feet) 1/

Gate Number																						
1*	2*	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20*	21*	22**	TOTAL
																					CLOSED	
4	5	2	2	3	3	3	3	3	(4)	4	3	3	4	4	3	3	3	2	2	5		
4	5	2	2	3	3	3	3	3	4	4	3	3	4	4	3	3	3	3	2	5		
4	5	2	2	3	3	3	3	(4)	4	4	3	3	4	4	4	3	3	3	2	5		
4	5	2	2	3	3	3	3	4	4	4	3	4	4	4	4	(4)	3	3	2	5		
4	5	2	2	3	3	3	3	4	4	4	3	4	4	4	4	4	3	3	(3)	6		74
4	5	2	2	3	3	3	3	4	4	4	4	4	4	4	4	4	3	(4)	3	6		
5	5	2	(3)	3	3	3	3	4	4	4	4	4	4	4	4	4	3	4	3	6		
5	5	2	3	3	3	3	4	4	4	4	4	4	4	4	4	4	3	4	3	6		
5	(6)	2	3	3	3	3	4	4	4	4	4	4	4	4	4	4	3	4	4	6		
5	6	3	3	3	4	3	4	4	4	4	4	4	4	4	4	4	3	4	4	6		84
6	(6)	3	4	3	4	3	4	4	4	4	4	4	4	4	4	4	3	4	4	6		
6	6	3	4	3	4	3	4	4	4	(5)	4	5	4	4	4	4	3	4	4	6		
6	(7)	3	4	3	4	3	4	4	4	5	4	5	4	4	4	4	3	4	4	7		
6	7	3	4	3	4	(4)	4	4	4	5	4	5	5	4	4	4	3	4	4	7		
(7)	7	3	4	3	4	4	4	4	4	5	4	5	5	4	4	4	3	4	4	7		93
7	7	3	4	3	4	4	(5)	4	4	5	4	5	5	5	4	4	3	4	4	7		
7	7	3	4	3	4	4	5	4	(5)	5	5	5	5	5	4	4	3	4	4	7		
7	7	(4)	4	3	4	4	5	4	5	5	5	5	5	5	4	4	4	4	4	7		
7	(8)	4	4	3	4	4	5	4	5	5	5	6	5	5	4	4	4	4	4	7		
7	8	4	4	3	4	4	5	(5)	5	5	5	6	5	5	4	5	4	4	4	7		103
7	8	4	4	4	4	4	5	5	5	6	5	6	5	5	4	5	4	4	4	7		
7	8	4	4	4	(5)	4	5	5	5	6	6	6	5	5	4	5	4	4	4	7		
(8)	8	4	4	4	5	4	5	5	6	6	6	6	5	5	4	5	4	4	4	7		
8	8	4	4	4	5	4	5	(6)	6	6	6	6	6	5	4	5	4	4	4	7		
8	8	4	4	4	5	4	5	6	6	6	(7)	6	6	5	4	5	4	4	4	8		113
8	8	4	4	4	5	4	5	6	6	(7)	7	7	6	5	4	5	4	4	4	8		
8	8	4	4	4	5	5	5	6	6	7	7	7	6	5	(5)	5	4	4	4	8		
8	8	4	4	4	5	5	5	6	7	7	7	7	6	(6)	5	5	4	4	4	8		
8	9	4	4	4	5	5	(6)	6	7	7	7	7	6	6	5	5	4	4	4	8		
8	9	4	4	4	5	5	6	7	7	7	(8)	7	6	6	5	5	4	4	4	8		123
8	9	4	(5)	4	5	5	6	7	7	7	8	7	6	6	5	5	4	5	4	8		
(9)	9	4	5	4	5	5	6	7	7	7	8	7	6	6	5	5	4	5	4	8		126
9	10	4	5	5	6	5	6	7	8	8	9	9	9	7	6	5	5	5	4	9		141
10	11	5	6	5	6	6	6	7	8	9	10	10	10	9	8	6	5	6	5	10		158

1/ Circled values may be 1 foot less than value shown
For example: (1) means 0 or 1 foot
(2) means 1 or 2 feet

*Gates 1, 2, 20, and 21 are split leaf openings.
**Gate 22 is closed because of the juvenile collection facilities immediately adjacent to it.

Recommended Spilling Schedule for Lower Spills at McNary Dam (Openings in feet) 1/

Reviewed January 1984

Gate Number																						
1*	2*	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20*	21*	22**	Tot CLOSED
1																						
1	1																					
1	1	1																				
1	1	1	1																			
1	2	1	1																			
1	2	1	1	1																		
1	2	1	1	1	1																	
1	2	1	1	1	1	1																
1	2	1	1	1	1	1	1															
1	2	1	1	1	1	1	1	(1)					1									9
1	2	1	1	1													1	1	1	2		
1	2	1	1	1	1											1	1	1	1	2		
1	2	1	1	1	1	1									1	1	1	1	1	2		
1	2	1	1	1	1	1	1							1	1	1	1	1	1	2		
1	2	1	1	1	1	1	1	(1)					1	1	1	1	1	1	1	2		19
2	2	1	1	1	1	1	1	1					1	1	1	1	1	1	1	2		
2	2	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	2		
2	2	1	1	1	1	1	1	1	1	(1)	1	1	1	1	1	1	1	1	1	2		
2	2	1	1	1	1	1	1	1	1	1	(2)	2	1	1	1	1	1	1	1	2		
2	2	1	1	1	1	1	(2)	1	1	1	2	2	1	2	1	1	1	1	1	2		28
2	2	1	1	1	(2)	1	2	1	1	1	2	2	1	2	1	2	1	1	1	2		
2	3	1	1	1	2	1	2	1	1	1	2	2	1	2	1	2	1	1	1	(3)		
2	3	1	(2)	1	2	1	2	1	1	1	2	2	1	2	1	2	1	2	1	3		
2	3	1	2	1	2	1	2	1	(2)	2	2	2	1	2	1	2	1	2	1	3		
2	3	1	2	1	2	1	2	(2)	2	2	2	2	2	2	1	2	1	2	1	3		38
3	3	1	2	1	2	1	2	2	2	2	2	2	2	2	1	2	1	2	1	3		
3	3	1	2	1	2	(2)	2	2	2	2	2	2	2	2	2	2	1	2	1	3		
3	4	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	(4)		
3	4	1	2	1	2	2	2	2	2	2	3	(3)	2	2	2	2	1	2	1	4		
3	4	(2)	2	1	2	2	2	2	2	2	3	3	3	2	2	2	1	2	1	4		47
3	4	2	2	1	2	2	2	2	(3)	3	3	3	3	2	2	2	1	2	1	4		
3	4	2	2	(2)	2	2	2	2	3	3	3	3	3	2	2	2	2	2	1	4		
3	4	2	2	2	2	2	(3)	2	3	3	3	3	3	2	2	3	2	2	1	4		
3	4	2	2	2	2	2	3	(3)	3	3	3	3	3	3	2	3	2	2	1	4		
3	4	2	2	2	(3)	2	3	3	3	3	3	3	3	3	3	3	2	2	1	4		57
3	4	2	2	2	3	3	3	3	3	3	3	3	3	(4)	3	3	2	2	1	4		
3	5	2	2	2	3	3	3	3	3	3	3	3	3	4	3	3	2	2	(2)	4		
3	5	2	2	3	3	3	3	3	3	(4)	3	3	3	4	3	3	2	2	2	4		
3	5	2	2	3	3	3	3	3	3	4	3	3	(4)	4	3	3	2	2	2	4		
3	5	2	2	3	3	3	3	3	3	4	3	3	4	4	3	3	3	2	2	4		66

/ Circled values may be 1 foot less than value shown.
For example: (1) means 0 or 1 foot
(2) means 1 or 2 feet

Gates 1, 2, 20 and 22 are split leaf openings.

* Gate 22 is closed because the juvenile collection facilities immediately adjacent to it.

SPILL MANAGEMENT FOR ADULT PASSAGE

The following current spill schedules shall be followed during the spill period. This schedule was developed through studies funded by the CoE and conducted by ODFW with subsequent agreement of fishery agencies with review by tribal representatives.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Spill management requests will be based in part upon dissolved gas monitoring data and the observed condition of migrant juveniles and adults, long with juvenile migration monitoring data. Total dissolved gas monitoring at McNary forebay is at two locations--north to monitor the mid-Columbia arm of the McNary pool, and south to monitor Snake River inflow. McNary north will continue as a non-automated station in 1985 but there is a potential that McNary south will be automated.

Total dissolved gas levels will be reported every four hours from April 1 through August 31 for non-automated stations and from the first week of March through September 30 for automated stations. Related data reported at the same time for McNary Dam will be spill volume, total project flow, and spill gates open.

JUVENILE BYPASS COLLECTION SYSTEM OPERATIONS

1. Yearling salmon will be separated from larger steelhead smolts by a mechanical fish size separator.
2. Yearling salmon will be bypassed to the river while steelhead and those yearling salmon not separated will be transported.
3. The intent is to limit the proportion of the spring chinook run transported from McNary Dam to 10 percent or less.
4. In the absence of an effective fish size separator, all fish collected will be returned to the river.
5. When subyearling chinook counts exceed those of yearling salmon, transportation of all species will begin.
6. Summer migrants collected will be transported below Bonneville Dam. Barging for summer migrants should be operational from approximately June 15 to August 15.
7. If one or more screens fail, the affected unit will be shut down until repairs are completed or until an operational Screen is in place. If there is significant systems failure resulting in injuries to large numbers of fish, that system will be shut down and spill will be provided as an alternative bypass.
8. The sampling objective at McNary is not to exceed the lesser of 3% of the estimated weekly outmigration or 10% of the weekly total of smolts collected and or bypassed. Given a 50% fish collection efficiency and an effective spill of 40%, a sample rate of 10% of fish collected or bypassed should equal about 3% of the total run. The daily sampling rate (noon to noon) may not exceed the objective except: for two days during any one week (Sunday to Saturday) the sampling rate may be doubled provided that for each day that the sample rate is raised above the sampling objective there must be a day in the same week in which the sample rate is lowered an equal or greater amount.
9. At McNary Dam transportation of smolts will continue until approximately September 31 or until 1,000 fish per day are collected for 5 consecutive days.
10. After transport seases, the fish facilities will be operated in a straight bypass mode until October 31. If because of low summer flows, or other reasons some units are not operated, STS's in those units may be removed. No unit will be operated without STS's prior to the end of the juvenile migration.
11. The bypass system will be operated through October with periodic monitoring for the purpose of determining the number of juveniles bypassing- the project and verifying the appropriateness of the shut down date.
12. Following removal of submersible travelling screen8 at the end of October and the bypass period, gatewell orifices and conduit8 should be operated to the extent consistent with required facility maintenance, to allow those fish entering gatewells to exit the facilities.
13. The WBC will publish sampling data in weekly report. More frequent reports or information may be obtained by contacting the WBC, Cecilia Noyes (503)230-4290 or F'TS 429-4290.

OPERATING STANDARDS FOR JUVENILE PASSAGE FACILITIES

Revised January 1984
Reviewed in December 1984

(Prior to April 1 each year)

Powerhouse

Forebay Area and Intakes:

Remove debris from forebay and trash racks.

Rake trash racks.

Remove debris from gatewell slots.

Measure drawdown in gatewell slots.

Inspect vertical barrier screens for holes or protrusions with video camera.

STS Screens

Inspect screens and operate on one trial run.

Log trial run.

Gallery Bypass Flume

Orifice lights operational.

Orifices clean and operational.

Orifice valves operational.

Water dissipation screens clean and ready for operation.

Sorter and Raceways

No rough edges on perforated plate.

Check operation of wet separator and fish distribution system.

All raceway retainer screens and crowder brushes in good order with no holes or protruding wires.

Raceways clean of debris.

Sample and holding tanks smooth and clean.

All electronic counters checked for operation.

Inspect PVC pipes to insure they are clear of debris and cracks.

Fish Trailers

All systems operate properly.

No leaks around air stone fittings.
A. Plugs in end of air stones.
B. Turn stones on lathe if necessary to allow free air passage through stones.

Each trailer carries 2-5" hoses and necessary 5" "Kamlock" caps.

All valves operating properly.

Overall condition of trailer in good shape including hatch covers, release gates, and oxygen manifold system.

Maintenance

Record all maintenance and inspections.

(April 1 - October 31)

Powerhouse

Forebay Area and Intakes

Remove trash from forebay.

Inspect gatewell slots daily and clean as required.

Remove debris from forebay and trashracks as required to maintain less than 1 foot of additional drawdown In gate slots. Additional raking may be required when heaby debris loads are present in the river. Fish quality will also be an Indicator of debris buildup on the trash racks.

Coordinate cleaning effort with personnel operating downstream migrant facilities.

Log gatewell drawdown differentials once a week.

Inspect a vertical barrier screen in a high priority collection unit about July 15 for buildup of debris. If debris accumulation is noted, inspect other screens and clean of debris as necessary.

Sumbersible Traveling Screens (STS)

Inspect, operate and cycle screens as per FTOT plan.

Gallery Bypass Flume

Operate one orifice per gate slot.

Orifices clean and operating.

Orifice lights operating on open orifices.

Orifice valve either full open or closed.

Water dissipation screens clean.

Maintain pinch valve in good operating condition and operate in fully open position if possible.

Adjust water flow over sorter to maintain a smooth, stable flow condition.

Sorter and Raceways

Operate in accordance with FTOT plan.

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

Velocity head range[4]: 1.0 to 1.5 feet

North Shore Entrances

Operate 2 downstream gates (WFE 2 & 3)
Weir depth: 8 feet or greater.

North Powerhouse Entrances

Operate 2 downstream gates, (NFE 2,3)
Weir depth: 8 feet or greater.

Powerhouse Collection System

Operation 30 floating orifices O.G. numbers 1, 2, 3, 4, 6, 8, 9, 10, 12, 14, 15, 17. 18, 20, 21, 23, 24, 26, 27, 29, 30, 32, 33, 35, 36, 37, 39, 41, 43, and 44.

South Shore Entrances

Operate 2 entrances (SFE 1 & 2)
Weir depth: 8 feet or greater, tailwater elevation permitting.

Transportation Velocity

1 to 4 feet per second.

Head on Trashracks

Maximum head of 0.8 feet on ladder exit and attraction water intakes.
Maximum head on picketed leads shall be 0.2 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

McNary Dam Turbine Units and Spillway Operations
Turbine Unit Operating Priority

Unit operation will be: 1, 2. 14, 4-10, 11, 12, 3, 13.

1985 Project Research

The following research is planned for the McNary project in 1984.

1. Evaluate Improved Collection, Handling and Transport Techniques to Materially Improve Survival of Transported Juvenile Chinook Salmon
   Funding Agency: CoE
   Contracting Agency: NMFS
   Principal Investigator: Donn L. Park

2. Title: PIT Tag Evaluation
   Funding Agency: BPA
   Contracting Agency: NMFS
   Principal Investigator: Carl Sims

FOOTNOTES

[1]Research at McNary Dam to develop and Implement a Fingerling Protection System for John Day Dam, Krcma, Gessel, Ossiander, May 1983.

2Preliminary Report, Migrational Characteristics of Juvenile Salmon and Steelhead in the Columbia River Basin - 1983, Sims & Giorgi, CZES, NMFS.

[3]Migrational Characteristics of Juvenile Salmon and Steelhead in the Columbia River Basin, 1982, and Preliminary Report for 1983, Sims et.al.

[4]Head as used in these criteria refers in some cases to effective head and in other to velocity head and will be so designated for specific entrances. The conventional method of measuring the entrance velocity (velocity head) is with head differential gauges (still gauges or elaborate mechanical gauges). These gauges indicate only the velocity created between them (velocity head) and do not include any velocity that may be upstream from gauges (velocity of approach). Effective entrance velocity (effective head) includes both velocities since their sum is the velocity that the fish encounter when entering the fishway. At entrances with relatively wide entrance pools, there is no appreciable velocity of approach. Where width of entrance pool is close to the vidth of the entrance, **the** velocity of approach may be considerable. The velocity must be added to velocity developed from entrance gauge readings. The sum of these velocities is the effective entrance velocity; i.e., the velocity that the fish encounter when entering the entrance. This concept applies to overflow weirs, vertical slots orifices type entrances.

PROJECT DATA

V. PRIEST RAPIDS DAM

PRIEST RAPIDS
FISH PASSAGE INFORMATION

JUVENILE PASSAGE FACILITIES

There are no juvenile facilities included in Priest Rapids Dam. Turbine units are not screened and no bypass to tailwater exists.

Spill is provided as an alternative to turbine passage for downstream migrants. Twenty percent-of the daily average flow was spilled in 1982 for downstream passage according to terms of the Mid-Columbia Settlement Agreement and subsequent Federal Energy Regulatory Commission Orders.

Efficiency of spill in passing downstream migrants has been studied at Priest Rapids. In 1980, 81 and 82 it appeared that the number of smolts passed over the spillway at Priest Rapids was roughly the same proportion as spill discharge. Preliminary results of 1983 spill studies did not show the same relationship indicating that spill effectiveness may vary with flow year and higher spill levels.

A new three year agreement between the PUD's and fishery agencies and tribes was reached on October 31, 1984. The principle objective of the parties is to develop facilities and programs at each mid-Columbia project to increase passage survival to the maximum extent feasible. It is particularly important to note that the intent of this agreement is to initiate measures for the protection of summer migrants and that the information needed to provide long term summer migrant protection will be developed under this agreement.

Spill for juvenile fish passage will be provided under the terms of the present agreement and will be managed by the mid-Columbia settlement designated representatives.

In addition to spill, some protection will be provided to spring migrants and limited protection to summer migrants by dipping all gatewells at Priest Rapids Dam, daily throughout the outmigration season. This will be done under the auspices of the mid-Columbia designated representatives.

According to the 1984 agreement, when a prototype bypass system is developed for Priest Rapids, it will be operated throughout the migration season to add an additional measure of protection for summer migrants.

JWENILE MIGRATION TIMING

Preliminary results of 1983 studies indicate that downstream migrants were concentrated in the upper half of the forebay water column. Fish were distributed deeper at night than during the day.

Horizontal distribution indicated that fish passage was greatest through turbine units adjacent to the spillway. Die1 passage varied in 1983 from past years. The general trend that fish passage is greater at night was true in 1983 but the day versus night difference was not as great. In 1983 60% of the migrants passed at night while 40% passed during daylight hours.

The peak of migration (50% past the project) occurred on May 13 in 1983. Juvenile migration occurs from April 1 through September 1.
April -Ma9 30 - Spring Migration

JUVENILE MIGRATION TIMING
SPRING CHINOOK

	1977	1979	1980	1981	1982	1983
Date of 10% Past Project	May 9	May12	May4	May 5	Apr 28	Apr 29
Date of 90% Past Project	May 27	May 28	May 29	May 23	May 22	May 23

JUVENILE PEAK MIGRATION

50% PAST PROJECT	DATE YEARLING	STEELHEAD	SUB-YEARLING CHINOOK	SOCKEYE	COHO
Earliest	5/12	5/10	8/8	5/l	4/29
Average	5/15	5/15	8/11	5/14	5/20
Latest	5/23	5/25	8/12	5/19	5/25

ADULT PASSAGE FACILITIES

The adult.fish facilities at Priest Rapids Dam are comprised of left and right bank fishways. These consist of the entrance and transport channel section, the fish ladder section, the exit section and the auxiliary water system. On the right bank only one of three entrances is ever open. Auxiliary water is added to flow from the fish ladder to provide attraction flow through the entrance. This auxiliary water flows through a large conduit from the auxiliary water pool, on the left bank which also supplies the left fishway. Auxiliary water is pumped and/or gravity flow. There is one main entrance on each side of the powerhouse and orifice entrances along the face of the powerhouse for the left bank fishway. These all lead to the left fishway ladder, which leads to the exit section. Counting and trapping facilities are also included.

PRIEST RAPIDS

ADULT MIGRATION TIMING

Upstream migrants are present at Priest Rapids Dam year around. Maintenance is scheduled from January through February to minimize the impact on upstream migrants. Fish passage periods for each species are:

Steelhead	March - February (year around)
Spring Chinook	March - June 14
Summer Chinook	June 15 - August 13
Fall Chinook	August 14 - December
Sockeye	June - July
Coho	August - December

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operation which is included in Appendix A. This water budget implementation plan was developed and endorsed by all parties, including the fishery agencies and tribes, for use on a trial basis during 1985.

The Water Budget Managers will specify the start of the flow augmentation period. The operating week is defined as Monday through Sunday. Five day weekday flow averages requested, measured at Priest Rapids Dam, will not exceed the following:

(1) 120 kcfs from April 15 - 28.
(2) 130 kcfs from April 29 - May 5.
(3) 140 kcfs from May 6 to the end of 45 days from the beginning of flow augmentation.

Weekend flows at Priest Rapids Dam, including the three day Memorial Day weekend, will not average less than 80% of the average flow for the previous five weekdays. The average of the four weekdays following Memorial Day will be used to establish the average flow for the following weekend.

The Agencies, PUDs and Tribes have agreed to the following stipulations regarding flow regimes at Priest Rapids, Vemita Bar for 1984-1985.

During the period from the commencement of spawning at Vemita Bar above the 36 kcfs flow level (approximately October 15, 1984) until the end of emergence (approximately April 30, 1985) flows below Priest Rapids Dam and operations at Priest Rapids Dam will be managed according to terms and conditions of the 1984-1985 Vernita Bar Settlement Agreement.

PRIEST RAPIDS

The Settlement Agreement includes conditions establishing a monitoring team which will conduct spawning surveys which will be the basis for subsequent flow levels to protect hatching and emerging fall chinook. The Water Budget Center staff and Water Budget Managers will keep in close contact with the monitoring team to keep advised on their operations. This is particularly important during the spring and summer outmigration period.

1. A Monitoring Team will be created, composed of one qualified fishery biologist from each of (a) Washington Department of Fisheries, (b) Grant County PUD, and (c) the remaining state and federal agencies and the Indian Tribes. All decisions of the Monitoring Team will be by consensus. If a consensus cannot be obtained, the issue will be referred for decision to a mutually agreeable third party, who shall be selected by the Monitoring Team members not later than September 15, 1984. Grant County will fund the activities of the Monitoring Team, subject to budget approval prior to July 1, 1984.
2. The Monitoring Team will survey redds on Vemita Bar in the area identified on the diagram that is Exhibit I for the purpose of determining the initiation of spawning, the location of redds and the extent of spawning. The surveys will be conducted each weekend beginning on the weekend closest to October 15, 1984. Additional activities will include calculation of temperature units, setting critical elevations, determining initiation dates for spawning, hatching, emergence and end of emergence, and making recommendations due to special circumstances. The Monitoring Team will submit a report to all parties by July 1, 1985.
3. "Initiation of spawning" is defined for the purpose of this agreement as the Wednesday before the weekend on which the Monitoring Team first identifies 5 or more redds. Separate dates for initiation of spawning will be set for two zones, (1) 36-50 kcfs and (2) above 50 kcfs.
4. During the period of spawning on Vernita Bar, Grant County PUD will limit the magnitude and duration of maximum daily flows to the extent feasible. The goal of maximum flow constraints is to ensure spawning below the 70 kcfs level on Vemita Bar. The agencies and tribes will work with Grant County PUD to obtain the cooperation of BPA and the Corps of Engineers in achieving the desired flow regime.
5. During the period of spawning and until hatching (defined below), Grant County can used minimum flows of 36 kcfs for up to 8 hours on weekdays and 12 hours on weekends (with no two consecutive minimum periods). All parties recognize that the utilization of the 36 kcfs minimum may be constrained to achieve the goal identified in paragraph 4.

6. The Monitoring Team will make a final survey of the redds to determine the critical elevation to which adequate protection will be provided until the end of emergence (approximately April 30, 1985), under the below stated terms. The critical elevation for adequate protection will be that flow level that is first above the location of the following-described redd. Flow level must be in 5 kcfs increments beginning at 40 kcfs.
   a. If the count of adult fall chinook salmon over McNary Dam is 40,000 or greater, the Monitoring Team will count from the highest redd in the survey area down to the 31st highest redd in the survey area to determine the critical elevation. As an example, if 1 redd occurred between 70 and 65 kcfs elevations and 30 between the 65 and 60 kcfs elevations (31 cumulative), the critical elevation for protection would be established at the 65 kcfs elevation. If 1 redd occurred between the 70 and 65 kcfs elevations and 29 between the 65 and 60 kcfs elevations (30 cumulative), the critical elevation for protection would be at the 60 kcfs flow elevation. A maximum of 30 redds will not be afforded adequate protection.
   b. If the count is less than 40,000, the Monitoring Team will count down from the higest redd in the survey area to the 11th highest redd in the survey area to determine the critical elevation for adequate protection. A maximum of 10 redds will not be afforded adequate protection.
7. Beginning with hatching (the date on which eggs will have accumulated 500 temperature units -- measured in celsius degree-days -- from the initiation of spawning) and until emergence (defined below), flows will be regulated to ensure that the intergravel vater level does not fall below 15 cm below that surface of the gravel:
   a. At the 50 kcfs level when the post-hatch stage has only been reached for the 36-50 kcfs zone.
   b. At the critical elevation as defined in paragraph 6 when the post-hatch stage has been reased for the zone above the 50 kcfs level.
8. From the date of emergence (the date on which eggs will have accumulated 1,000 temperature units from the initiation of spawning), until the end of emergence (defined as the date on which eggs will have accumulated 1,000 temperature units from the completion of spawning), flows will not be less than:
   a. 50 kcfs when emergence has only been reached for the 36-50 kcfs zone.
   b. Flows corresponding to surface water at the critical elevation as defined in paragraph 6 when the emergence stage has been reached for the zone above the 50 kcfs level.

9. Between the end of emergence and October 15, 1985, Grant County PUD is not subject to any limitation upon minimum flows except as set forth in the project license. Minimum flow limitations after that date may be established after further negotiations.
10. During the 1984-85 season, Grant County PUD will attempt to provide flows to adequately protect all redds above the critical elevation identified in paragraph 6 in a manner consistent with the protection provided to redds below the critical elevation, subject to consideration of cost and load management. Such efforts will be reported to the Monitoring Team.
11. The parties understand that Grant County PUD's willingness to enter into this interim settlement is for the express purpose of permitting the PUD to reach a long-term agreement with BPA for the federal hydrosystem to assume responsibility for adequate protection of redds above the 50 kcfs level, since the PUD believes the redds sited above that level occur principally as a result of the construction and operation of the federal system since 1959, and the PUD does not believe that it should bear the responsibility for their adequate protection. Grant County PUD has advised the parties to these negotiations that it is willing to agree to a long-term settlement incorporating the concept of this interim settlement only if it obtains an agreement with BPA for that sharing of responsibility. The parties further understand that the fishery agencies and tribes have not necessarily agreed that Grant County PUD's responsibility for protecting natural production of fall chinook salmon on Vernita Bar is expressly conditioned upon the PUD reaching an agreement with BPA or is limited to redds below the 50 kcfs flow level.

SPILL MANAGEMENT FOR JUVENILE PASSAGE

1. Spill levels, durations and gate configurations will be set through the FERC process of designated representatives with the agencies and tribes participating in the Mid-Columbia Studies Committee, as established by the October 1984 agreement.
2. Grant County PUD will spill 1.5 million acre-feet of water over an approximate 30-day period to bypass a portion of the spring downstream migrants past Priest Rapids Dam. The availability of this volume of spill is contingent upon average May flows of 130-140 kcfs at Priest Rapids Dam. Spill volume will increase and decrease as follows on the projected May flows.

River Flow ($cfs \times 10^3$)	Spill-Volume ($acre\text{-}ft. \times 10^6$)
-100 - 110	0.6
110 - 120	1.0
120 - 130	1.25
130 - 145	1.55
145 - 160	1.6
160 - 170	1.75
170 - 180	1.85
180 - 190	2.0
190 -	2.0+

Grant County PUD will conduct hydroacoustic monitoring at the Priest Rapids spillway and powerhouse to manage the spill/passage program. The spill program and spill management will be conducted under the auspices of the designated representatives. Any adjustments or modifications of the spill program must be approved by the majority of the designated representatives.

SPILL MANAGEMENT FOR ADULT PASSAGE

1. When spill occurs during the daytime hours, that spill shall be shaped in accordance with the criteria currently being developed by the agencies and tribes as shown in the following chart. Grant PUD has not adopted to these criteria, but are currently cooperating in efforts to refine the adult spill configuration schedule.
2. Spill request for adults will be based upon the tribes and agencies' objective of obtaining 100 percent passage efficiency, without delays at this project.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Spill management requests will be based in part upon dissolved gas monitoring data and the observed condition of migrant juveniles and adults, along with juvenile migration monitoring data. Total dissolved gas monitoring during 1985 will be at the Priest Rapids forebay and reported every four hours from April 1 through August 31. Related data reported at the same time will be spill volume, total project flow, and spill gates open.

PRIEST RAPIDS

Operating Standards for Adult Passage Facilities

Fish Ladders

Water depth over weirs: 1.0 to 1.2 ft.

Transport Channel (Between Entrance and Ladder)

Transport Velocity: 1 to 4 fps.

Staff Gauge and Water Level Indicators

Shall be readable at all water levels encountered during passage periods.

Staff gages or water level indicators shall be located upstream and downstream from entrances, at a convenient location for viewing along the ladder, and upstream and downstream of the fishvay exit trashrack. They should be located away from the path of entrance flow, at a location where water velocities are low.

Staff gage or water level indicators shall be consistent with panel board water surface readings in the control room.

Trashracks

Buildups of debris shall be cleaned immediately from the ladder exit when water surface differential exceeds 0.3 foot.

Visable buildups of debris shall be cleaned immediately from picket leads at the counting window.

Turbine Unit No. 10 Operation

In the interest of improved passage at LEW-4, Unit 10 will be the first turbine to reduce or discountinue operation during daylight hours for periods when the powerhouse is operating at less than capacity from April 1 to November 30.

ENTRANCE OPERATION

-A. Spring/summer/fall (March through November - exact dates depend on fish counts, and will vary from year to year) - Total flow = 3,008 cfs.

Gate	Width (ft)	Head (ft)	Gate Depth (ft)
LEW-2	12	1.0 (minimum)	11.9
LEW-2	12	1.25	10.6
LEW-2	12	1.5	9.7
LEW-4	12	1.0 (minimum)	14.4
LEW-4	12	1.25	12.9
LEW-4	12	1.5	11.8
REW-2	15	1.0 (minimum)	8.3
REW-2	15	1.25	7.4
REW-2	15	1.5	6.8

Orifice Gates: 9 orifice gates open.

Note:

1. Head represents staff gauge reading immediately above the entrance subtract the staff reading in tailwater.

2. Gate depth represents the tailwater gauge reading minus the entrance weir crest reading.

3. The above gate depths are designed to provide flow from the 9 closed orifies to the remaining entrances of the left fishway especially LEW-2 and LEW-4.

A. Winter (December 1 through February - exact dates based on fish counts) - Total flow = 1,640 cfs.

Gate	Width (ft)	Hydraulic Drop (ft)	Gate Depth (ft)
LEW-2	12	1.0 (minimum)	7.5
LEW-2	12	1.25	6.7
LFW-2	12	1.5	6.1
LEW-4	12	1.0 (minimum)	7.5
LEW-4	12	1.25	6.7
LEW-4	12	1.5	6.1
REW-2	15	1.0 (minimum)	5.5
REW-2	15	1.25	4.9
REW-2	15	1.5	4.5

Orifice Gates: 3 gates to be open.

Trial Spilling Schedule for Priest Rapids Dam 1985
(Openings in Feet)

GATE NUMBER
November 14, 1984

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
																					(1)*
1																				(1)	1
1	1																			1	1
1	(2)	1																	(1)	1	1
1	2	1	1																1	1	1
																		(1)			
1	2	1	2	1	(1)													1	1	1	1
1	2	1	2	1	1	1											(1)	1	1	1	1
1	2	1	2	1	1	1	1									(1)	1	1	1	1	1
1	2	1	2	1	1	1	1	1							(1)	1	1	1	1	1	1
1	2	1	2	1	1	1	1	1	1					(1)	1	1	1	1	1	1	1
1	2	1	2	1	1	1	1	1	1	1			(1)	1	1	1	1	1	1	1	1
1	2	1	2	1	1	1	1	1	1	1	1	(1)	1	1	1	1	1	1	1	1	1
1	2	1	2	1	2	1	1	1	1	1	1	1	1	1	1	(2)	1	2	1	2	1
2	2	1	2	1	2	1	1	1	1	1	1	1	1	1	1	(2)	1	2	1	2	(2)
2	2	1	2	1	2	1	(2)	1	1	1	1	1	1	(2)	1	2	1	2	2	2	2
2	2	1	2	1	2	1	2	1	2	1	1	(2)	1	2	1	2	1	2	2	2	2
2	2	2	2	1	2	1	2	1	2	1	1	2		2	1	2	1	2	(2)	2	2
2	2	2	2	1	2	1	2	1	2	2	(2)	2	1	2	1	2	1	2	2	2	2
2	2	2	2	1	2	1	2	2	2	2	2	2	(2)	2	1	2	1	2	2	2	2
2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	(2)	2	1	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	2	2		2	2	2	(2)	2	2	2	2
2	2	2	2	2	2	2	2	2	2	3	(3)	2	1	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	3	3	3	(3)	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	3	3	3	3	(3)	2	2	2	2	2	2	2	2

* Circled values include indicated opening or one foot less than that value. For example :

(1) Means 0 or 1 foot opening.
(2) Means 1 or 2 foot opening.
(3) Means 2 -or 3 foot opening.

PRIEST RAPIDS

1985 PROJECT RESEARCH

Research to be conducted at Priest Rapids Dam will be developed by the Mid-Columbia Studies Committee in accordance with the October 1984 Settlement Agreement.

FOOTNOTES

[6]Hydroacoustic Assessment of Downstream Migrating Salmon and Steelhead at Wanapum and Priest Rapids Dams in 1983, DRAFT, BioSonics, Inc.

[7]From compilation of data by Mike Dell, Grant County PUD for 1977, 1979, 1980, 1981, 1982, 1983 for spring chinook from gatewell sampling. Spill levels in 1982 and 1983 effectednumbers of fish in gatewell samples, and therefore the mgration index.

[8]PUD Number 2 of Grant County, Project Number 2114, Transcript at Page 578-582 and 600-601, October 12, 1984.

PROJECT DATA

VI. WANAPUM DAM

WANAPUM DAM

FISH PASSAGE INFORMATION

JUVENILE PASSAGE FACILITIES

There are no juvenile facilities included in Wanapum Dam. Turbine units are not screened and no bypass to tailwater exists.

Twenty percent of the daily average flow was spilled in 1982 as an alternative to turbine passage according to terms of the Mid-Columbia Settlement Agreement and subsequent FERC orders of the designated agencies and PUD representatives.

Efficiency of spill for passing downstream migrants was studied at Wanapum in 1983. Preliminary results indicate the number of smolts passed in spill increased as spill level increased. At spill levels of less than 60% of the river flow, the proportion of fish passed over the spillway was greater than what would occur with a one-to-one spillway versus powerhouse passage relationship.

Vertical and horizontal fish distribution data was collected utilizing hydroacoustics at Wanapum dam in 1983. Preliminary results indicate that fish were concentrated in the upper one third of the water column in the forebay. Fifty percent of the fish were distributed in the upper 25% of the water column. Fish distribution in the turbine intake was similar with 60 percent of the migrants in the top third of the water column as they entered the intake. The 1983 spill effectiveness data indicates 50% spillway passage can be achieved by planned used of about two million acre feet through the migration season.

Horizontal distribution was constant throughout the study with most fish passing through the units in the middle of the powerhouse. Fish passage was lowest in the turbine units nearest the spillway. Preliminary study results indicate that high flow, high spill years probably affect fish distribution. Fish were distributed slightly deeper in the forebay at night compared to daytime distribution.

All gatewells at Wanapum Dam will be dipped daily. Throughout the outmigration period, criteria will be established by mid-Columbia designated representatives. Fish dipped from gatewells will be released into the river below Priest Rapids Dam.

Grant County PUD will conduct hydroacoustic monitoring at Wanapum spillway and powerhouse to manage and assess spill for fish passage. The spill program and any adjustments or modification to the program must be approached by a majority of the designated representatives.

JUVENILE MIGRATION TIMING

Juvenile migration timing at Wanapum is assumed to be similar to that at Priest Rapids. Hydroacoustics showed that forty percent of the total migration passed Wanapum dam at night, while 55% passed the project during daylight hours.

ADULT PASSAGE FACILITIES

The left fishway includes two small main slotted entrances or one large one, on the left end of the powerhouse. There is one main slotted entrance on the right end of the powerhouse, and orifice entrances along the powerhouse collection channel. These all divert fish to the ladder section, then to the exit section. Auxiliary water is provided by turbine pumps, and combines with ladder flow to provide attraction flow through entrances. The right fishway has three entrances, but only one is permanently open. Auxiliary water is gravity fed. A transport channel connects the entrances and the ladder. An exit section is at the upper end of the ladder.

ADULT MIGRATION TIMING

Fish are present year around. Primary passage periods for individual species are the same as those noted for Priest Rapids Dam. The exact time required for fish migration from Priest Rapids to Wanapum is unknown.

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operation which is included as Appendix A. This water budget implementation plan was developed and endorsed by all parties, including the fishery agencies and tribes, for use on a trial basis during 1985.

The Water Budget Managers will specify the start of the flow augmentation period. The operating week is defined as Monday through Sunday. Five day weekday flow averages requested, measured at Priest Rapids Dam, will not exceed the following:

(1) 120 kcfs from April 15 - 28.
(2) 130 kcfs from April 29 - May 5.
(3) 140 kcfs from May 6 to the end of 45 days from the beginning of flow augmentation.

Weekend flows at Wanapum Dam, including the three day Memorial Day weekend, will not average less than 80% of the average flow for the previous five weekdays. The average of the four weekdays following Memorial Day will be used to establish the average flow for the following weekend.

SPILL MANAGEMENT FOR JUVENILE PASSAGE

Spill levels, durations and gate configurations will be set through the FERC process of designated representatives with the agencies and tribes participating in the Mid-Columbia Studies Committee, in accord with the October 1984 settlement agreement.
Grant County PUB will spill 2.0 million acre feet of water over an approximate 30 day period to bypass a portion of the spring downstream migration.. The availability of spill will be contingent upon average May flows of 130-140 kcfs at Wanapum Dam. Spill volume will increase and decrease as flows based on the projected May flows.

River Flqw (cfs x 10)	Spill Volume (acre ft X 106)
100-110	0.8
110-120	1.2
120-130	1.5
130-150	2.0
150-160	2.5
160-	2.5+

Grant County PUD will evaluate the measure of protection which may be afforded summer migrants through spill used in conjunction with a forebay guidance device. A study design will be developed by the mid-Columbia studies committee, the volume of spill to be utilized in the study will not exceed 200,000 acre-ft of water during the 2-3 week peak of the summer migrant period.

SPILL MANAGEMENT FOR ADULT PASSAGE

1. All spill not provided for juvenile passage will be shaped in accordance with PUD and fishery agencies agreement, to avoid delay to upstream migrants. The adult spill schedule for 1984, shown in the following chart , may be refined to some extent during the upcoming passage season.
2. Spill shaping requests will be based on agencies and tribes objective of achieving 100 percent upstream passage efficiency without delays.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Dissolved gas is not monitored at Wanapum. Spill management requests will be based upon total dissolved gas monitoring at Rock Island, the next upstream project, and upon the observed condition of migrant juveniles and adults at Wanapum along with juvenile migration monitoring data.

Wanapum Dam Adult Spill Criteria for 1984. (Openings in Feet).

Gate Number												
1	2	3	4	5	6	7	8	9.	10	11	12	Tot
1	(1)*											
2	1	(1)										4
2	1	(2)	1									
2	1	2	(2)	1								8
2	1	2	2	1	1	(1)						
2	1	2	2	1	1	1	1	(1)				12
2	1	2	2	2	(2)	1	1	1				
2	1	2	3	2	2	1	1	1	(1)			16
2	1	2	2	2	2	2	2	(2)	1			
2	1	2	2	2	3	2	2	2	1	(1)		20
2	1	2	2	2	3	2	2	2	2	(2)		
2	1	2	2	(3)	3	2	2	2	2	2	1	24
2	1	2	2	3	3	3	(3)	2	2	2	1	
2	1	(3)	3	3	3	3	3	2	2	2	2	28
2	1	3	3	(4)	3	3	3	2	2	2	2	
2	1	3	3		(4)	3	3	3	2	2	2	32
2	(2)	3		2	4	3	3	3	3	2	2	
2	2	3	3	4	4	4	3	3	3	(3)	2	36
2	2	3	3	4	4	4	4		3	3	(3)	
2	2		(4)	4	4	4	4	2	3	3	3	40
2	2	3	4	4	5	4	4	4	(4)	3	3	
2	(3)	3	4	4	5	4	4	4	4	4	3	44
2	3	3	4	(5)	5	5	4	4	4	4	3	
2	3	(4)	4	5	5	5	5	4	4	4	3	48
2	3	4	(5)	5	5	5	5	5	4	4	3	
2	3	4	5	5	5	5	5	5	5	4	(4)	52
2	3	4	5	(6)	5	5	5	5	5	5	4	
2	3	4	5	6		(6)	5	5	5	5	4	56
2	3	4	5	6	8		6	5	5	5	(5)	
2	3	4	(6)	6	7	8	6	5	5	5	5	60
2	3	4	6	(7)	7	6	6	6	5	5	5	
2	3	4	6	7	7	7	6	6	(6)	5	5	64

*Circled values include indicated opening or one foot less than that value.
For example: (1) means 0 or 1 foot opening
(2) means 1 or 2 feet opening
(3) means 2 or 3 feet opening

OPERATING STANDARDS FOR ADULT FACILITIES

Fish Ladders

Water depth over weirs: 1.0 to 1.2 feet.

Transportation Channel (Between Entrances and Ladder)

Transportation velocity: 1 to 4 fps.

Trashracks

Buildups of debris shall be cleaned immediately from the ladder exit when water surface differential exceeds 0.3 feet.

Visable buildups of debris shall be cleaned immediately from picket leads at the counting window.

Staff Gages and Water Level Indicators

Shall be readable at all water levels encountered during passage periods.

Staff gages or water level indicators shall be located upstream and downstream from entrances, at a convenient location for viewing along the ladder, and upstream and downstream of fishway exit trashracks. They should be located away from the path of entrance flow, at a location where water velocities are low.

Turbine Unit No. 1 Operation

In the interest of improved passage at SE-2, Unit 1 will be the first turbine to reduce or dicountinue operation during daylight hours for periods when the powerhouse is operating at less than capacity from May 1 to October 30.

Entrance Operation

Spring/summer/fall (exact dates depend on fish counts at Priest Rapids, and will vary from year to year).

SE-2 (right powerhouse main entrance) to be open continually.
Head = 1.5 feet minimum.

SE-2 (left powerhouse main entrance - without 4' insert) to be open continually.
Head = 1.5 feet minimum.

Orifice gates - 10 orifice gates to be open.

REW-2 to be open continually.
Head 1.0 feet minimum.

Submerged Weir Depth of REW-2

Head (ft.)	Gate Depth (ft.)
1.0 (minimum)	8.3
1.25	7.4
1.5	6.8

Note:

1. Head represents staff gage reading immediately above the entrance. Subtract the staff gage reading in tailwater.

2. Gate depth represents the tailwater gage reading subtract the entrance weir crest reading.

3. Note: The above listed minimum head settings for SE-3 and SE-2 also provide additional head at orifice entrances. The higher head (1.5 feet instead of 1.0 feet) allows flow from the 10 closed orifices to pass through the remaining left fishway entrances, providing a total of 2,763 cfs at tailwater elevation 490, and 3,038 cfs at tailwater elevation 493.

Winter Operation

SE-3 - to be open continually.
Head - 1.0 feet minimum.

SE-2 - to be open continually.
Head - 1.0 feet minimum.

Orifice gates - 6 gates to be open.
REW-2 to be open continually.
Head - 1.0 feet minimum.

Submerged Weir Depth of REW-2

Head (ft.)	Gate Depth (ft.)
1.0 (minimum)	8.3
1.25	7.4
1.5	6.8

1985 PROJECT RESEARCH

Research to be conducted in 1985 at Wanapum Dam will be determined by the Mid-Columbia Studies Committee.

PROJECT DATA

VII. ROCK ISLAND DAM

FISH PASSAGE INFORMATION

JUVENILE PASSAGE FACILITIES

Rock Island 1

Rock Island I does does not include any juvenile passage facilities. Twenty percent of the daily average flow was provided in 1982 according to terms of the Mid-Columbia Settlement Agreement and subsequent agreements to provide an alternative to turbine passage. Loading of the 1st powerhouse is minimized when possible during the spring migration.

Rock Island 2

Rock Island 2 juvenile passage facilities consist of a gatewell orifice system with 8" orifices, collection channel, downwell, and closed pipe bypass conduit. An inclined plane juvenile sampling trap was added to the conduit system. The bulb turbine units at Rock Island are not screened.

Utilization of this system, without any guidance devices, was studied at Rock Island Dam. Less than 15% of marked coho were recovered in the bypass conduit trap. This system is not operated as a primary bypass. [10]

Hydroacoustics was utilized in 1983 at Rock Island Dam to assess the effectiveness of spill. Horizontal and vertical distribution were also assessed. Preliminary results indicate that high levels of spill are more effective at passing fish than low levels.

More fish passed through shallow spill gates than deep spill gates. Half the water spilled passed through deep spill gates while only 13% of the fish passed through deep spill gates. [11]

Vertical distribution data from hydroacoustic monitoring indicate that 50 percent of migrants were within 30 feet of the forebay surface during the day, while 50 percent were within 42 feet of the surface at night. Inside the turbine intakes, 50 percent of the migrants were within 6 feet of the intake ceiling at night while 50 percent were 5 feet from the intake ceiling during the day. 80 percent of the migrants were within 13 feet of the intake ceiling during the day and were within 22 feet of the intake ceiling at night.

During 1983, fyke net tests were conducted at the project. The results of those tests indicate a slightly deeper vertical distribution. [12]

Horizontal distribution was evenly distributed across the powerhouse with the exception of unit 5. This may have been influenced by the fact that adjacent units 6 and 7 were not operating.

Spill is provided as an alternative to turbine passage. Spill volume and management are established by the Mid-Columbia Settlement Agreement and subsequent FERC orders and PUD and agencies designated representatives.

As part of the 1984 Settlement Agreement, Chelan PUD has agreed to provide a 50% passage efficiency at Rock Island Dam, utilizing spill. Specifics of the spill program will be determined by the Mid-Columbia designated representatives.

JUVENILE MIGRATION TIMING

Juvenile passage was monitored during 1981 using hydroacoustics. 10% of the total migration passed Rock Island Dam by April 24. 90% of the run had passed Rock Island by May 31.[12]

Die1 passage data collected during 1983 showed that 57% of the fish passed the project during daylight hours.

ADULT PASSAGE FACILITIES

Adult passage facilities at Rock Island are comprised of three fishways: a right bank fishway a left bank fishway and a middle fishway. The right bank fishway is located in the approximate center of the spillway. The left bank fishway is located at the south end of the second powerhouse. The middle fishway is located at the north side of the first powerhouse. Each facility includes a counting station, auxiliary water supply, attraction water system with entrances, and an exit.

ADULT MIGRATION TIMING

For the purpose of operation and maintenance, primary fish passage is considered to occur from March through November. Species primary passage periods at Rock Island are:

Spring Chinook	April 18 - May 31
Summer Chinook	July 1 - August 17
Fall Chinook	August 18 - November
Steelhead	April - March
Coho	August - November
Sockeye	July - October

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operation which is included in Appendix A. This water budget implementation plan was developed and endorsed by all parties, including the fishery agencies and tribes, for use on a trial basis during 1985.

The Water Budget Managers will specify the start of the flow augmentation period. The operating week is defined as Monday through Sunday. Five day weekday flow averages requested, measured at Priest Rapids Dam, will not exceed the following:

(1) 120 kcfs from April 15 - 28.
(2) 130 kcfs from April 29 - May 5
(3) 140 kcfs from May 6 to the end of 45 days from the beginning of flow augmentation.

Weekend flows at Rock Island Dam, including the three-day Memorial Day weekend, will not average less than 80% of the average flow for the previous five weekdays. The average of the four weekdays following Memorial Day will be used to establish the average flow for the following weekend.

ROCK ISLAND ADULT SPILL CRITERIA FOR SPILL OR 40,000 CFS OR LESS
(Preliminary - 1984 only)

GATE NUMBER

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Total Feet Open
0	3	0		0	0		0			0	0	0				0	3
0	3	0	3	0	0		0			0	0	0				0	6
0	3	0	3	0	0	3	0			0	0	0				0	9
0	3	0	4	0	0	3	0	0	0	0	0	0	0	0	0	0	1[o]
o	w	0	4	o	o	w	o	o	o	o	o	o	6	o	o	o	16
o	3	0	4	o	o	3	o	o	0	o	o	o	6	0	5	o	21
o	3	0	4	o	o	3	o		3	o	o	o	6	0	5	o	24
o	3	0	4	o	o	3	o	3	3	o	o	o	6	0	5	o	27
o	3	0	4	o	o	3	o	3	3	o	o	o	6	4	5	o	31
o	3	0	4	o	o	3	o	3	4	o	o	o	8	4	5	o	34
o	3	0	4	o	o	3	o	4	4	o	o	o	8	5	5	o	36
o	3	0	4	o	o	3	o	5	4	o	o	o	8	6	5	o	38
o	3	0	4	o	o	3	o	5	5	o	o	o	8	7	5	o	40
o	3	0	4	o	o	3	o	6	6	o	o	o	8	7	5	o	42
o	3	0	4	o	o	3	o	6	7	o	o	o	9	7	5	o	44
o	3	0	4	o	o	4	o	7	7	o	o	o	9	7	5	o	46
o	3	0	4	o	o	4	o	8	8	o	o	o	9	7	5	o	48
o	3	0	4	o	o	4	o	9	8	o	o	o	9	7	5	o	49
o	3	0	4	o	o	4	o	1o	9	o	o	o	9	7	5	o	51
o	w	o	4	o	o	5	o	11	9	o	o	o	w	7	5	0	53
o	w	o	4	o	o	6	o	11	9	o	o	o	w	7	6	0	55
o	w	o	4	o	o	6	o	11	10	o	o	o	w	8	6	0	57

NOTES

1. Minimum gate opening for shallow and deep gates are reflected.

2. This criteria should be employed when juvenile criteri is not in effect.

3. Mid-range and higher spill have not been provided revised spill configuration gate settings due to limited operation flexibility.

4. Gates 16, 18, 20, 21, 23, 26-28 and 32 are gantry-operat and can only be left fully ope or closed.

5. This criteria is only applicable to lower spill leve (approximately 40,000 cfs or less).

SPILL MANAGEMENT FOR JUVENILE PASSAGE

1. Spill levels, durations, and gate configurations will be set through the FERC process of designated representatives with the agencies and tribes participating in the Mid-Columbia Studies Committee.
2. Spill levels are determined and implemented by fishery agencies designated representatives and Chelan County PUD based on the actual needs of migrants and results of spill studies at Rock Island.
3. Spill will be managed in accord with the October 1984 Agreement.

SPILL MANAGEMENT FOR ADULT PASSAGE

1. All spill not provided for juvenile passage shall be shaped in accordance with the criteria developed by the fishery agencies and tribes.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Spill management requests will be based in part upon dissolved gas monitoring data and the observed condition of migrant juveniles and adults, along with juvenile migrantion monitoring data. Total dissolved gas monitoring during 1985 will be at the Rock Island forebay and reported every four hours from Apirl 1 through August 31. Related data reported at the same time will be spill volume, total project flow, and spill gates open.

During the 1984 monitoring period, total dissolved gas levels at Rock Island forebay ranged from 107 to 122 percent saturation. Spill during the same period, not correlated with dissolved gas occurrences, ranged from zero to 99,900 cfs. No juvenile or adult migrants were observed with nitrogen gas bubble symptoms.

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Left Bank Fishway

Fish Ladder

Water depth over weirs: 1.0 to 1.2 ft.

Entrances

Head: 1.0 to 1.5 feet
Operate two entrances at all times
Weir depth 6 ft. minimum for each (below tailwater)

Transportation Channel (Between Entrances and Ladder)

Transportation velocity: 1 to 4 fps

Trashracks

Visible buildups of debris shall be cleaned immediately from ladder exit and attraction water intake trashracks.

Visible buildups of debris shall be cleaned immediately from picket leads at the counting window.

Staff Gauges & Water Level Indicators

Shall be readable at all water levels encountered during passage periods.

Staff gauges or water level indicators shall be located upstream and downstream from entrances, at a convenient location for viewing along the ladder.

Staff gauge or water level indicators shall be consistent with panel board water surface readings in the counter room.

Middle Fishway

Fish Ladder

Water depth over weirs: 1.0 to 1.2 ft.

Entrances

Head: 1.0 to 1.5 ft.
Main 4 ft. wide entrance to be open continually
Weir depth: 8.5 minimum (below tailwater)
The left 2 ft.-wide side entrance to be fully opened at all times.

Trashracks

Visible buildups of debris shall be cleaned immediately from ladder exit and attraction water intake trashracks.

Visible buildups of debris shall be cleaned immediately from picket leads at the counting window.

Staff Gauges 6 Water Level Indicators

Shall be readable at all water levels encountered during passage periods.

Staff gauges or water level indicators shall be located upstream and downstream from entrances, and at a convenient location for viewing along the ladder.

Staff gauge or water level indicators shall be consistent with panel board water surface readings in the counting room.

Second Powerhouse Fishway

Fish Ladder

Water depth over weirs: 1.0 to 1.2 ft.

Entrances

Head: 1.0 to 1.5 ft.

Wing gates at each entrance allow 3.5 ft. wide opening when fully open. Minimum opening of wing gates shall be 3.0 ft., which occurs when gate deflections are 16 degrees from the fully open position.

At the left powerhouse entrances, LPEl shall be continuously open.

The two right powerhouse entrances (RPEl and PRE2) and the tailrace entrance (TRE) shall be continuously open.High velocity jet at RPE2 shall be operated at and above tailwater elevation 570 (USC+GC). The ball valve (MOV-ROZ) shall be fully open during that time. It is operated from the control room.

Transportation Channel

Transportation velocity: 1 to 4 fps.

Trashracks

Visible buildups of debris shall be cleaned immediately from ladder exit trashrack.

Visible buildups of debris shall be cleaned immediately from picketed leads at the counting window.

Traveling Screens at Auxiliary Water Intake

At least one of two traveling screens will be operating while ladder is operational, and attraction jet at RPE2 is on. Operation of both traveling screens required when attraction water pumps are non-functioning and gravity water must be used. Bypass ports for traveling screens to be checked for debris and to ensure lights operate. Adequate bypass flow to be maintained from bypass pipe in tailrace.

Staff Gauges and Water Level Indicators

Be readable at all water levels encountered during passage periods. Staff gauges or water level indicators shall be located upstream and downstream from entrances, and at a convenient location for viewing along the ladder.

Staff gauges or water level indicators shall be consistent with panel board water surface readings in the counting room.

1985 PROJECT RESEARCH

Research to be conducted in 1985 at Rock Island Dam will be determined by the Mid-Columbia Studies Committee, according to provisions of the Oct. 1984 Settlement Agreement.

FOOTNOTES

[10]1981 and 1982 Rock Island Dam Fish Bypass Study, Chelan County PUD, Forrest Olson, CH_2MHill, April 1983.

[11]Hydroacoustic Assessment of Downstream Migrating Salmon and Steelhead at Rock Island Dam in 1983, DRAFT, BioSonics Inc., Oct. 1983, Chelan PDD.

[12]Preliminary results 1983 fyke net studies.

[13]COFO Annual Report - 1981.

PROJECT DATA

VIII. ROCKY REACH DAM

ROCKY REACH DAM

FISH PASSAGE INFORMATION

JWENILE PASSAGE FACILITIES

Rocky Reach Dam does not currently include juvenile passage facilities. Spill is provided as an alternative to turbine passage. During 1982, twenty percent of the daily average flow was spilled. Spill volume and spill management is determined by Chelan PUD and fishery agencies Mid-Columbia Studies Committee Designated Representatives. Spill is managed according to the Mid-Columbia Settlement and subsequent agreements.

The effectiveness of spill in passing downstream migrants was studied in 1983 utilizing hydroacoustics at Rocky Reach Dam. Preliminary results indicate that for instantaneous and 24 hour daily average, the relationship between fish passed through spill and percent river spilled was below a one-to-one relationship. 40% instantaneous spill passed approximately 25% of the fish through the spillway.

In addition, horizontal and vertical fish distribution data was collected. 80% of the migrants were within 20 feet of the intake ceiling. 80% of the fish passed through the downstream units, 1 through 5. Horizontal distribution appeared constant across the spillway. 14

Chelan County PUD will operate a prototype bypass system, dip gatewells, and provide spill as necessary to achieve a 30% bypass level for spring chinook salmon juveniles passing Rocky Reach Dam. This bypass level reflects the low spill bypass efficiency and accelerated bypass development program at Rocky Reach Dam. Protection of all spring migrants is the intent of these measures, spring chinook will be monitored as the indicator species. Spill up to 10% of the daily average flow will be available if necessary to achieve a 30% bypass efficiency for spring chinook salmon. Juvenile migrant protection will be provided as follows:

1. The prototype travelling screen will operate during the entire migration.
2. Juvenile migrants will be removed from gatewells daily and transported to the Rocky Reach Dam tailrace.
3. During the first five days of the outmigration, the prototype bypass system will be evaluated to determine whether a 30% bypass efficiency for spring chinook is being achieved. Rocky Reach Dam will spill 10% of the daily average flows during the first five days of the outmigration between the hours of 2000 and 0600 to juvenile passage while the prototype is being evaluated.

Chelan County PUD will operate the prototype travelling screen, remove fish from all gatewells daily (based on criteria to be developed by the designated representative), and release them to the river at the Rock Island tailrace, during the summer outmigration period to assess the measure of protection which may be afforded summer migrants through the use of the prototype bypass.

JUVENILE MIGRATION TIMING

Die1 passage data was compiled during 1983 hydroacoustic monitoring. During the study, 57% of the fish passed the projects between 6 am and 8 pm, daylight hours. 43% of the migrants passed during hours of darkness from 8 pm to 6 am.

JUVENILE MIGRATION TIMING

Total Spring Migration	1984	1983[14]	1982[15]	1981[16]
Date of 10% Past Project		4/23	4/25	4/26
Date of 90% Past Project		5/17	5/21	5/30

ADULT PASSAGE FACILITIES

The adult passage facilities at Rocky Reach Dam consist of a fishway on the powerhouse side with right and left powerhouse entrances, a powerhouse collection channel, a spillway collection channel and a main spillway entrance. The left powerhouse entrance is located at mid-dam between the powerhouse and spillway. The fishway includes a counting station on the right bank, The system includes pumped and auxiliary water supplies.

ADULT MIGRATION TIMING

For operation and maintenance purposes, the primary fish passage season is considered to be April through November. Primary passage periods by species are:

Spring Chinook	April - June 19
Summer Chinook	June 20 - August 19
Fall Chinook	August 20 - November
Coho	August - November
Sockeye	June - October
Steelhead	April - November

ROCKY REACH DAM

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operation, which is included as Appendix A. This water budget implementation plan was developed and endorsed by all parties, including the fishery agencies and tribes, for use on a trial basis during 1985.

The Water Budget Managers will specify the start of the flow augmentation period. The operating week is defined as Monday through Sunday. Five-day weekday flow averages requested, measured at Priest Rapids Dam, will not exceed the following:

(1) 120 kcfs from April 15 - 28
(2) 130 kcfs from April 19 - May 5
(3) 140 kcfs from May 6 to the end of 45 days from the beginning of flow augmentation.

Weekend flows at Priest Rapids Dam, including the three-day Memorial Day weekend, will not average less than 80% of the average flow for the preivous five weekdays. The average of the four weekdays following Memorial Day will be used to establish the average flow for the following weekend.

SPILL MANAGEMENT FOR JUVENILE PASSAGE

Spill will be managed by the mid-Columbia designated representatives according to the October 1984 Settlement Agreement.

1. Rocky Reach Dam will spill 10% of the daily average flows during the first five days of the outmigration between the hours of 2000 and 0600 to aid juvenile passage while the prototype is being evaluated.
2. If the agreed upon bypass level for spring chinook is being achieved by operation of the prototype and gatewell dipping, spill will be discontinued.
3. If the prototype and gatewell dipping are not achieving the agreed upon bypass level for spring chinook, then spill will be provided for the remaining 25 days at the rate necessary (not to exceed 10% of the daily average flow) to achieve the agreed upon bypass level.
4. In the event of mechanical failure or other unforeseen events Rocky Reach Dam will spill 10% of the daily average flow at any time, during the spring outmigration that the prototype bypass system.18 not operating. This does not include temporary shutdowns required to conduct the evaluation program.

SPILL MANAGEMENT FOR ADULT PASSAGE

1. Spill not provided for juvenile passage will be shaped to avoid delay of upstream migrants according to agencies, tribes, and PUD agreement.
2. Spill shaping requests are based on the tribes and agencies objective of achieving 100% passage efficiency without delay.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Spill management requests will be based in part upon dissolved gas monitoring data and the observed condition of migrant juveniles and adults, along with juvenile migration monitoring data. Total dissolved gas monitoring during 1985 will be at the Rocky Reach forebay and reported every four hours from April 1 through August 31. Related data reported at the same time will be spill volume, total project flow, and spill gates open.

Trial Spilling Shedale for Rocky Reach Dam, 1985 (Openings in feet)

Gate Number												
1	2	3	4	5	6	7	8	9	10	11	12	Total
					(1)		1					
					(2)		2					
	(1)		1		2		2					
	(2)		2		2		2					
	2		2	(1)	2	1	2					10
	2	(1)	2	1	2	2	2					
	2	(2)	2	2	2	2	2					
	2	2	2	3	(3)	2	2					
	2	2	3	3	3	(3)	2					
	2	2	3	(4)	3	3	3					20
	2	(3)	3	4	4	3	3					
	2	3	4	(5)	4	3	3					
	2	3	4	5	4	4	(4)					
	2	3	5	5	(5)	4	4					
	2	3	5	(6)	5	5	4					30
	2	3	5	6	(6)	5	5					
	2	4	5	6	(7)	5	5					
	2	4	6	6	7	(6)	5					
	2	4	6	6	(8)	6	6					
	2	4	6	7	8	(7)	6					40
	2	5	(7)	7	8	7	6					
	2	5	7	7	9	(8)	6					
	2	5	(8)	8	9	8	6					
	(3)	5	8	9	9	8	6					
	3	6	8	9	(10)	8	6					50
	3	6	8	10	10	(9)	6					
	3	6	9	10	(11)	9	6					
	3	(7)	9	11	11	9	6					
	3	7	10	11	11	(10)	6					
	3	7	11	(12)	11	10	6					60

Circled values indicate opening one foot less than value.
For example:

(1) means 0 or 1 foot opening.
(2) means 1 or 2 foot opening.
(3) means 2 or 3 foot opening.

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fish Ladder

Water depth over weirs: 1.0 to 1.2 ft.

Transportation Channel (Between Entrances and Ladder)

Transportation velocity: 1 to 4 fps

Entrances

General: Head 1.0 ft. minimum
Right Powerhouse Entrance (RPE): Rotary gate openings at RPEl and RPE2 shall be fully open.

- Left Powerhouse Entrance (LPE):
LPEl and LPE3 shall be continuously open
Submerged weir crest elevation for the following tailwater elevations shall be at or below

Tailwater El.	Submerged Weir Crest El.
615.0	**603.5**
620.0	**606.5**
625.0	**608.8**

- Orifice Entrances (CC's)

The following 6 orifice entrance shall be open: CCL-CC3, CC16, CC18, **CC20**
- Main Spillway Entrance (MSE)

One gate permanently closed
One gate permanently open
Submerged weir crest elevations for the following tailwater elevations shall be at or below:

Tailwater El.	Crest El.
Below 621.5	**604.5**
625	**605.3**

Turbine No. 11 Operation

Turbine No. 11 loading will be reduced or discontinued completely during daylight hours from May 1 through October 30 of each year, during periods when the powerhouse is not fully loaded. This will improve adult passage at the left powerhouse entrances.

Trashracks

Visible buildups of debris shall be removed immediately from ladder exit and attraction water intake trashracks.

Visible buildups of debris shall be cleaned immediately from picket leads at the counting window.

Staff Gauges & Water Level Indicators

Shall be readable at all water levels encountered during passage periods.

Staff gauges or water level indicator6 shall be located upstream and downstream from entrances, and at a convenient location for viewing along the ladder.

Staff gauges or water level indicators shall be consistent with panel board water surface readings in the fishway room.

Water level indicators shall be maintained such that they are in continuous operation.

1985 PROJECT RESEARCH

Research to be conducted in 1985 at Rocky Reach Dam will be developed by the Mid-Columbia Studies Committee, according to provisions of the Oct. 1984 Settlement Agreement.

FOOTNOTES

[14]Hydroacoustic Assessment of Downstream Migrating Salmon and Steelhead at Rocky Reach Dam in 1983, DRAFT, BioSonics Inc., Chelan PUD, 1983.

[15]COFO Annual Report - 1982

[16]COFO Annual Report - 1981

PROJECT DATA

IX. WELLS DAM

WELLS DAM

FISH PASSAGE INFORMATION

JUVENILE PASSAGE FACILITIES

Wells Dam does not include specific juvenile passage facilities. Presently, spill is the only passage alternative to turbine passage. During 1982, twenty percent of the daily average flow was provided as spill according to the terms of the Mid-Columbia Settlement Agreement and subsequent FERC orders.

Presently, there are no quantitative estimates for spillway passage efficiency at Wells Dam. However, there are some indications from studies that spillway passage may be effective at Wells Dam. Studies are being conducted to maximize efficiency of spillway passage at Wells. This includes assessment of some structural facilities.

During 1983 and 1984, hydroacoustics was utilized at Wells Dam to determine fish distribution, monitor timing, and to evaluate structural facilities to improve spill passage effectiveness.[17] Preliminary results of this study indicate that the spillway modifications were more effective at higher spill levels.

Vertical distribution was deeper at night than during the day. Horizontal distribution at Wells is a function of powerhouse and spillway flow. Fish concentrated passage in units with the most flow.

Douglas County PUD will provide spill during 1985 according to the provisions of the October 1984 Settlement Agreement to provide juvenile passage protection as agreed.

Douglas County PUD will evaluate the bypass efficiency of enhanced spill during the peak summer migrant period using the most effective bypass configuration and operational regimes determined from spring bypass studies. The evaluation will be designed by and conducted under the auspices of the Mid-Columbia Studies Committee. The evaluation will include a comparison of day and night bypass efficiencies.

JWENILE MIGRATION TIMING

The downstream migration at Wells Dam is comprised primarily of spring chinook, sockeye, steelhead, and summer chinook. Downstream migrants have been monitored with hydroacoustics during 1982 and 1983, Species composition cannot be determined by hydroacoustic monitoring, Concurrent purse seine sampling indicated that the early portion of the migration consisted primarily of spring chinook with steelhead, sockeye, and summer chinook making up the remainder of the spring and summer migration. In 1983, passage increased sharply on April 19 with peak passage occurring on April 23. This peak was comprised primarily of Winthrop spring chinook. Between April 23 and May 23 the migration was composed primarily of wild sockeye from the Okanogan River and steelhead releases.

WELLS DAM

JUVENILE MIGRATION TIMING

Total Spring Migration	1984	1983	1982
Date of 10% past project		4/20	4/16
Date of 90% past project		5/21	5/21

Source: Hydroacoustic Monitoring of Downstream Migrant Salmon and Steelhead at Wells Dam, 1983, and 1982, BioSonics Inc.

There was no clear Die1 passage pattern at Wells Dam in 1983. Brief decreases in passage rates occurred at dawn and dusk.

ADULT PASSAGE FACILITIES

The adult passage facilities at Wells Dam consist of left and right bank facilities. The two facilities are identical with the exception of a trapping facility on the right bank. Each fishway includes a main side entrance and a downstream entrance, a fish ladder, an auxiliary water system, a collection channel, and an exit system.

ADULT MIGRATION TIMING

For the purpose of operation and maintenance, the primary adult passage period is considered to be May through November. Primary passage periods for each species at Wells dam are:

Spring Chinook	May l-June 28
Summer Chinook	June 29-August 28
Fall Chinook	August 29-November
Steelhead	May-November
Sockeye	June-October
Coho	October-November

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operation which is included as Appendix A. This water budge; implementation plan was developed and endorsed by all parties, including the fishery agencies and tribes, for use on a trial basis during 1985.

The Water Budget Managers will specify the start of the flow augmentation period. The operating week is defined as Monday through Sunday. Five day weekday flow averages requested, measured at Priest Rapids Dam, will not exceed the following:

(1) 120 kcfs from April 15 - 28
(2) 130 kcfs from April 29 - May 5
(3) 140 kcfs from May 6 to the end of 45 days from the beginning of flow augmentation.

Weekend flows at Priest Rapids Dam, including the three-day Memorial Day weekend, will not average less than 80% of the average flow for the previous five weekdays. The average of the four weekdays following Memorial Day will be used to establish the average flow for the following weekend.

SPILL MANAGEMENT FOR JUVENILE PASSAGE

Spill will be managed by the designated representatives according to the terms of the October 1984 Settlement Agreement.

1. Douglas County PUD will provide up to 30% of the instantaneous flow at Wells Dam as spill for the hours necessary each day to achieve a 50% bypass efficiency during the spring out-migration period.
2. During the first five days of the juvenile outmigration, an evaluation will be conducted of the measure of bypass efficiency provided by spilling 21% of the instantaneous flow.
   a. If the agreed upon level of bypass efficiency is achieved spill will continue for the remaining 25 days at 21% of the instantaneous flow for the hours necessary each day to achieve at least 50% bypass efficiency. An evaluation of migration timing will be conducted to establish criteria for the possible extension of the spill period up to a total of 44 days.
   b. If the agreed upon bypass level is not achieved spill will be increased to 30% of instantaneous flow for the hour6 necessary to achieve a 50% bypass efficiency for the remaining 25 days. An evaluation of migration timing will be conducted to establish criteria for the possible extension of the spill period up to a total of 44 days.

SPILL MANAGEMENT FOR ADULT PASSAGE

Spill will be managed according to the following agreed upon operating criteria.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Spill management requests will be based in part upon dissolved gas monitoring data and the observed condition of migrant juveniles and adults, along with juvenile migration monitoring data. Total dissolved gas monitoring during 1985 will be at the Wells forebay and reported every four hours from April 1 through August 31. Related data reported at the same time will be spill volume, total project flow, and spill gates open.

Three automated dissolved gas monitoring stations are located upstream from Wells Dam. These are the Chief Joseph forebay, which is the head of adult migration, another located Six miles downstream form Grand Coulee Dam, and one at the international boundary which measures total dissolved gas entering Lake Roosevelt. These stations record hourly but will be reported in four hour blocks to maintain consistency with the non-automated stations, It is intended, however, to start the 1985 reporting from the automated stations during the first week of March and continue through September to give additional coverage at each end of the migration period in case runoff and migration varies form normal.

WELLS DAM

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Operating standards for adult passage facilities agreed upon by agencies, tribes, and Doug166 County PUD are described in the following section.

Fish Ladders

Water depth over weirs: 1.0 to 1.2 ft.

Entrances

Head: 1.5 ft.

Gate Settings:

March 1 – November 30	Side Wing Gate	End Wing Gate
Spill less than 80,000 cfs	4 ft.	6 ft.
Spill greater than 80,000 cfs	Closed	8 ft.

Low level fixed orifice entrance to be open whenever side gate is closed.

December 1 – February 28

Side and end gates open 2 ft.
Gate settings to be open to March 1 – November 30 widths one day per week for a 24-hour period.

Attraction Jets:

The jets are located in a vertical line immediately upstream of the side wing gates.
The lower jet (30-inch diameter) should operate only when the low level fixed orifice entrance is open.
The three 24-inch diameter jets should each be discharging when tailwater reaches that level. They are at elevations 700, 708 and 717.

Staff Gauge and Water Level Indicator6

Shall be located upstream and downstream of all entrances, and at convenient locations for viewing along the ladder.
Shall be located upstream and downstream of the fishway exit trashrack.
Shall be readable at all water levels - shall be kept clean.
Shall be checked again& panel board water surface readings to, insure proper adjustment of water level sensing equipment.

Trashracks

- Visible buildups of debris shall be cleaned immediately from picketed leads near the counting stations, and from trashracks at the fishway exits.
- The staff gauge upstream and downstream of the fishway exit trashrack shall be monitored for water surface differential, which will reflect buildup on the submerged trashrack. The trashrack shall be cleaned immediately if the differential reading is greater than 0.3 ft.

1985 PROJECT RESEARCH

Research to be conducted at Wells Dam will be developed by the Mid-Columbia Studies Committee, according to provisions of the Oct. 1984 Settlement Agreement,

FOOTNOTES

[17]Hydroacoustic Monitoring and Distribution of Downstream Migrant Salmonids and the Evaluation of the Prototype Bypass System at Wells Dam in Spring 1983 - DRAFT - BioSonics, 1983.

PROJECT DATA

X. ICE HARBOR DAM

ICE HARBOR DAM

FISH PASSAGE INFORMATION

The locations of fish passage facilities are shown on the following General Site Plan for Ice Harbor Lock and Dam.

JUVENILE PASSAGE FACILITIES

The juvenile passage facilities at Ice Harbor consist of an orifice system from the gatewells to the ice and trash sluiceway. There are no guidance devices in place. Fish must enter the system on their own volition. The orifice/sluiceway system only affects those fish which find their way into the gatewells from the turbine intakes, since there are no turbine intake screens.

The collection efficiency of this system has not been determined but is believed to be low, especially during sluiceway operation. Studies at Ice Harbor, Rock Island, John Day and Bonneville I indicate that less than 15% of fish approaching a powerhouse enter gatewells when there is no guidance device in place.

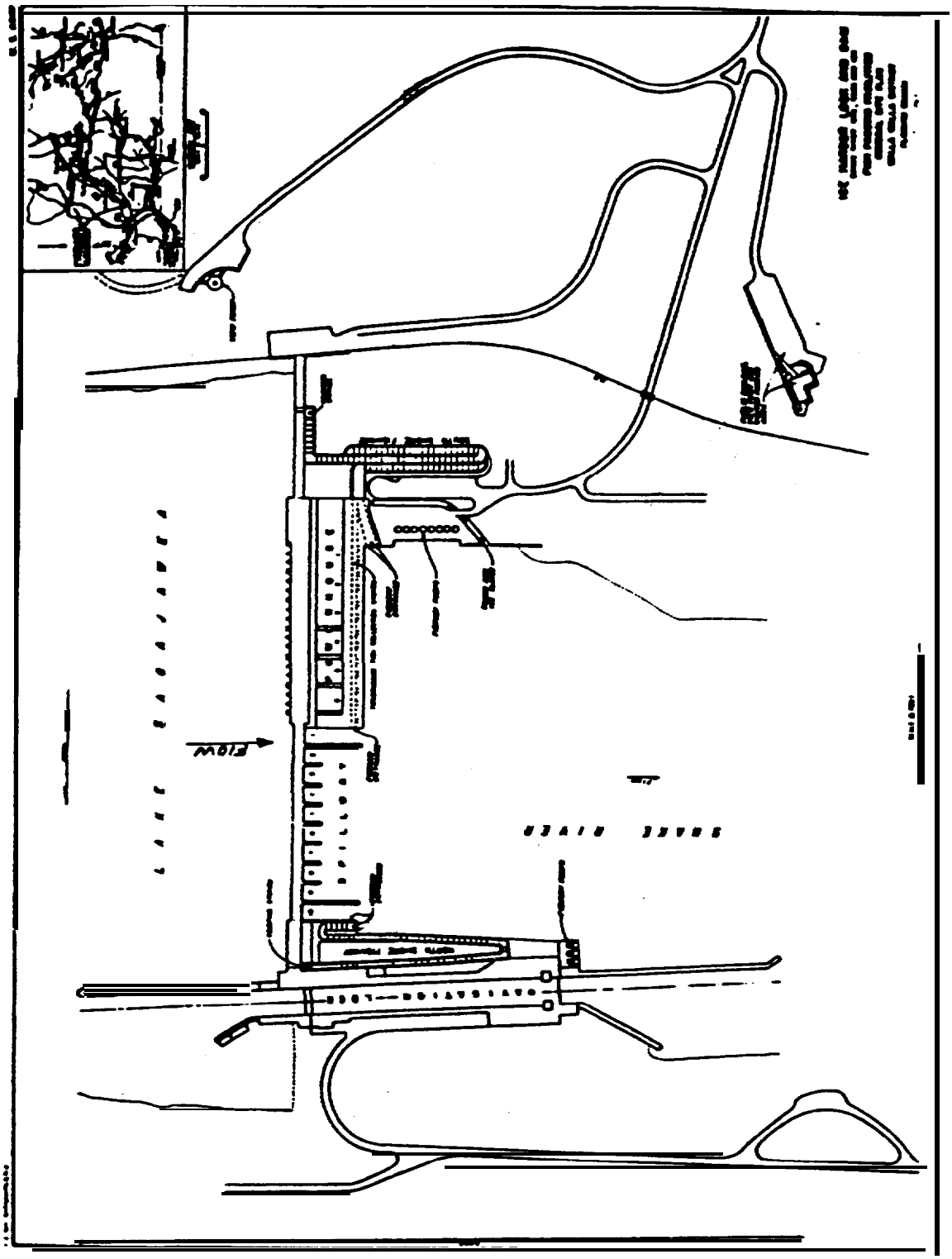
Spill has been provided in some years as an alternative to turbine passage.

The ice and trash sluiceway has received consideration as a primary means of bypass. The ice and trash sluiceway was studied in 1982 and 1983 to estimate passage efficiency. Hydroacoustics were used to determine fish passage through the sluiceway under various operating conditions. During 1982, approximately 24% of the salmonids approaching the powerhouse were estimated to have passed through the sluiceway. Sluiceway efficiency seemed to be related to turbine operations more than to sluiceway flow.[17] Preliminary results of the 1983 study indicate that the sluiceway operated at about 50 percent efficiency.

JUVENILE MIGRATION TIMING

Maintenance of juvenile fish facilities is scheduled for the period between September and March to minimize impact on downstream migrants.

The following table shows dates of 10% and 90% passage. Data from 1964-1968 was compiled from gatewell dipping during the completion of the Snake River projects. The 1982 monitoring dates are from hydroacoustic monitoring.



ICE HARBOR DAM

JUVENILE MIGRATION TIMING [18]

1964-1968	Yearling Chinook	Steelhead
Earliest date of 10% past project ,	4/10/65	4/20/65
Average date of 10% past project	4/15	5/5
Latest date of 10% past project	4/16/66	5/6/66

	Yearling Chinook	Steelhead
Earliest date of 90% past project	5/25/64	5/25/64
Average date of 90% past project	5/30	5/30
Latest date or 90% past project	6/5/66	6/5/66

*no date on sub-yearlings

During 1982, 10% of the total spring migration passed the project by April 28. 90 percent of the total spring migration passed the project by May 22.

Die1 and seasonal trends appeared in the 1982 hydroacoustic monitoring data. The sluiceway passed more fish during the day than during the night. The sluiceway passed fewer fish as the season progressed.

ADULT PASSAGE FACILITIES

Adult fish facilities at Ice Harbor include north and south shore facilities. The north shore facility includes a fish ladder, a counting station, a collection system, and a pumped auxiliary water supply. The south shore facility includes a fish ladder, a counting station, two south shore entrances, a powerhouse collection system, and a pumped auxiliary water supply.

ADULT MIGRATION TIMING

Migrants are present at Ice Harbor year around. The maintenance of adult passage facilities is scheduled for the period of January through February to minimize impact on adult migrants. The following table shows primary passage period for each species and shows earliest and latest date of peak passage on record from fish count data compiled by the Corps of Engineers.

ICE HARBOR DAM

ADULT MIGRATION TIMING
FROM FISH COUNTS 1962-1982

SPECIES	PASSAGE PERIOD	EARLIEST PEAR	LATEST PEAR
Spring Chinook	3/ - 6/11	4/24	5/26
Summer Chinook	6/12-8/10	6/12	7/23
Fall Chinook	8/11-10/31	9/8	9/27
Coho	8/ - lO/	9/8	9/27
Sockeye	6/ - lO/	7/l	9/22
Steelhead	3/ - 10/	9/6	10/7

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operations which is included as Appendix A. This water budget implementation plan was developed and endorsed by all parties, including the fishery agencies and tribes, for use on a trial basis during 1985.

The March 1 forecast for Lower Granite is 25.1 MAF for the April - July period, which is 113% of normal. This large runoff forecast has cuased the evacuation of both Brownlee and Dworshak reservoirs for flood control. Because of this flood control operation, there will be no water in storage for water budget. Fishery flows for 1985 will be provided by natural runoff which are projected to average over 100 kcfs during the April 15 to June 15 periods. The COE will maintain daily average flows at or above 85 kcfs, except when constrained by flood control operations.

SPILL MANAGEMENT FOR JUVENILE PASSAGE

1. Spill will be provided based upon the actual needs of juvenile migrants. As noted earlier, the majority of downstream migrants pass this project from April 1 through August 31.
2. The passage efficiency of the sluiceway is estimated to be in the range of 24 - 50 percent (see following chart) and most of the fish pass through the sluiceway during daylight hours.
3. Spill will be managed according to the Interim Spill Plan for 1985, starting on page 5 of the DFOP. Substantial spill will be required during the passage period. Generally, minimum powerhouse loading with the remainder as spill will be requested. Other problems may supercede this request such as high concentrations of dissolved gas, poor adult passage, or extreme low flows.

ICE HARBOR DAM

SPILL MANAGEMENT FOR ADULT PASSAGE

1. When spill occurs during the daytime hours that spill shall be shaped in accordance with the criteria established by the agencies and tribes.
2. Spill requests for adults will be based upon the agencies and tribes objective of obtaining 100 percent passage efficiency unimpeded, at this project.
3. The following current spill schedule shall be followed during the spill period. This schedule was developed through studies funded by the COE and conducted by Oregon Department of Fish and Wildlife and agreed upon by fishery agency and with review of tribal representatives.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Spill management requests will be based in part upon dissolved gas monitoring data and the observed- condition of migrant juveniles and adults, along with juvenile migration monitoring data. Total dissolved gas monitoring during 1985 will be at the Ice Harbor forebay and reported every four hours from April 1 through August 31. Related data reported at the same time will be spill volume, total project flow, and spill gates open.

During the 1984 monitoring period, total dissolved gas at Ice Harbor forebay ranged from 99 to 138 percent saturation. Spill during the same period, not correlated with dissolved gas occurrences, ranged from zero to 185,900.

Ice Harbor Dam Smolt Passage

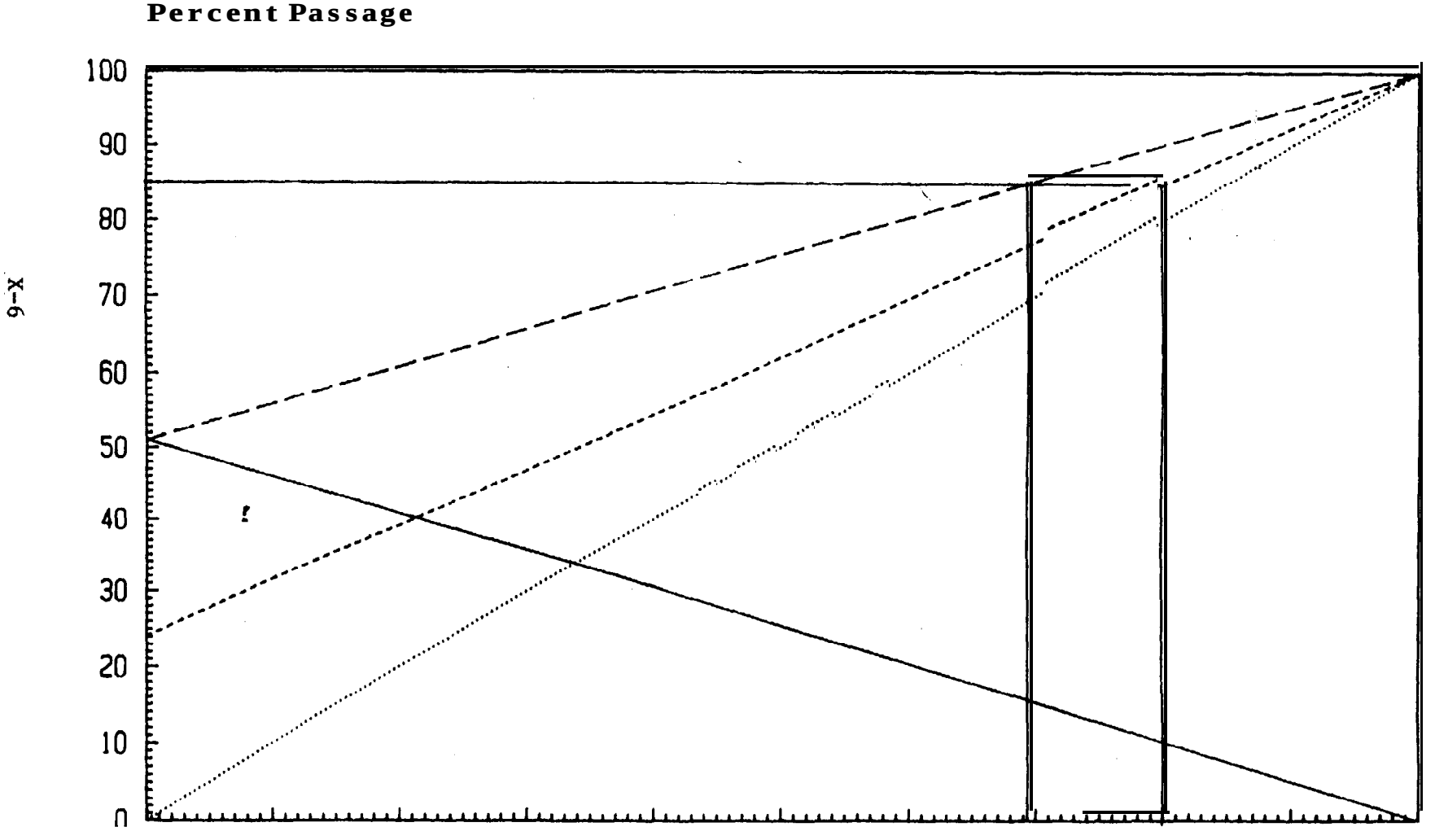
All Species Composite 1982-83

1983 11.76 Passage

1983 Total Bypass

1982 Total Bypass

1983 Spill Passage



Tentative Spilling Schedule at Ice Harbor Dam Adjusted for Expanded Powerhouse in 1976 (Openings in feet). 2/

Gate Number										
1	2	3	4	5	6	7	8	9	10	Total
(1)									1.5	
1	(1)							1	1.5	
1	1	(1)					1	1	1.5	
1	(2)	1					1	2	1.5	
1	2	1	(1)			1	1	2	1.5	10.5
1	2	1	1	(1)	1	1	1	2	1.5	
1	2	(2)	1	1	1	1	2	2	1.5	
1	2	2	(2)	1	1	2	2	2	1.5	
1	2	2	2	(2)	2	2	2	2	1.5	
1	2	2	2	(3)	3	2	2	2	1.5	20.5
1	2	2	(3)	3	3	3	2	2	1.5	
1	2	(3)	3	3	3	3	3	2	1.5	
1	2	3	3	(4)	4	3	3	2	1.5	
1	2	3	3	4	4	4	3	2	1.5	
1	2	3	3	(5)	5	4	3	2	1.5	30.5
1	2	3	(4)	5	5	4	3	3	1.5	
1	(3)	3	5	5	5	4	3	3	1.5	
1	3	(4)	5	6	5	4	3	3	1.5	
(2)	3	4	(6)	6	5	4	4	3	1.5	
2	3	4	6	6	(6)	5	4	3	1.5	40.5
2	3	(5)	6	6	6	5	4	3	1.5	
2	3	5	6	(7)	6	5	5	3	1.5	
2	3	5	(7)	7	6	6	5	3	1.5	
2	3	(6)	7	8	6	6	5	3	1.5	
2	(4)	6	7	8	6	6	5	4	1.5	50
2	4	6	7	8	(7)	7	5	4	2	
2	4	6	(8)	8	7	7	6	4	2	
2	4	6	8	(9)	8	7	6	4	2	
2	4	(7)	8	9	9	7	6	4	2	
2	4	7	(9)	10	9	7	6	4	2	60
2	4	7	(10)	10	9	8	6	4	2	
2	4	7	10	11	9	8	(7)	4	2	
2	4	7	(11)	11	10	8	7	4	2	
2	4	(8)	11	12	10	8	7	4	2	
2	4	8	11	13	10	(9)	7	4	2	7 0

1/ Circled values may be 1 foot less than values shown. For example: 1 means 0 or 1 foot. 2 means 1 or 2 feet.

2/ Each foot of opening equals about 1.7 kcfs at forebay elevation 439.0.

3/ Reviewed January 1985.

OPERATING STANDARDS FOR JUVENILE PASSAGE FACILITIES

Revised January 1984

Note: Operating criteria for several years will be subject to some modifications and exceptions due to ongoing research studies.

Prior to April 1 each year

Remove debris from forebay and gatewell slots.

Rake trash racks.

Inspect and clean orifices of debris. Video inspection permitted.

Test that chain gates are operational.

Run gates on manual and automatic operation.

April 1 to September 1 (passage period)

Remove debris from forebay.

Remove debris from trashracks as required to maintain less than 1 foot of additional drawdown in gateslots. Additional raking may be required when heavy debris loads are present in the river.

Inspect orifices daily and clean as required.

Inspect gatewell slots twice a week and clean as required.

Operate chain gates, lA, 2A, 3A, 4A, 5A, 6A at maximum flows allowed by sluiceway capacity. Operate for 24 h per day. Operate forebay level whenever possible above elevation 439.

Maintenance

Record all maintenance and inspections.

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

Velocity head range 1/: . 1.0 to 1.5 feet

North Shore Entrance (NEW 1)

Operate downstream gate closest to shore.
Weir depth: 8 feet or greater.

North Powerhouse Entrance (NFE 1 & 2)

Operate 2 downstream gate.
Weir depth: 8 feet or greater, tailwater elevation permitting.

Powerhouse Collection System

Operate 7 floating orifices, O.G. numbers 1, 2, 4, 6, 8, 10 and 12.

South Shore Entrance (SFEW-1)

Operate entrance closest to powerhouse.
Weir depth: 8 feet or greater.

Transportation Velocity

1 to 4 feet per second.

Head on Trashracks

Maximum head of 0.8 feet on ladder exits attraction water intakes.
Maximum head on picketed leads shall be 0.2 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be: 1, 2, 3, 4, (5 or 6 in either order).

1985 PROJECT RESEARCH

There is no research planned for 1985.

FOOTNOTES

[17]USA CoE, NPD, Fish Passage Development and Evaluation Program, Annual Progress Report, 1982.

[18]Progress Report, Evaluation of Fish Protection Facilities at Little Goose Dam and Review of Other Studies Relating to Protection of Juvenile Salmonids in Columbia and Snake River, 1972, Ebel et al,, 1972, NMFS.

[19]Head as used in these criteria refers in some cases to effective head and in others to velocity head and will be so designated for specific entrances. The conventional method of measuring the entrance velocity (velocity head) is with head differential gauges (still gauges or elaborate mechanical gauges). These gauges indicate only the velocity created between them (velocity head) and do not include any velocity that may be upstream from gauges (velocity of approach). Effective entrance velocity (effective head) includes both velocities since their sum is the velocity that the fish encounter when entering the fishway. At entrances with relatively wide entrance pools, there is no appreciable velocity of approach. Where width of entrance pool is close to the width of the entrance, the velocity of approach may be considerable. This velocity must be added to velocity developed from entrance gauge readings. The sum of these velocities is the effective entrance velocity; i.e., the velocity that the fish encounter when entering the entrance. This concept applies to overflow weirs, vertical slots or orifice type entrances.

PROJECT DATA

XI. LOWER MONUMENTAL DAM

FISH PASSAGE INFORMATION

The locations of fish passage facilities are shown on the following General Site Plan for Lower Monumental Lock and Dam.

JUVENILE PASSAGE FACILITIES

The juvenile fish facilities at Lower Monumental Dam are comprised of a closed pipe conduit adjacent to the intake gatewells extending from turbine unit 1 through 6. Each gatewell slot contains one orifice to provide a passage way from the gatewell to the bypass pipe. The bypass pipe discharges downstream of Turbine unit 6. There has been no estimate of collection efficiency or of fish injury rates, but the system is considered to be relatively ineffective and is available only to those fish volitionally entering the gatewells.

Spill is the only alternative to turbine passage for downstream migrants. At other projects, spill passage efficiency has been found to be roughly proportional to percentage of river flow spilled (see following figure).

JUVENILE MIGRATION TIMING

During 1985, hydroacoustic monitoring will be conducted at Lower Monumental Dam as part of the Water Budget Center Smolt Monitoring Program. This will begin to provide data on migration timing, horizontal distribution, vertical distribution and die1 passage patterns.

Maintenance of juvenile passage facilities is scheduled to be completed during September through March to minimize the impact on downstream migrants. Juvenile sampling has not been carried out at Lower Monumental.

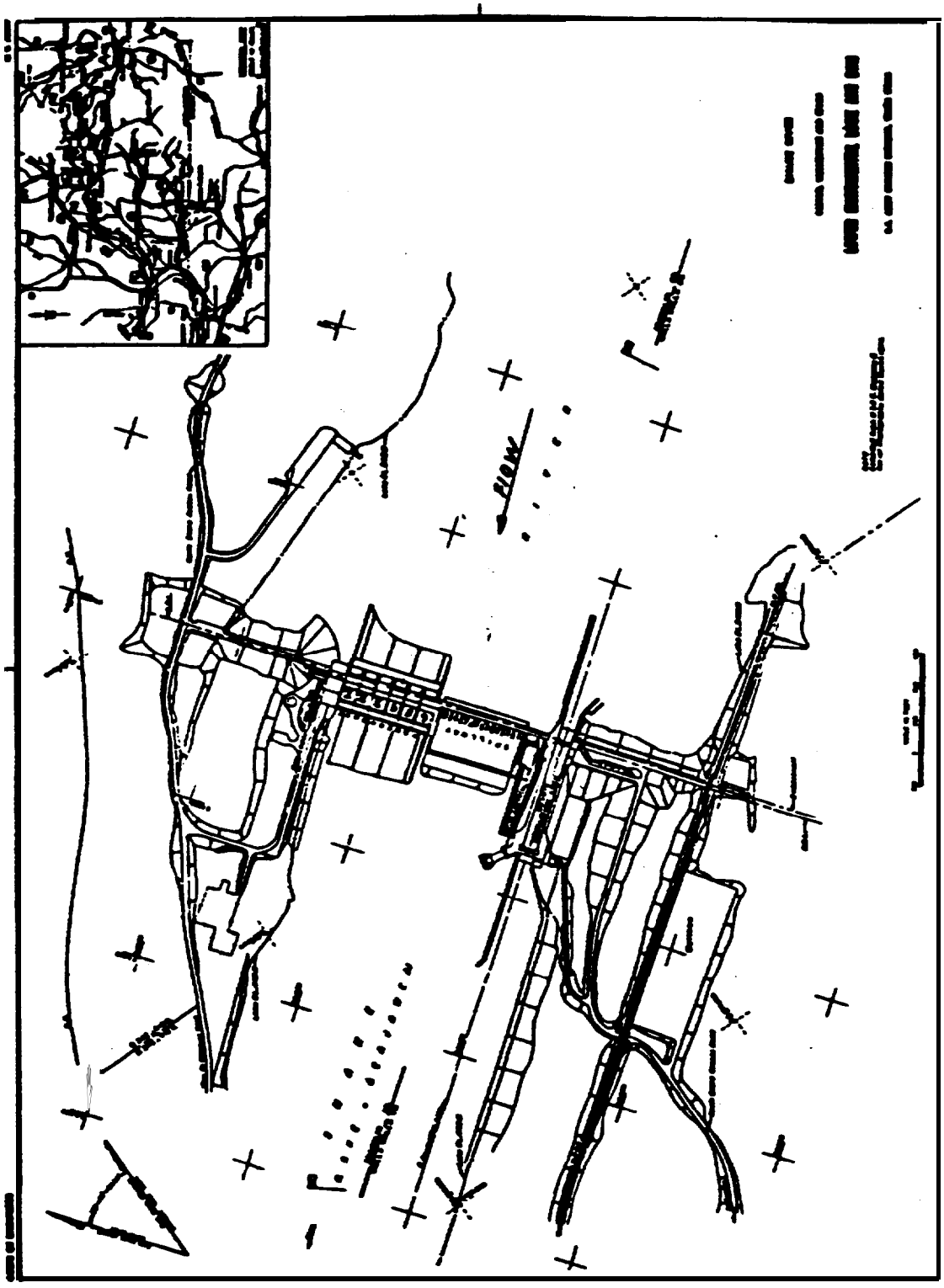
ADULT PASSAGE FACILITIES

The adult passage facilities at Lower Monumental consist of north shore and south shore facilities. The north shore facilities include two north shore entrances and the powerhouse collection system. The powerhouse collection facility includes two downstream and one side entrance, ten floating orifices, and a common transportation channel. Attraction water is provided by turbine driven pumps. The south shore fish ladder has two downstream entrances and one side entrance from the spillway basin, with attraction water pumped from the tailrace.

ADULT MIGRATION TIMING

Upstream migrants are present at Lower Monumental year around. Maintenance of adult fish facilities is scheduled from January through February to minimize the impact on upstream migrants.

The following table shows the primary passage periods by species and shows the latest and earliest recorded dates of peak passage from fish count records compiled by the CoE.



ADULT MIGRATION TIMING

FROM 1969-1982

SPECIES	PASSAGE PERIOD	EARLIEST PEAR	LATEST PEAK
Spring Chinook	4/ - 6/13	4/20	5/27
Summer Chinook	6/14 - 8/13	6/14	7/12
Fall Chinook	8/13 - l0/31	9/14	9/30
Steelhead	4/ - l0/ .	9/16	10/10
Sockeye	6	6/24	7/19
Coho	8/ - l0/	9/12	10/7

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operations which is included as Appendix A. This water budget implementation plan was developed and endorsed by all parties, including the fishery agencies and tribes, for use on a trial basis during 1985.

The March 1 forecast for Lower Granite is 25.1 MAF for the April - July period, which is 113% of normal. This large runoff forecast has cuased the evacuation of both Brownlee and Dworshak reservoirs for flood control. Because of this flood control operation, there will be no water in storage for water budget. Fishery flows for 1985 will be provided by natural runoff which are projected to average over 100 kcfs during the April 15 to June 15 periods. The COE will maintain daily average flows at or above 85 kcfs, except when constrained by flood control operations.

SPILL MANAGEMENT FOR JUVENILE PASSAGE

1. Spill will be requested based upon the actual needs of juvenile migrants. The downstream passage period for this project is considered to be from April 1 through August 31.
2. There are no effective bypass facilities at the Lower Monumental project.
   To obtain the agencies and tribes objective of 85 percent bypass efficiency, spill will be required. Spill effectiveness has not been investigated at Lower Monumental Dam. Spill will be managed according to the Interim Spill Plan for 1985, starting on page 5 of this DFOP.

SPILL MANAGEMENT FOR ADULT PASSAGE

1. When spill occurs during the daytime hours, that spill shall be shaped in accordance with the criteria established by the tribes and agencies.
2. The primary objective of fishery agencies and tribes is to provide 100 percent upstream passage efficiency, without delay of upstream migrants, for all migrants throughout the year.
3. The following table indicates some preferred spill patterns suggested with a six turbine powerhouse and with the existing deflectors in spill bays 2 through 7. The table was developed from model studies at Bonneville Hydraulic Lab and needs to be verified or modified by observation in prototype when all turbine units are on the line and spill is available.

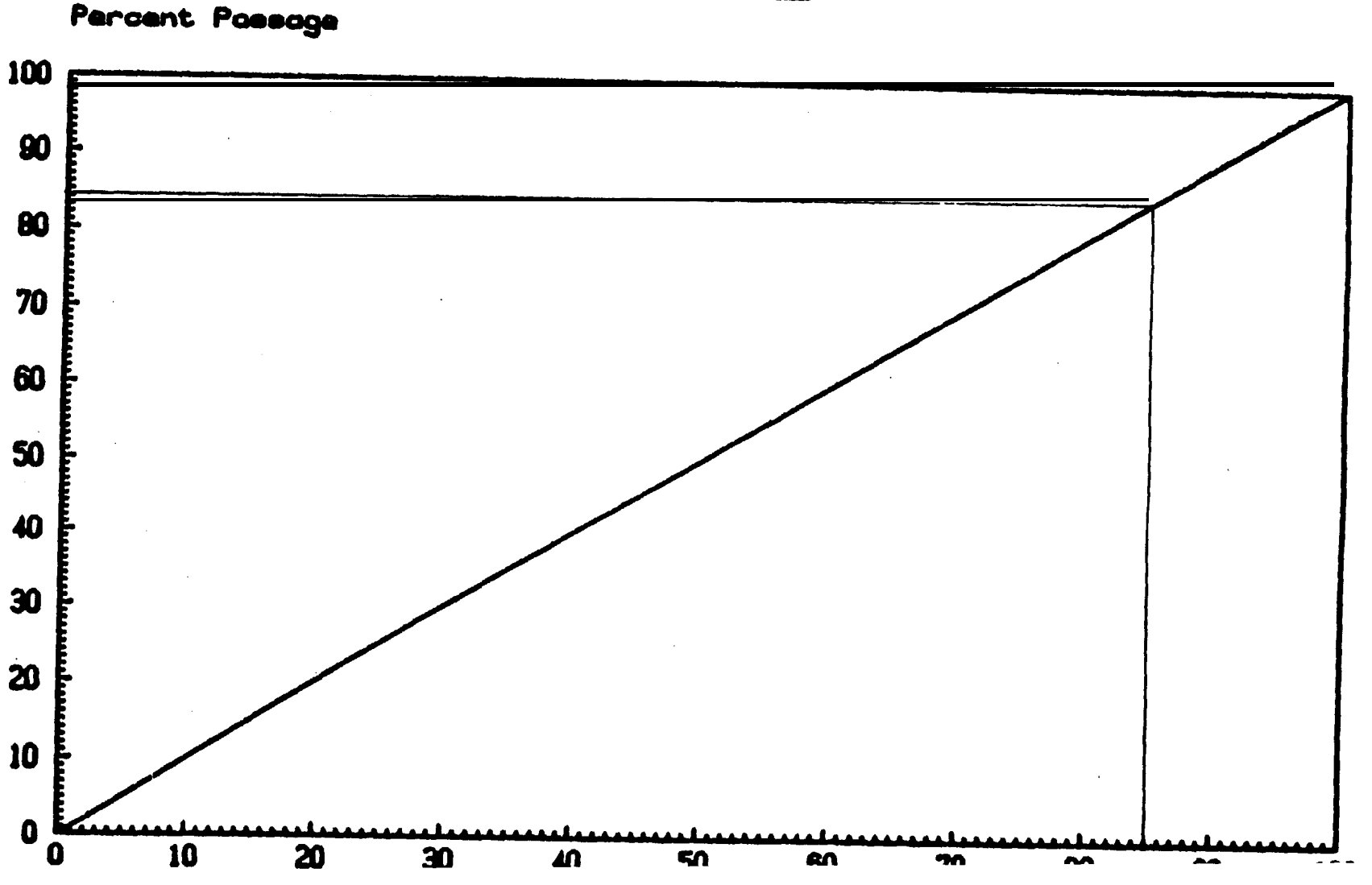
SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Dissolved gas is not monitoring at Lower Monumental. Spill management requests will be based upon total dissolved gas monitoring at Little Goose, the next upstream project, and upon the observed condition of migrant juveniles and adults at Lower Monumental along with juvenile migration monitoring data.

Lower Monumental Smolt Passage

Chinook and Steelhead

Total Spill
% Bypass



LOWER MONUMENTAL SPILL PATTERN

Gate numbers								Total	
1	2	3	4	5	6	7	8	stops	K
1								1	
1							1	2	
1	1						1	3	
1	1					1	1	4	
2	1					1	1	5	
2	1					1	2	6	
2	1	1				1	2	7	
2	1	1			1	1	2	8	1
2	1	1	1		1	1	2	9	1
2	1	1	1	1	1	1	2	10	1
2	1	2	1	1	1	1	2	11	1
2	1	2	1	1	2	1	2	12	1
2	1	2	2	1	2	1	2	13	1
2	1	2	2	2	2	1	2	14	1
3	1	2	2	2	2	1	2	15	2
3	2	2	2	2	2	1	2	16	2
3	2	2	2	2	2	1	3	17	2
3	2	2	2	2	2	2	3	18	2
4	2	2	2	2	2	2	3	19	2
4	2	2	2	3	2	2	3	20	2
4	2	2	2	3	2	2	4	21	3
4	2	2	2		2	3	4	22	3
4	2	3	2	5	2	3	4	23	3
4	3	3	2	3	2	3	4	24	3
4	3	3	3	3	2	3	4	25	3
4	3	3	3	3	3	3	4	26	4
4	3	3	4	3	3	3	4	27	4
4	3	3	4	4	3	3	4	28	4
5	3	3	4	4	3	3	4	29	4
5	4	3	4	4	3	3	4	30	4
5	4	3	4	4	3	3	5	31	4
5	4	3	4	4	3	4	5	32	5
5	4	4	4	4	3	4	5	33	5
5	4	4	4	4	4	4	5	34	5
5	4	4	5	4	4	4	5	35	5
5	4	4	5	4	5	4	5	36	5
6	4	4	5	4	5	4	5	37	1
6	5	4	5	4	5	4	5	38	i
6	5	4	5	4	5	4	6	39	6
6	5	4	5	4	5	5	6	40	6
6	5	5	5	4	5	5	6	41	6
6	5	5	5	5	5	5	6	42	6
6	5	5	6	5	5	5	6	43	6
6	5	5	6	5		5	6	44	
7	5	5	6	5	8	5	6	44	
7	6	5	6	5	6	5	6	46	
7	6	5	6	5	6	5	7	47	
7	6	5	6	5	6	6	7	48	
7	6	6	6	5	6	6	7	49	
7	6	6	6	6	6	6	7	50	6
7	6	6	7	a	6	6	7	51	6
7	6	6	7	6	7	6	7	52	6

LOWER MONUMENTAL SPILL PATTERN

Gate Numbers								Total	
1	2	3	4	5	6	7	8	Stops	Kcfs
8	6	6	7	6	7	6	7	53	86.3
8	7	6	7	6	7	6	7	54	88.0
8	7	6	7	6	7	6	8	55	89.9
8	7	6	7	6	7		8	56	91.6
8	7	7	7	6	7	3	8	57	93.3
8	7	7	7	7	7	7	8	58	95.0
8	7	7	8	7	7	7	8	59	96.9
8	7	7	8	7	8	7	8	60	98.8
9	7	7	8	7	8	7	8	61	100.4
9	8	7	8	7	8	7	8	62	102.3
9	8	7	8	7	8	7	9	63	103.9
9	8	7	8	7	8	8	9	64	105.8
9	8	8	8	7	8	8	9	65	107.7
9	8	8	8	8	8	8	9	66	109.6
9	8	8	9	8	8	8	9	67	111.2
9	8	8	9	8	9	8	9	68	112.8
10	8	8	9	8	9	8	9	69	111.6
10	9	8	9	8	9	8	9	70	116.2
10	9	8	9	8	9	8	10	71	118.0
10	9	8	9	8	9	9	10	72	119.6
10	9	9	9	8	9	9	10	73	121.2
10	9		9	9	9	9	10	74	122.8
10	9	3	10	9	9	9	10	75	124.6
10	9	9	10	9	10	9	10	76	126.4
11	9	9	10	9	10	9	10	77	128.1
11	10	9	10	9	10	9	10	78	129.9
11	10	9	10	9	10	9	11	79	131.6
11	10	9	10	9	10	10	11	80	133.4
11	10	10	10	9	10	10	11	81	135.2
11	10	10	10	10	10	10	11	82	137.0
11	10	10	11	10	10	10	11	83	138.1
11	10	10	11	10	11	10	11	84	140.4
12	10	10	11	10	11	10	11	85	142.2
12	11	10	11	10	11	10	11	86	143.9
12	11	10	11	10	11	10	12	87	145.7
12	11	10	11	10	11	11	12	88	147.4
12	11	11	11	10	11	11	12	89	149.7
12	11	11	11	10	11	11	12	89	149.7
12	11	11	11	11	11	11	12	90	150.8

Kcfs values estimated at forebay elevation 539.0.

OPERATING STANDARDS FOR JUVENILE PASSAGE FACILITIES

Revised January 1985

Prior to April 1 each year:

Remove debris from forebay and gatewell slots.

Rake trash racks.

Inspect and clean orifices. Video inspection permitted.

Check regulating valve for full open.

Check and repair downstream migrant pipe and air valve as required.

Downstream migrant pipe outlet turned toward powerhouse tailrace.

April 1 to September 1 (Passage Period):

Remove debris from forebay and trashracks as required to maintain less than 1 foot of additional drawdown in gate slots. Additional raking may be required when heavy debris loads are present in the river.

Inspect gatewell slots twice a week and clean when required.

Rotate gate slot orifice openings, i.e.:
Operate orifices from (Units 4, 5, and 6) continually.
Alternate operation of Unit 3 and Unit 2 orifices every third day.

Inspect facilities daily.

Maintenance

Record all maintenance and inspections.

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladders

Water depth over weirs: 1.0 to 1.3 feet

Head on all Entrances

Head range: 1.0 to 1.7 feet

North Shore Entrances (NSE 1 & 2)

Operate both gates
Weir depth: 8 feet or greater.

Powerhouse Collection System

Operate 5 floating orifices, O.G numbers 1, 3, 5, 7, 9.

South Powerhouse Entrances (SPE 1 & 2)

Operate both downstream gates.
Weir depth: 8 feet or greater.

South Shore Entrances (SSE 1 & 2)

Operate both downstream gates.
Weir depth: 8 feet or greater.

Transportation Velocity

1 to 4 feet per second.

Head on Trashracks

Maximum head of 0.8 feet on ladder exits, attraction water intakes. Maximum head on picketed leads, such as around counting station, shall be 0.2 feet.

Staff Gauges and Water Level Indicators

Gauges shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be: Daytime (0400 to 2000h) 1, 2, 3, 4, 5, 6
Nighttime (2000 to 04OOh) 6, 5, 4, 3, 2, 1

1985 PROJECT RESEARCH

There is no research planned for 1985.

PROJECT DATA

XII. Little Gooose Dam

FISH PASSAGE INFORMATION

The locations of fish passage facilities are shown in the following general design drawing of Little Goose Lock and Dam.

JUVENILE PASSAGE FACILITIES

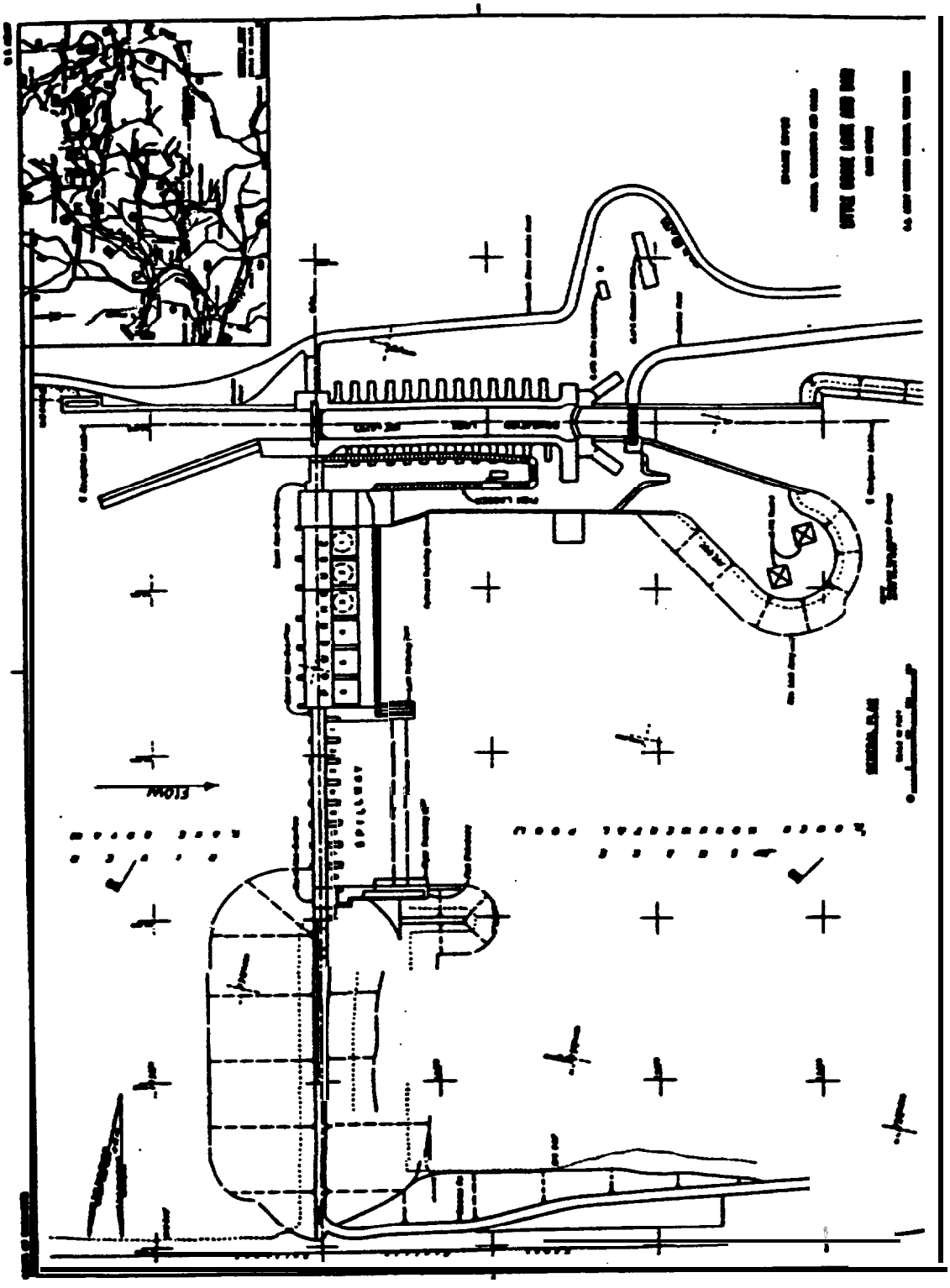
Juvenile passage facilities Little Goose Dam consist of a bypass system and juvenile collection and transportation facilities. The bypass system includes traveling screens in all units, gatewell orifices, a bypass channel the length of the powerhouse, a bypass hopper, and bypass pipe. The collection/transportation facilities include an upwell, separator, holding raceways, a sampling building, truck and barge loading facilities, and associated water supply lines.

The bypass channel was reconstructed and other aspects of the collection bypass system were modified in 1978 with additional numerous changes in subsequent years. Guidance and collection efficiencies of the new system have not been directly measured. However, estimates have been calculated based on collection and transportation of fish at Lower Granite and Little Goose and collection efficiency measurements at Lower Granite. These calculated estimates indicate that collection efficiency at Little Goose is within the same range as Lower Granite; approximately 30 percent for spring chinook and 60 percent for steelhead.[1]

The temporary modifications of the Little Goose Collection/bypass channel have apparently reduced the dissolved gas problems which previously occurred in the system. Long term modification of the collection/transportation/bypass system are being considered at the present time.

JWENILE MIGRATION TIMING

Maintenance of juvenile fish facilities is scheduled for the period of September through March to minimize the impact on downstream migrants. Juvenile passage timing at Little Goose corresponds closely with juvenile passage at Lower Granite Dam. During 1982, 10 percent of the total migration had passed Little Goose by April 28 and 90 percent by May 23.



JUVENILE MIGRATION TIMING

1970-1974

	Yearling Chinook	Steelhead
10% PAST PROJECT		
Earliest	4/17/72	4/28/72
Average	4/20	4/30
Latest	4/27/70	5/5
90% PAST PROJECT		
Earliest	5/18/71	5/18/71
Average	5/30	5/28
Latest	6/5/73	6/2/73

Source: Migration of Snake River Salmon and Steelhead, Raymond & Sims

ADULT PASSAGE FACILITIES

The adult fish passage facilities at Little Goose are made up of one fish ladder on the south shore, two south shore entrances, a powerhouse collection system, north shore entrances with a transportation channel underneath the spillway to the powerhouse collection system and an auxiliary water supply system. The powerhouse collection system is made up of ten floating orifices. The north shore entrances are made up of two downstream entrances and a spillway basin side entrance.

ADULT MIGRATION TIMING

Upstream migrants are present at the project year around. Maintenance of upstream passage facilities is scheduled for January through February to minimize the impact on upstream migrants.

The following table gives primary passage periods by species and shows the earliest and latest dates of peak passage which have been recorded from compilation of fish counts by the CoE.

ADULT MIGRATION TIMING

SPECIES	PASSAGE PERIOD	EARLIEST PEAK	LATEST PEAK
SPRING CHINOOK	4/ - 6/17	4/23	5/28
SUMMER CHINOOK	6/18 - 8/17	6/16	7/14
FALL CHINOOK	8/18 - 12	9/17	9/29
STEELHEAD	4/l - 12	9/9	10/5
COHO	8/ - 10	9/9	9/29
SOCKEYE	6/ - l0/	7/2	9/22

1985 OPERATING CRITERIA

STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operations which is included as Appendix A. This water budget implementation plan was developed and endorsed by all parties, including the fishery agencies and tribes, for use on a trial basis during 1985.

The March 1 forecast for Lower Granite is 25.1 MAF for the April - July period, which is 113% of normal. This large runoff forecast has cuased the evacuation of both Brownlee and Dworshak reservoirs for flood control. Because of this flood control operation, there will be no water in storage for water budget. Fishery flows for 1985 will be provided by natural runoff which are projected to average over 100 kcfs during the April 15 to June 15 periods. The COE will maintain daily average flows at or above 85 kcfs, except when constrained by flood control operations.

Tentative Spill Schedule at Little Goose Dam with Six Powerhouse Units and Deflectors in Bays 2 through 7 in 1982 (openings in increments) 1/.
Reviewed January 1984.

Gate Numbers								Totals	
1	2	3	4	5	6	7	8	Increments	Kcfs
(1)							1		
1	(1)					1	1		
1	1	(1)			1	1	1		
1	1	1	(1)	1	1	1	1		
1	1	(2)	1	1	2	1	1	10	19
1	1	2	(2)	2	2	1	1		
(2)	1	2	2	2	2	1	2		
2	2	2	2	2	2	(2)	3		
(3)	2	2	2	2	2	2	(3)		
3	2	(3)	(3)	2	2	2	3	20	39
3	3	3	3	2	(3)	2	3		
3	3	3	3	2	3	(3)	4		
3	3	3	(4)	3	3	3	4		
4	3	(4)	4	3		3	4		
4	4	4	4	3	3	(4)	4	30	60
5	(5)	4	4	3	3	4	4		
5	5	(5)	4	4	(4)	4	4		
5	5	5	4	4			5		
5	(6)	5	5	4	4	4	5		
5	6	5	5	4	4	(5)	6	40	80
(6)	6	5	5	4	5	5	6		
6	6	5	5	(5)	5	6	6		
(7)	6				5	(6)	7		
7	6	5	5		5	6	7		
7	6	5	(6)		6	6	7	50	100
		(6)							
7	6	6	(7)	7	6	6	7		
7	(7)	6	7	7	7	6	7		
7	7	7	7	7	7	7	7		
8	7	(8)			7	7	(8)		
8	7				7	7	8	60	120
8	7	8	(8)	8	8	7	8		
8	(8)	8	8	8	8	8	8		
(9)	8	8	8	8	8	8	9		
9	8	(9)	8	9	8	8	9		
9	8	9	(9)	9	9	8	9	70	140

1/ Circled values may be 1 increment less than indicated.

For example: (2) means 2 or 1 increments
(3) means 3 or 2 increments

SPILL MANAGEMENT FOR JUVENILE PASSAGE

1. Based on collection efficiency at Lower Granite approximately 70% daily average spill would be required during the spring chinook migration period to achieve the 85% passage efficiency goal.
2. During the steelhead migration period, approximately 49% daily average spill would be required if steelhead transportation was not maximized as planned by agencies and tribes.
3. If one or more screens fail, the affected unit will be shut down until repairs are completed or until an operational screen is in place. If there is significant failure in guidance or collection systems resulting in injuries to large numbers of fish, that system will be shut down and spill will be provided as an alternative bypass.
4. Spill will be managed according to the Interim Spill Plan for 1985, starting on page 5 of the DFOP, and on the agreed upon FTOT workplan and planned research activities.

SPILL MANAGEMENT FOR ADULT PASSAGE

1. When spill occurs during the daytime hours, that spill shall be shaped in accordance with the criteria established by the tribes and agencies.
2. The primary objective of fishery agencies and tribes is to provide 100 percent upstream passage efficiency, without delay of upstream migrants, for all migrants throughout the year.
3. The following spill schedules for selected flows with a six unit powerhouse and deflections in bays 2 through 7 were developed from model studies and require verification when a six unit powerhouse is complete and spill conditions can be tested.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Spill management requests will be based in part upon dissolved gas monitoring data and the observed condition of migrant juveniles and adults, along with juvenile migration monitoring data. Total dissolved gas monitoring during 1985 will be at the Little Goose forebay and reported every four hours from April 1 through August 31. Related data reported at the same time will be spill volume, total project flow, and spill gates open.

During the 1984 monitoring period, total dissolved gas levels at Little Goose forebay ranged from 103 to 128 percent saturation. Spill during the same period, not correlated with dissolved gas occurrences, ranged from zero to 112,800 cfs.

JUVENILE BYPASS - COLLECTION SYSTEM OPERATION

1. Fish will be separated by a mechanical fish size separator. If planned modifications to the bypass system are successful, yearling salmon will be bypassed to the river after being separated from larger steelhead. Those salmon not separated and steelhead will be collected for transport.
2. Maximum collection of juvenile migrants for transport will begin when approximately 80% of yearling salmon have past the project.
3. In the event that gas bubble disease, fish injury, or descaling is not reduced in the bypass-collection system, an emergency gatewell dipping program will be implemented to salvage fish from gatewells upon recommendation of FTOT and with input from agencies and tribes. These fish will be released in the tailrace unless a satisfactory means of holding and counting them for transport can be developed through FTOT. The emergency measures will continue until bypass conditions are improved and acceptable to FTOT representatives and coordinated through WBC to obtain agency and tribal input.
4. The sampling objective for Little Goose is based upon requirements of the transportation program, specifically not to exceed 1.5% of the daily collection or bypass. The combined sampling rate for Bonneville Dam and Little Goose is not to exceed 3%.
5. At Little Goose transportation of smolts will continue until approximately August 1 or until fish numbers approach 500 fish per day.
6. After transport ceases, the fish facilities will be operated in a straight bypass mode until the end of September. If because of low summer flows or other reasons, some units are not operating STS's in those units may be removed. No unscreened units will be operated prior to the end of the juvenile migration.
7. The bypass system will be operated through September with periodic monitoring for the purpose of determining the number of juveniles bypassing the project and verifying the appropriateness of the shut down date.
8. Following the removal of submersible traveling screens at the end of September and the bypass period, gatewell orifices and conduits should be operated, to the extent consistent with required facility maintenance, to allow those fish entering gatewells to exit the facilities.

(Prior to April 1 each year)

Powerhouse

Forebay Area and Intakes

Remove debris from forebay and gatewell slots.

Rake trash racks.

Measure drawdown in gatewell slots.

Inspect barrier screens for holes or protrusions.

Submersible Traveling Screens (STS)

Inspect screens for good running order and operate on one trial run (dogged off on deck).

Log trial run.

Collection System (Gallery)

Makeup water gates operational.

Orifice lights operational.

Orifice clean and operational.

Tailrace Area

Sorter and Raceways

42" and 48" sluice gates operational.

Inclined screens clean and good shape with no holes.

Perforated plate edges smooth with no rough edges.

Check wet separator and fish distribution system for operation as designed.

Brushes on crowder in good order.

Crowder operates properly.

All slide gates in and around separator and raceways in good operating order.

Retainer screens in place with no holes or sharp wires protruding.

Barge and truck loading pipes free of debris, cracks or blockages.

Sampling Marking Facility

Building and all equipment operable.

Maintenance

Record all maintenance and inspections.

(April 1 - end of transport season and bypass through August 31)

Powerhouse

Forebay Area

Remove debris from forebay.

Intakes

Inspect gatewell slots daily (preferably early in day shift) and remove debris when needed.

Clean trash racks in front of units as recommended n FTOT work plan.

Coordinate cleaning effort with personnel operating downstream migrant facilities.

Log drawdown differentials once a week.

Submersible Traveling Screens (STS)

Inspect screens as recommended in FTOT plan.

Make formal determination at end of season with FTOT transport inspection for adequacy of screen mesh and replacement if necessary.

Collection System (Gallery) Checks

Orifice clean and operating.

Orifice lights operating.

Orifice jets not hitting backwall (bypass gallery full).

Makeup water gate and float control equipment operational.

Operate one 12" orifice per slot in priority units.

Water surface at inlet hopper to transport pipe at proper elevation.

Tailrace

Sorter and Raceways

42" and 48" sluice gat operational.

No holes in screens.

Crowder brushes in good operating condition.

Retainer screens in raceway clean with no hole or protruding wires.

Operate wet separator and fish distribution system as designed.

Truck hopper and release valve in good oeprating order, i.e., no sharp edges, smooth paint on inside.

Inspection

Inspect fish facilities once each shift.

Record all maintenance and inspections.

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladder

Water depth over weirs: 1.0 to 1.3 feet.

Head on all Entrances

Head range: 1.0 to 1.7 feet.

North Shore Entrances (NSE 1 & 2)

Operate both downstream gates.
Weir depth: 8 feet or greater.

North Powerhouse Entrances (NPE 1 & 2)

Operate both downstream gates.
Weir depth: 8 feet or greater.

Powerhouse Collection System

Operate 4 floating orifices, numbers 1, 4, 6 and 10.

South Shore Entrances (SSE 1 & 2)

Operate both gates.
Weir depth: 8 feet or greater.

Transportation Velocity

1 to feet per second.

Tunnel Lights

Lights in the tunnel section, under the spillway, shall be on during fish passage period.

Head on Trashracks

Maximum head of 0.8 feet on ladder exits and attraction water intakes. Maximum head on picketed leads shall be 0.2 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit operation will be: operate unit 1 at reduced load (80-100 **mg)** from 0400-2000h, 2, 3, and then 4-6.

Spillway Operations

The following spill schedules for selected flows with a 6-unit powerhouse and deflectors in bays 2 through 7 were developed from model studies and should be verified in prototype.

1985 PROJECT RESEARCH

Project research plans have not been established for Little Goose.

Research applicable to Little Goose will be conducted at Lower Granite Dam.

FOOTNOTES

[1]FTOT Annual Report, 1982, Basham, Athearn, Pettit, 1983, NOAA Technical Memorandum NMFSF/NWRS, US Dept Commerce

PROJECT DATA

XIII. LOWER GRANITE DAM

FISH PASSAGE INFORMATION

The locations of fish passage facilities are shown on the following general design drawing of Lower Granite Lock and Dam.

JUVENILE PASSAGE FACILITIES

Juvenile passage facilities-at Lower Granite Dam consist of a bypass system and a smolt transportation system. All turbine units contain traveling screens. The bypass system includes traveling screens, gatewell orifices, a bypass channel the length of the powerhouse, and a bypass pipe. The smolt collection/transportation-facilities include an upwell, separator, holding raceways, a sampling and marking building, and truck and barge holding facilities.

Indirect estimates of fish collection efficiencies were developed for Lower Granite Dam. With 100% of the river flow passing through the powerhouse, fish collection efficiency for spring chinook was only 30 percent, fish I collection efficiency for steelhead was 60 percent; this is unacceptable.

Direct measure of fish guidance efficiency was conducted during 1982. Fish guidance efficiency was found to be 50 percent for spring chinook and 74 percent for steelhead. Subsequent hydraulic model testing showed that hydraulic conditions could be improved to increase fish guidance efficiency. Fish guidance would be improved by raising operating gates.'

During 1984 vertical distribution any fish guidance tests were conducted. Results of the 1984 fish guidance tests did not coincide with earlier test results. Vertical distribution tests reflected 1983 test results with 80% of migrants passing through the top third of the turbine intake.

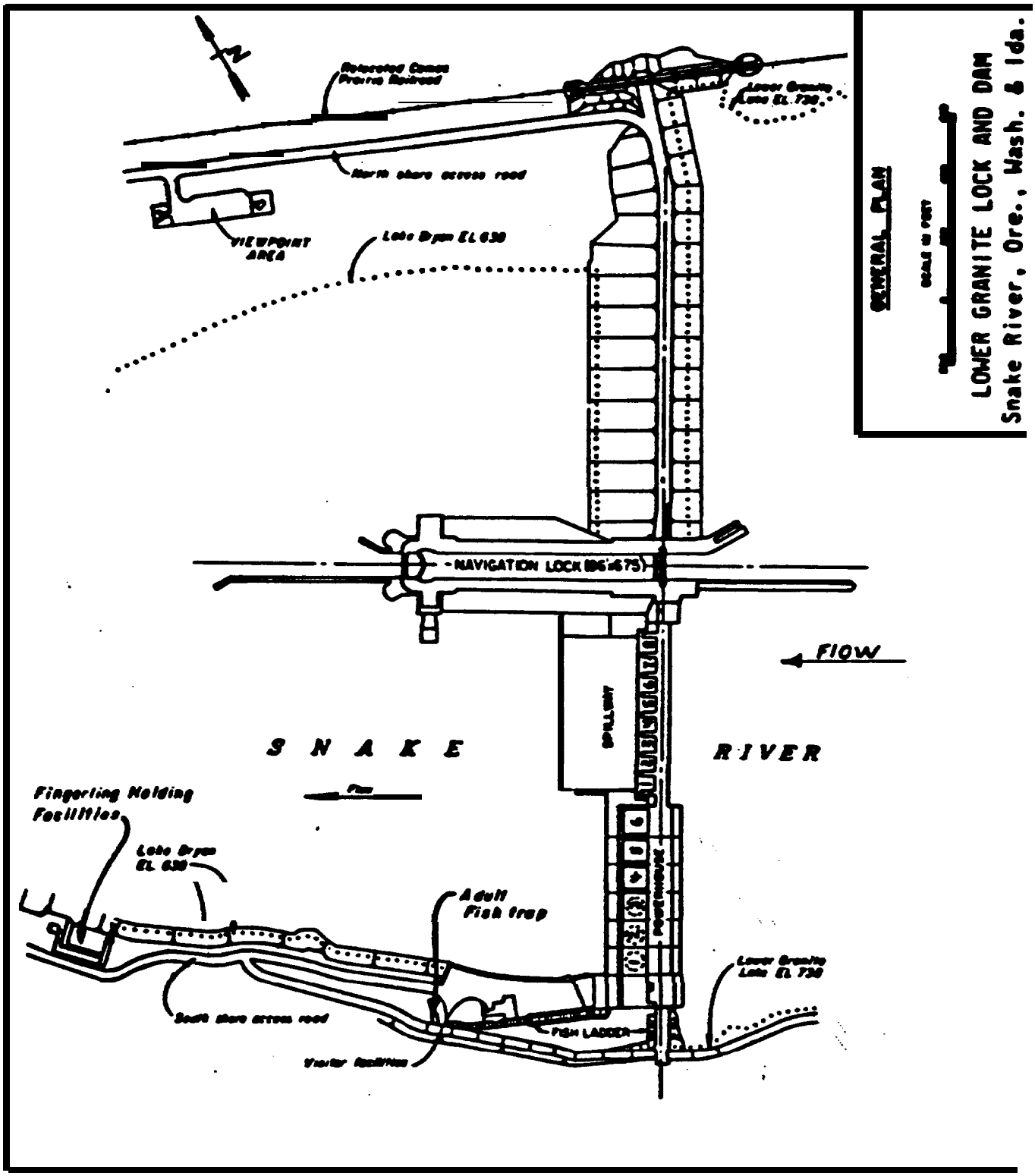
The first replicates of fish guidance tests indicated guidance of 35%. Various conditions were tested with balanced flow and standard barrier screens, with different travelling screens. Fish guidance efficiency increased 12% with change of travelling screen.

The reasons the fish guidance in 1984 did not reflect 1983 test results are not clear. Reasons being considered include, the effect of spill, the presence of the forebay trash boom, differences in gatewell dip nets, the effect of raised gates on sampling and fish behavior.

Research is planned in 1985 to test the effect of the forebay trash boom.

JUVENILE MIGRATION TIMING

Maintenance of fish facilities should be scheduled for October through March to minimize impact on downstream migrants. Transportation of juvenile migrants is conducted according to the Annual Fish Transportation Oversight Team Plan as approved by fishery agencies and tribes. Juvenile migrant numbers have been low in August. No information is available on numbers of fish which could pass the system after that date.


LOWER GRANITE LOCK AND DAM
Snake River, Ore., Wash. & Ida.
GENERAL PLAN
N
Relocated Camas Prairie Railroad
North shore access road
VIEWPOINT AREA
Lake Bryan EL 630
NAVIGATION LOCK (86'x675')
FLOW
SPILLWAY
POWERHOUSE
S N A K E
R I V E R
Fingerling Holding Facilities
Lake Bryan EL 630
Adult Fish trap
South shore access road
FISH LADDER
Visitor facilities
Lower Granite Lake EL 738

JUVENILE MIGRATION TIMING
1975-1981

	Yearling Chinook	Steelhead
Earliest Date for 10% past project	4/16/78	4/21/79
Average Date for 10% past project	4/20	4/30
Latest Date for 10% past project	5/1/77	5/l/77
Earliest Date for 90% past project	5/10/76	5/26/80
Average Date for 90% past project	5/28	5/30
Latest Date for 90% past project	6/11/77	

JUVENILE MIGRATION TIMING

% Migration Past Project	1983	1984
Yearling chinook		
10%	4/14	4/20
90%	6/l	6/10
Steelhead		
10%	5/5	4/30
90%	6/4	6/2
Sub-yearlings		
10%	6/30	4/25
90%	7/12	6/30

ADULT PASSAGE FACILITIES

Adult passage facilities at Lower Granite Dam are comprised of one south shore fish ladder, the south shore entrances, a powerhouse collection channel, north shore entrances with a transportation channel underneath the spillway to the powerhouse channel, and an auxiliary water supply.

ADULT MIGRATION TIMING

Upstream migrants are present at Lower Granite throughout the year. Maintenance of adult facilities is scheduled for the period of January through February to minimize the impact on upstream migrants. Primary passage periods by species and earliest and latest date of peak passage follow.

ADULT MIGRATION TIMING
FROM 1975-1982

SPECIES	PASSAGE PERIOD	EARLIEST PEAK	LATEST PEAK
SPRING CHINOOK	4/ - 6/17	5/17	6/10
SUMMER CHINOOK	6/18 - 8/17	6/22	7/10
FALL CHINOOK	8/18 - 11/	9/19	10/6
COHO	10/	9/16	9/28
SOCKEYE	71	7/2	7/19
STEELHEAD	3/ - 12/31	9/3	10/9

1985 OPERATING CRITERIA

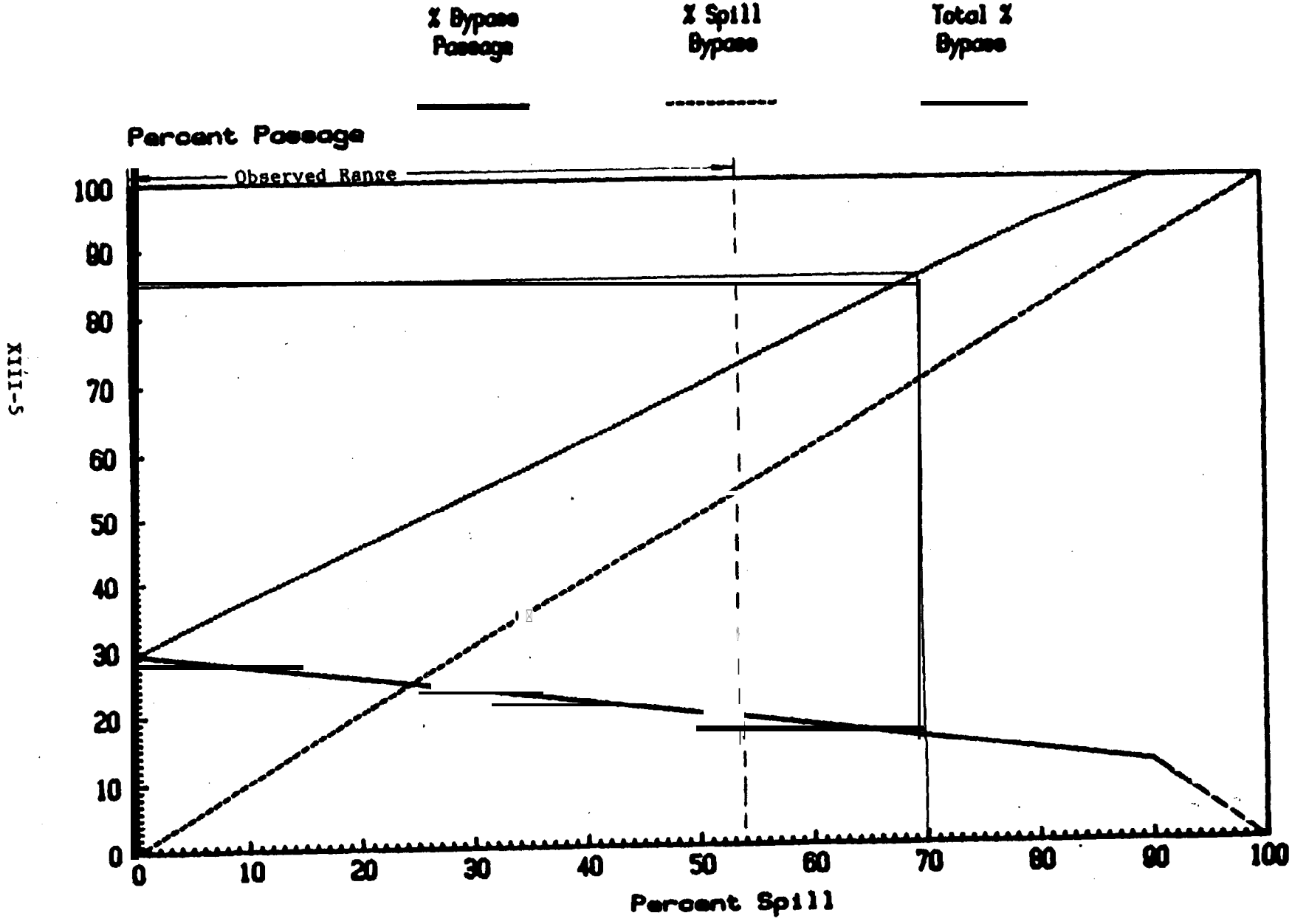
STREAM FLOW MANAGEMENT

Stream flow management during the 1985 water budget period will be in accordance with the Coordinated Plan of Operations which is included as Appendix A. This water budget implementation plan was developed and endorsed by all parties, including the fishery agencies and tribes, for use on a trial basis during 1985.

The March 1 forecast for Lower Granite is 25.1 MAF for the April - July period, which is 113% of normal. This large runoff forecast has cuased the evacuation of both Brownlee and Dworshak reservoirs for flood control. Because of this flood control operation, there will be no water in storage for water budget. Fishery flows for 1985 will be provided by natural runoff which are projected to average over 100 kcfs during the April 15 to June 15 periods. The COE will maintain daily average flows at or above 85 kcfs, except when constrained by flood control operations.

Lower Granite Smolt Passage

Yearling Chinook



OPTIMUM & MINIMUM FLOW RECOMMENDATIONS

MONTHLY PERIOD	STREAMFLOW IN 1000 CFS		
	Instan. Min	Daily Ave	Optimum
JAN	10	20	20
FEB	10	20	20
MAR	10	20	20
APR l-15	15	40	100
APR 16-25	30	85	110
APR 26-30	30	85	120
MAY	30	85	140
JUN 1-15	30	85	120
JUN 16-30	15	30	90
JUL 1-15	15	30	*
JUL 16-31	10	10	*
AUG	10	10	*
SEP	10	10	*
OCT	10	10	*
NOV	10	10	*
DEC	10	10	20

* Research needed to define

SPILL MANAGEMENT FOR JUVENILE PASSAGE

1. Spill will be required at Lower Granite until bypass collection efficiencies are improved, in order to bypass the majority of spring chinook.
2. Based on collection efficiencies at Lower Granite Dam, approximately 70% daily average spill would be required during the spring chinook migration period to achieve the 85% passage efficiency goal, as illustrated in the following figure.

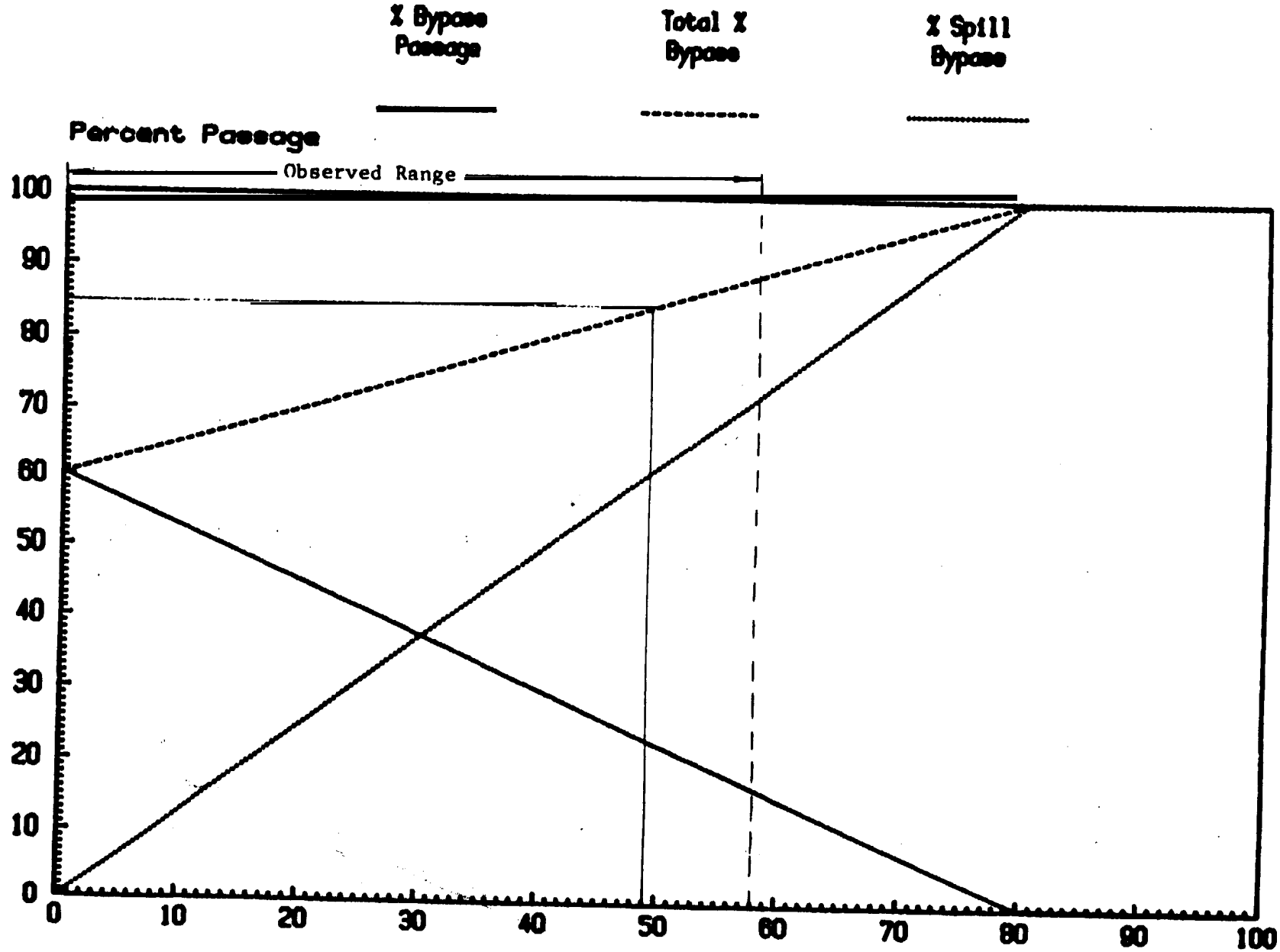
3. During the steelhead migration period, approximately 49% daily average spill would be required if steelhead transportation was not maximized. as illustrated in the following figure.
4. If one or more screens fail, the affected unit will be shut down until repairs are completed or until an operational screen is in place. If there is significant failure in guidance or collection systems resulting in injuries to large numbers of fish, that system will be shut down and spill will be provided as an alternative bypass.
5. Spill will be managed according to the Interim Spill Plan for 1985, beginning on page 5 of the DFOP, and based on the agreed upon FTOT workplan, and on agreed upon research schedules.

SPILL MANAGEMENT FOR ADULT PASSAGE

1. When spill occurs during the daytime hours, that spill shall be shaped in accordance with the criteria established by the tribes and agencies shown in the following table.
2. The primary objective of fishery agencies and tribes is to provide 100 percent upstream passage efficiency, without delay of upstream migrants, for all migrants throughout the year.

Lower Granite Smolt Passage

Steelhead



Spilling Schedule for Lower Granite Dam for Spills Up to 64,000 cfs with Turbine Units 1 to 6 Operating (openings in stops) 1-/

Elevation 737 *

Gate Number								Total	
1	2	3	4	5	6	7	8	stops	kcfs
1								1	1.75
1							1	2	3.5
1						1	1	3	5.25
1	1					1	1	4	7.00
1	1				1	1	1	5	8.75
1	1	1			1	1	1	6	10.50
1	2	1			1	1	1	7	12.37
1	2	1			1	2	1	8	14.25
1	2	1	1		1	2	1	9	15.99
1	2	2	1		1	2	1	10	17.86
1	2	2	1	1	1	2	1	11	19.61
1	2	2	2	1	1	2	1	12	21.48
1	2	2	2	2	1	2	1	13	23.35
1	2	2	3	2	1	2	1	14	25.27
2	2	2	3	2	1	2	1	15	27.14
2	2	2	3	3	1	2	1	16	29.06
2	2	2	3	3	2	2	1	17	30.93
2	2	3	3	3	2	2	1	18	32.85
2	3	3	3	3	2	2	1	19	34.77
2	3	3	4	3	2	2	1	20	36.67
3	3	3	4	3	2	2	1	21	38.61
3	3	4	4	3	2	2	1	22	40.53
3	3	4	4	3	3	2	1	23	42.45
3	4	4	4	3	3	2	1	24	44.37
3	4	4	4	4	3	2	1	25	46.29
3	4	4	5	4	3	2	1	26	48.21
3	4	5	5	4	3	2	1	27	50.13
4	4	5	5	4	3	2	1	28	52.05
4	5	5	5	4	3	2	1	29	53.97
4	5	5	5	4	4	2	1	30	55.89
4	5	5	5	5	4	2	1	31	57.81
4	5	5	6	5	4	2	1	32	59.73
4	5	6	6	5	4	2	1	33	61.65
4	6	6	6	5	4	2	1	34	63.57

NOTE: Spills over 64,000 should be employed only at night if possible.

* Reviewed January 1984.

3. There is no spill schedule available at the present time for the six unit powerhouse with deflectors in all eight spill bays. The following tentative spill schedule will be followed, Verification of this schedule is required.

SPILL MANAGEMENT FOR DISSOLVED GAS CONTROL

Spill management requests will be based in part upon dissolved gas monitoring data and the observed condition of migrant juveniles and adults, along with juvenile migration monitoring data. Total dissolved gas monitoring during 1985 will be at the Lower Granite forebay automated station and reported every four hours from early March through September 30. Related data reported at the same time will be spill volume, total project flow, and spill gates open.

JUVENILE BYPASS - COLLECTION SYSTEM OPERATION

1. There is no fish size separation system in operation at Lower Granite Dam. Species separation will be attempted by adjustment of hatchery release dates. The fishery agencies and tribes have requested that screen bypass sytems will be operational by March 15.
2. All fish which are collected will be transported.
3. Spill will be utilized to bypass spring chinook.
4. Maximum collection for transportation will begin when approximately 80 percent of yearling salmon have passed the project.
5. If during 1985 species separation by adjustment of hatchery release dates proves ineffective, maximum collection for transportation may begin at an earlier date, e.g., when 50 percent of the collection is steelhead smolts. The design, construction, and installation of a fish size separation system is necessary for Lower Granite in the future.
6. Barging of collected fish will begin on April 10.
7. Turbine intake operating gates should be raised 20 feet to increase fish guidance efficiency.
8. The sampling objective at Lower Granite is not to exceed the lesser of 3% of the estimated weekly outmigration or 10% of the weekly total of smolts collected and or bypassed. Given a 50% fish guidance efficiency and an effective spill of 40%, a sample rate of 10% of the fish collected or bypassed should equal about 3% of the total run. The daily sampling rate (noon to noon) may not exceed the objective except: for two days during the sampling, the rate may be doubled provided that for each day that the sampling rate is raised above the sampling objective, there must be a day in the same week in which the sample rate is lowered an equal or greater amount.

9. After transport ceases the fish facilities will be operated in a straight bypass mode until the end of September. If because of low summer flows or other reasons, some units are not operating STS's in those units may be removed. No unscreened units will be operated prior to the end of the juvenile migration.
10. The bypass sytem will be operated through September with periodic monitoring for the purpose of determining the number of juveniles bypassing the project and verifying the appropriateness of the shut down date.
11. Following the removal of submersible traveling screens at the end of September and the bypass period, gatewell orifices and conduits should be operated, to the extent.consistent with required facility maintenance, to allow those fish entering gatewells to exit the facilities.

OPERATING STANDARDS FOR JUVENILE PASSAGE FACILITIES

Revised January 1984

(Prior to April 1 each year)

Powerhouse

Forebay Area and Intakes

Remove debris from forebay and gatewell slots.

Rake trash racks.

Measure drawdown in gatewell slots.

Inspect vertical barrier screens for holes or protrusions. Video camera inspection acceptable.

Submersible Traveling Screens (STS)

Inspect screens for good running order and operate on one trial run (dogged off on deck).

Log trial run.

Collection System (Gallery)

Makeup water gates and float equipment operational.

Orifice lights operational.

Orifice clean and operational.

Tailrace Area

Sorter and Raceways

42" and 72" sluice gates operational.

Inclined screens clean and in good shape with no holes.

Perforated plate edges smooth with no rough edges.

Check wet separator and fish distribution system for operation as designed.

Brushes on crowder in good order.

Crowder operates properly.

All slide gates in and around separator and raceways in good operating order.

Retainer screens in place with no holes or sharp wires protruding.

Sampling Marking Facility

Building and all operational equipment operable.

Barges

All pumps (including spare) in good working order.

Dump gates operational.

No rough edges or support beams protruding compartments.

No brass or galvanized fittings in circulation lines.

All loading hoses properly installed so fish will not hit sides of compartments or support beams when loading,

Loading hoses in good shape with rubber gaskets in "Kamlock" fittings.

Inside edges of Kmalock Lock joints should be beveled to avoid sharp edges.

Warning system operational.

Provide net and/or deck covers.

Log Maintenance

Record all maintenance and inspections.

(April 1 - end of transport season and bypass through August 31)

Powerhouse

Forebay Area and Intakes

Remove debris from forebay.

Inspect gatewell slots daily (preferably early in day shift) and remove debris when needed.

Clean trash racks in front of units as recommended in FTOT work plan.

Coordinate cleaning effort with personnel operating downstream migrant facilities.

Log drawdown differentials once a week.

Submersible Traveling screens (STS)

Inspect screens as recommended in FTOT plan.

Make formal determination at end of season with FTOT transport inspection for adequacy of screen mesh and replacement if necessary.

Collection System (Gallery) Checks

Orifice clean and operating.

Orifice lights operating.

Orifice jets not hitting backwall (bypass gallery full).

Makeup water gate and float control equipment operational.

Alternate orifices infish screens slots daily (12 open).

Bulk head slots orifices opening (30) (6 unit operation).

Both orifices open in A and B slots.

One orifice open in C slot.

*Note: 42 orifices should be open to produce' best juvenile fish passage. Operation of orifice in the above manner is conditional on turbine units operating.

Tailrace

Sorter and Raceways

42" and 48" sluice gate operational.

Maintain stable water conditions in upwell at sorter.

No holes in screens.

Crowder and brushes in good operating condition.

All slide gates and inflow gates in and around separator and raceways operational.

Raceway retainer screens to be clean and have no holes or protruding wires.

Barges and Trucks

Barge and truck loading pipes free of debris, cracks or blockages.

Tugs

Capable of making turn around trip in less than 96 hours.

Inspection

Inspect fish facilities once each shift.

Record all maintenance and inspections.

OPERATING STANDARDS FOR ADULT PASSAGE FACILITIES

Fishway Ladder

Water depth over weirs: 1.0 to 1.3 feet

Head on All Entrances

Head range: 1.0 to 1.7 feet.

1.5 to 1.7 feet on South Shore entrance is required to maintain the necessary transportation flow at bottom of ladder and first bend in channel.

North Shore Entrances (NSE 1 & 2)

Operate both downstream gates.
Weir depth: 8 feet or greater.

North Powerhouse Entrances (NPE 1 & 2)

Operate both downstream gates.
Weir depth: 8 feet or greater.

Powerhouse Collection System

Operate 4 floating orifices, numbers 1, 4, 7 6 10.

South Shore Entrances (SSE 1 & 2)

Operate both gates.
Weir depth; 8 feet or greater.

'Transportation Velocity

1 to 4 feet per second.

Tunnel Lights

Lights in the tunnel section, under the spillway, shall be on during fish passage period.

Head on Trashracks

Maximum head of 0.8 feet on ladder exits and attraction water intakes.
Maximum head on picketed leads shall be 0.2 feet.

Staff Gauges and Water Level Indicators

Shall be readable at all water levels encountered during fish passage period.

Turbine Unit Operating Priority

Unit Operation will be: 1, 2, 3 and then 4-6.

1985 PROJECT RESEARCH

The following research is planned for Lower Granite in 1985.

1. Comparison of Two Fishway Designs for Downstream Passage of Spring Chinook and Steelhead Trout Smolts
   Funding Agency: CoE
   Contracting Agency: Idaho Cooperative Fishery Unit
   Principle Investigator: J.L. Congleton
2. Hydroacoustic Evaluation of Fish Guiding Efficency at Lower Granite Dam
   Funding Agency: CoE
   Contracting Agency: BioSonics/Walla Walla District, CoE
   Principle Investigator: F.O. Lane
3. Continuing Studies to Improve and Evaluate Juvenile Fish Collection at Lower Granite Dam
   Funding Agency: CoE
   Contracting Agency: NMFS
   Principle Investigator: Dick Krcma
4. Evaluate Improved Collection, Handling, and Transport Techniques to Materially Improve Survival of Transported Juvenile Chinook Salmon
   Funding Agency: CoE
   Contracting Agency: NMFS
   Principle Investigator: Donn L. Park

FOOTNOTES

[1]Studies to Improve Fish Guiding Efficiency of Traveling Screens at Lower Granite Dam, Swan, Krcma and Ossiander, CZES, May 1983.

[2]Migrations of Juvenile Chinook Salmon and Steelhead Trout in the Snake River from 1973 to 1979, a Research Summary, Sims, Ossiander, 1981.

[3]1984 Annual Report, Water Budget Center, November 1983.