Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal

Section 1. General administrative information

Spring Chinook Salmon Early Life History

Bonneville project number, if an ongoing project 9202604

Business name of agency, institution or organization requesting funding
Oregon Department of Fish and Wildlife

Business acronym (if appropriate) ODFW

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NPPC Program Measure Number(s) which this project addresses.
7.1C, 7.1D, 7.4L

NMFS Biological Opinion Number(s) which this project addresses. Information collected during this study relates to and will be useful for two actions described in the NMFS Hydrosystem Operations Biological Opinion. This study will provide data on multiple detections of wild PIT-tagged salmon at mainstem dams. This information can be used in evaluating in-river survivals of wild salmon. In addition, data collected during this study has been and will continue to be incorporated into the PATH life cycle modeling project.

Other planning document references.
Proposed recovery efforts for the Imnaha and Grande Ronde River stocks require knowledge of stock specific life history strategies and critical habitats for spawning, rearing, and downstream migration (Snake River Recovery Team 1993, Northwest Power Planning Council 1992, Oregon Department of Fish and Wildlife 1990). There is little information available on the early life history and critical rearing habitats in the Grande Ronde River basin. Recent calls for information include: a description of the spatial differences in spawning and rearing habitats (Snake River Recovery Team 1993), development of a profile on genetic, life history, and morphometric characteristics of wild and naturally spawning populations (Snake River Recovery Team 1993, Northwest Power Planning Council 1992, Oregon Department of Fish and Wildlife 1990), and evaluation of critical habitat needs and factors limiting production (Northwest Power Planning Council 1992, Oregon Department of Fish and Wildlife 1990).

Subbasin.
Grande Ronde and Imnaha River subbasins

Short description.
Investigate the abundance, migration patterns, survival, and alternate life history strategies exhibited by spring chinook salmon juveniles from distinct populations in the Grande Ronde and Imnaha River basins.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
X	Anadromous fish		Construction		Watershed
	Resident fish		O & M		Biodiversity/genetics
	Wildlife		Production	X	Population dynamics
	Oceans/estuaries	X	Research		Ecosystems
	Climate		Monitoring/eval.		Flow/survival
	Other		Resource mgmt		Fish disease
			Planning/admin.		Supplementation
			Enforcement		Wildlife habitat enhancement/restoration
			Acquisitions		

Other keywords.
life history

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship

9403300	Fish passage center's smolt monitoring program	Trap data will be exchanged with Lower Grande Ronde study to provide in-river information on migration timing.
8805305	Northeast Oregon Hatcheries Master Plan	Provide information on local populations that is crucial for planning and implementation of supplementation in the Grande Ronde Basin.
9402700	Grande Ronde Model Watershed	Provide information on habitat utilization and juvenile production.
9604400	Grande Ronde Basin Spring Chinook Captive Broodstock Program	Trapping and associated abundance estimation will be used to monitor the success of the Captive Broodstock Program when progeny are released back into streams. Parr abundance surveys will provide useful reconnaissance information for locating juvenile chinook salmon for the Captive Broodstock Program. In addition, life history information collected will be used to evaluate broodstock program.
9600800	PATH: Plan for analyzing and testing hypotheses	Provide data for life cycle model.
8805301	NEOH Grande Ronde (Nez Perce)	Provide information on local populations that is crucial for planning and implementation of supplementation in the Grande Ronde Basin. Provide monitoring for evaluating impacts of this project on naturally reproducing populations.
8805302	NEOH Grande Ronde (CTUIR)	Provide information on local populations that is crucial for planning and implementation of supplementation in the Grande Ronde Basin. Provide monitoring for evaluating impacts of this project on naturally reproducing populations.
8810804	STREAMNET	Provide information for use in database.
9405400	Bull Trout Studies in Central and Northeast Oregon	Collect bull trout for tagging and provide meristic and recapture data.

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Document the in-basin migration patterns for spring chinook salmon juveniles in the upper Grande Ronde River, including the abundance of migrants, migration timing and duration.	A	Collect juvenile spring chinook salmon migrants in the Grande Ronde River by operating two screw traps at selected trapping sites. The lower trap (RM 102) will be operated from fall to spring, while the upper trap (RM 186) will be operated from ice-out (February-March) until ice-up (November).
		B	Enumerate all spring chinook salmon collected in traps. Measure the length and weight for 80 migrants collected weekly at each trapping location. Calculate condition factor for these 80 salmon
		C	Mark approximately 50 spring chinook salmon migrants collected weekly at each trap. Salmon will receive a mark of water soluble acrylic paint that is applied with a Panjet marking instrument.
		D	Determine trapping efficiencies for each trap throughout the trapping period using fish marked in Task 1.3.
		E	Estimate the number of juvenile chinook salmon migrating from rearing areas based on number of chinook salmon collected in the traps, trap efficiencies, and mortality estimates associated with the marking procedure.

		F	For each trap location, plot estimated number of migrants against time of the year to determine timing and duration of the juvenile migration periods.
		G	Continuously monitor water temperature using a thermograph and monitor river height daily from a river gage at each trap.
2	Estimate and compare smolt detection rates at mainstem Columbia and Snake River dams for fall and spring migrating spring chinook salmon from the upper Grande Ronde River.	A	Interrogate each chinook salmon collected in the screw traps for a previously implanted PIT tag. Record tag number and measure lengths and weights of all PIT-tagged recaptures.
		B	PIT-tag approximately 500 fall and spring migrating spring chinook salmon juveniles at the upper trap that were not previously tagged and create a PIT tag data base for tagged fish.
		C	Collect and PIT tag approximately 500 winter resident parr from rearing areas above the upper screw trap. Create a PIT tag data base for these fish.
		D	Monitor PIT-tagged migrants at the lower trap. Measure and record tag number, length and weight information for all PIT-tagged fish. Enter lower trap recovery data on PTAGIS database.
		E	Obtain detection information for PIT-tagged fish recovered at Lower Granite, Little Goose, Lower Monumental, McNary, John Day, and Bonneville dams.
		F	Determine mainstem dam detection rates for fall, winter and spring tagged fish.

		G	Compare detection rates between treatment groups. Derive estimates of overwinter mortality, the success of fall migration strategy, and the relative success of the fall migrant and spring migrant life history strategies.
3	Document the in-basin migration patterns, including abundance of migrants, timing, and duration, for spring chinook salmon juveniles in Catherine Creek.	A	Collect juvenile spring chinook salmon migrants in Catherine Creek by operating screw traps at selected trapping sites. The Catherine Creek trap will be operated from ice-out (February-March) until ice-up (November-February).
		B	Enumerate all spring chinook salmon collected. Measure the length and weight for 80 migrants collected weekly at each trapping location. Calculate condition factor for these 80 salmon.
		C	Mark spring chinook salmon migrants collected at the trap. Salmon will receive a mark of water soluble acrylic paint that is applied with a Panjet marking instrument.
		D	Determine weekly trapping efficiencies for each trap throughout the trapping period using fish marked in Task 3.3.
		E	Estimate the number of juvenile chinook salmon migrating from rearing areas based on number of chinook salmon collected in the traps, trap efficiencies, and mortality estimates associated with the marking procedure.
		F	Plot the estimated number of migrants collected at the trap against time of the year to determine timing and duration of the juvenile migration periods.

		G	Continuously monitor water temperature using a thermograph and monitor river height daily from a river gage at the Catherine Creek trap
4	Estimate and compare smolt detection rates at mainstem Columbia and Snake River dams for fall and spring migrating spring chinook salmon from Catherine Creek.	A	Interrogate each chinook salmon collected in the screw trap for a previously implanted PIT tag. Record tag number and measure lengths and weights of all PIT-tagged recaptures.
		B	PIT-tag approximately 500 fall and spring migrating spring chinook salmon juveniles at the Catherine Creek trap that were not previously tagged and create a PIT tag data base for tagged fish.
		C	Collect and PIT tag approximately 500 winter resident parr from rearing areas above the Catherine Creek screw trap. Create a PIT tag data base for these fish.
		D	Monitor PIT-tagged migrants at the lower Grande Ronde trap. Measure and record tag number, length and weight information for all PIT-tagged fish from Catherine Creek. Enter lower trap recovery data on PTAGIS database.
		E	Obtain recovery information for PIT-tagged fish recovered at Lower Granite, Little Goose, McNary and John Day dams.
		F	Determine trap-to-trap and trap-to-dam detection for fall and spring migrating and winter-tagged fish. Obtain mainstem recovery data from summer resident chinook salmon.

		G	Compare detection rates between treatment groups. Derive estimates of overwinter mortality, the success of fall migration strategy, and the relative success of the fall migrant and spring migrant life history strategies.
5	Document the in-basin migration patterns, including abundance of migrants, timing, and duration, for spring chinook salmon juveniles in the Wallowa subbasin.	A	Collect juvenile spring chinook salmon migrants in Wallowa subbasin by operating screw traps at selected trapping sites. The traps will be operated year round if possible as determined by summer water temperatures and winter icing.
		B	Enumerate all spring chinook salmon collected. Measure the length and weight for 80 migrants collected weekly at each trapping location. Calculate condition factor for these 80 salmon. Smolt condition will also be evaluated weekly, using both a visual index and measurements of morphological smolt characteristics from digital images (Maule 1994) of 36 salmon per week. Ten scale samples will be taken weekly from 24 juveniles to identify growth patterns associated with rearing conditions and migration timing. These fish will be selected from the 80 measured above to represent the maximum size range sampled.
		C	Mark approximately 50 spring chinook salmon migrants collected weekly at each trap. Salmon will receive a mark of water soluble acrylic paint that is applied with a Panjet marking instrument.
		D	Determine weekly trapping efficiencies for each trap throughout the trapping period.

		E	Estimate the number of juvenile chinook salmon migrating from rearing areas based on number of chinook salmon collected in the traps, trap efficiencies, and mortality estimates associated with the marking procedure.
		F	For each trap location, plot the estimated number of migrants against time of the year to determine timing and duration of the juvenile migration periods.
		G	Continuously monitor water temperature using a thermograph and monitor river height daily from a river gage at each trap.
6	Estimate and compare smolt detection rates at mainstem Columbia and Snake River dams for fall and spring migrating spring chinook salmon from the Wallowa subbasin.	A	Interrogate each chinook salmon collected in the screw traps for a previously implanted PIT tag. Record tag number and measure lengths and weights of all PIT-tagged recaptures.
		B	PIT-tag approximately 500 fall and spring migrating spring chinook salmon juveniles at the Lostine River trap that were not previously tagged and create a PIT tag data base for tagged fish.
		C	Collect and PIT tag approximately 500 winter resident parr from rearing areas above the Lostine River screw trap. Create a PIT tag data base for these fish.
		D	Monitor PIT-tagged migrants at the lower Wallowa trap. Measure and record tag number, length and weight information for all PIT-tagged fish from the Wallowa subbasin. Enter lower trap recovery data on PTAGIS database.

		E	Obtain recovery information for PIT-tagged fish recovered at Lower Granite, Little Goose, Lower Monumental, McNary, John Day, and Bonneville dams.
		F	Determine trap-to-trap and trap-to-dam detection for fall and spring migrating and winter-tagged fish. Obtain mainstem recovery data from summer resident chinook salmon.
		G	Compare detection rates between treatment groups. Derive estimates of overwinter mortality, the success of fall migration strategy, and the relative success of the fall migrant and spring migrant life history strategies.
7	Determine seasonal habitat utilization and preference of juvenile spring chinook salmon in the upper Grande Ronde River, Catherine Creek, and the Lostine River.	A	Identify the limits of the summer and winter rearing distribution of salmon juveniles. This task will be accomplished in conjunction with spawning ground surveys.
		B	Identify and select sites to be sampled within upper rearing areas. Select replicate sites that are representative of all available habitat types (i.e. plunge pool, glide, etc.).
		C	At each sampling site enumerate spring chinook salmon juveniles using snorkeling observations.
		D	Record the habitat classification and describe the habitat of each sampling site. The following measurements will be taken: temperature, water velocity, maximum river depth, width at three different points, length, substrate composition, instream habitat, cover, and shade.

		E	Estimate surface area of each sampling site (S.A. = Length X mean width) and calculate the density of juvenile salmon per unit area of habitat.
		F	Determine habitat preference using preference/selectivity indices.
8	Characterize cold- and warm-water areas located in the Grande Ronde River basin and describe the patterns of use by juvenile spring chinook salmon.	A	Map potential thermal refugia in critical rearing habitats for juvenile chinook salmon based on USFS thermal imagery data.
		B	Conduct stream surveys to identify, map and characterize actual thermal refugia.
		C	Monitor temperature regimes within refugia and in surrounding waters using thermographs.
		D	Use snorkeling observations combined with marking techniques to monitor use of thermal refugia (identified in task 8.2) by juvenile chinook salmon.
		E	Conduct stream surveys to provide information that will help us to relate the frequency and characterization of thermal refugia to the current habitat conditions in the basin.
9	Estimate and compare smolt detection rates at mainstem Columbia and Snake River dams for migrants from four local, natural populations in the Grande Ronde and Imnaha River basins.	A	Collected juvenile chinook salmon from Catherine Creek and the Lostine River and 1,000 juveniles from the Minam and Imnaha rivers in August and September 1998. We will locate juveniles using snorkel observations and will collect the fish with seines. Sanctuary dip nets will be used to minimize out of water transfers.

		B	Once collected, we will implant passive-integrated- transponder tags in the fish. Tags will be implanted as described in Prentice et al. (1986,1990) and Mathews et al. (1990,1992). We will proceed with collection at temperatures up to 17°C and will tag at temperatures up to 15°C. We will tag fish that are 60 mm in fork length or longer and appear to be in good health. Fish will be anesthetized with 40-50 ppm MS-222. PIT tags will be injected manually with modified hypodermic syringes. The syringes will be disinfected for 10 minutes in 70% ethanol prior to tagging. Fish will be allowed to recover after tagging and will be released as near to the collection site as possible.
		C	Incorporate data into ASCII files according to criteria developed by the PIT Tag Steering Committee and submit files to the PIT Tag Information System (PTAGIS) database.
		D	Import data from collection stations at Lower Granite, Little Goose, and McNary dams on the Snake and Columbia rivers. Files will be downloaded from PTAGIS and parr-to-smolt survival of the PIT tagged populations will be determined.
		E	Analyze the results and interpret the analysis.
10	Document the annual migration patterns for spring chinook salmon juveniles from four local, natural populations in the Grande Ronde and Imnaha River basins.	A	Plot the number of PIT tagged fish migrating over time for spring chinook from each population.

		B	Analyze the data using ANOVA of a distribution analysis and interpret the data.
11	Determine survival to parr stage for spring chinook salmon in two local, natural populations in the Grande Ronde River Basin.	A	Use snorkeling observation to determine the summer rearing distribution of parr and the relationship of parr distribution to redd distribution.
		B	Collect parr using snorkelers to herd the fish into a seine, anesthetize parr, determine length and weight and give appropriate mark. Release fish at or near collection site after they recover from anesthesia.
		C	Repeat collection survey two to three days later to enumerate recaptures.
		D	Use mark-recapture methodology to estimate the total abundance of parr in summer.
		E	Estimate survival by life stage using data collected in Task 9.2 combined with smolt abundance and adult escapement data from an ongoing related study.
12	Investigate the significance of alternative life history strategies of spring chinook salmon in two local populations in the Grande Ronde and Imnaha river basins.	A	Estimate the total abundance of precocious males in late summer and determine what portion of the population exhibits this alternate life history strategy.
		B	Estimate the abundance of juvenile salmon that remain in freshwater past their second spring and do not mature sexually and determine the portion of the total parr population that exhibits this alternate life history strategy.
		C	Estimate the number of two year old smolts that out migrate past the mainstem Snake and Columbia river dams.

Objective schedules and costs

Objective #	Start Date Mm/yyyy	End Date Mm/yyyy	Cost %
1	10/98	09/99	8
2	10/98	09/99	9
3	10/98	09/99	8
4	10/98	09/99	9
5	10/98	09/99	8
6	10/98	09/99	9
7	12/98	08/99	11
8	10/98	09/99	11
9	08/98	09/99	8
10	08/98	09/99	6
11	07/98	08/99	8
12	07/98	09/99	6
			TOTAL 3400.00%

Schedule constraints.

Spring chinook salmon in the Grande Ronde basin are listed as threatened under the Endangered Species Act. Therefore, these research activities are regulated by NMFS and are subject to NMFS permitting for scientific take.

This project involves the handling of large numbers of naturally-produced spring chinook salmon. Consequently, there is some risk of mortality associated with our field activities. Over the past three years juvenile chinook salmon mortality has been low, although it has varied some year to year mortality has remained near or below 1% of all fish captured. We have and continue to take several precautions to reduce or eliminate mortality when collecting salmon. We have replaced fin clipping with a benign paint mark for trap efficiencies and when we anticipate high debris loads at our traps we implement 24 hour trap checking to reduce debris accumulation and minimize the time fish are held in the trap.

All field activities on private land are subject to obtaining permission from the landowner for access to the river.

Completion date.

2013

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel	permanent = 175,801 seasonal = 110,628	286,429
Fringe benefits	36% for permanent employees = 63,289 45% for seasonal employees = 49,783	113,072

Supplies, materials, non-expendable property		64,200
Operations & maintenance	NA	0
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	Desk top computer = 2,400 Truck canopy = 1,200	3,600
PIT tags	# of tags: 8,500 @ 2.90 ea.	24,650
Travel	80 d @ $90/d = 7,200 8 commercial flights @ 350 =2,800	10,000
Indirect costs	22.9% of PS and S&S (473,701)	108,477
Subcontracts	Oregon State University	76,952
Other	NA	0
TOTAL		$687,380

Outyear costs

Outyear costs	**FY2000**	**FY01**	**FY02**	**FY03**
Total budget	$708,001	$729,241	$751,118	$773,652
O&M as % of total	NA	NA	NA	NA

Section 6. Abstract

The goal of this project is to investigate the abundance, migration patterns, survival, and alternate life history strategies exhibited by spring chinook salmon juveniles from distinct populations in the Grande Ronde and Imnaha River basins. Our methods include collecting juveniles with migrant traps and passive seining techniques.

This study will provide such information as directed under three separate measures of the Columbia River Fish and Wildlife Program. This study pertains to program measures 7.1C and D in that it will provide information on abundance of parr and estimates for egg to parr and parr to smolt survival. This information is important in evaluating, critical life stages, population status, and sustainability of naturally spawning populations. This study will also provide a means for long term monitoring of juvenile production in the Grande Ronde and Imnaha River basins. Furthermore, program measure 7.4L funded the establishment of Northeast Oregon Hatcheries project (NEOH). Task 3.3.4, identified in the Northeast Oregon Hatchery Grande Ronde River Final Report is the completion of early life history studies in the upper Grande Ronde system.

Section 7. Project description

a. Technical and/or scientific background.

The sizes of spring chinook salmon populations in the Grande Ronde basin have been declining steadily and are substantially depressed below estimates of historic levels. It is estimated that prior to the construction of the Columbia and Snake River dams, more than 20,000 adult spring chinook salmon returned to spawn in the Grande Ronde River

(ODFW 1990). A spawning escapement of 12,200 adults was estimated for the Grande Ronde in 1957 (USACE 1975). Recent population estimates have been variable year to year, yet remain a degree of magnitude lower than historic estimates (e.g., 248 adults in 1995). In addition to a decline in population abundance, a constriction of spring chinook salmon spawning distribution is evident in the Grande Ronde basin. Historically, 21 streams supported spawning chinook salmon, yet today the majority of production is limited to 8 tributary streams and the mainstem upper Grande Ronde River (ODFW 1990). The Wallowa River and its tributaries, and the Minam and Lostine Rivers, contribute substantially to the juvenile salmon production in the basin. In recent years, the Wallowa subbasin has produced as much as 37% of total redds in the Grande Ronde River basin.

Numerous factors are thought to contribute to the decline of spring chinook salmon in the Snake River and its tributaries. These factors include passage problems and increased mortality of juvenile and adult migrants at mainstem Columbia and Snake river dams, overharvest, and habitat degradation associated with timber, agricultural and developmental practices. More than 80% of anadromous fish habitat in the Upper Grande Ronde River is considered to be degraded (USFS 1992). Habitat problems throughout the Grande Ronde River basin (reviewed by Bryson 1993) include poor water quality associated with high sedimentation and poor thermal buffering, moderately to severely degraded habitat, and a decline in abundance of large pool habitat.

Precipitous declines in Snake River spring chinook salmon resulted in these stocks, including the Grande Ronde River stocks, being listed as threatened under the Endangered Species Act (October 1992). Proposed recovery efforts for these salmon stocks require knowledge of stock specific life history strategies and critical habitats for spawning, rearing, and downstream migration (Snake River Recovery Team 1993, NWPPC 1992, ODFW 1990). There is little information available on early life history and critical rearing habitats in the Grande Ronde River basin. Recent calls for information include: a description of the spatial differences in spawning and rearing habitat (Snake River Recovery Team 1993), development of a profile on genetic, life history, and morphometric characteristics of wild and naturally spawning populations (Snake River Recovery Team 1993; NWPPC 1992; ODFW 1990), evaluation of critical habitat needs and factors limiting production (NWPPC 1992; ODFW 1990) in the Grande Ronde Basin.

More specifically, we need to increase our knowledge of juvenile migration patterns, smolt production and survival, the importance of alternate life history strategies, and rearing habitat utilization for juvenile spring chinook salmon in the Grande Ronde basin. Both historic and recent estimates of juvenile production in the basin are lacking. However, given the decrease in total number of adult salmon returning to the basin and the extent of habitat degradation, it is reasonable to assume that juvenile production in the basin also has declined. Recent parr to smolt survival estimates for the Grande Ronde basin range from 7.3-22.1% (Achord et al. 1992, Sankovich et al. 1997). These estimates are based on data from parr that were individually tagged with passive integrated transponders (PIT tags) in late summer and were recaptured at mainstem Columbia and Snake river dams. Therefore, we can not separate mortality that occurs during the smolt migration from mortality that occurs during the fall and winter prior to the smolt migration.

Although, typically the chinook salmon smolt migration occurs in the spring, data from Lookingglass Creek (Burck 1993, Lofy and McLean 1995), Catherine Creek and mainstem Grande Ronde River (Keefe et al. 1995) indicate that some juveniles move out of summer rearing areas during the fall. We know little about the extent of this fall migration. Data from the past two migration years demonstrated that approximately 10% of the juveniles migrated out of summer rearing areas in the upper Grande Ronde River; whereas 50 - 90% of juveniles move out of summer rearing areas in Catherine Creek. Recent data also indicates that not all parr transform into smolts and leave their rearing stream in their second spring. Some parr may choose to mature early and attempt to reproduce with adults during the summer of their first year, while others may simply delay the smolt transformation and migration one year later (Sankovich et al. 1997).

We are also lacking information on where these fall migrants overwinter. Data from Grande Ronde River trapping operations 1993-1996 indicated that the fish that leave upper rearing areas in the fall overwintered somewhere between the upper (RM 186) and lower (RM 102) traps. Much of the habitat in the mid-reaches of the Grande Ronde River is degraded. Stream habitat conditions in the section of the Grande Ronde River below La Grande consist of meandering and channelized stream section which run through agricultural land. Riparian vegetation in this area is sparse and provides little shade or instream cover. The river is heavily silted due to extensive erosion caused by agricultural and forest management practices and mining activities. The affect overwintering has in this habitat on subsequent survival is unclear. Availability of adequate winter habitat can be a major factor affecting salmonid production. Nickelson et al. (1992) demonstrated that the lack of alcove and beaver pond habitat during the winter was an important factor limiting coho production in many coastal Oregon streams. If adequate overwinter rearing conditions do not exist in middle reaches of the Grande Ronde River, then we would expect reduced survival for juveniles exhibiting this life history strategy. We anticipate seeing similar patterns of movement in the Wallowa subbasin but do not know the extent of the fall and spring migrations nor the winter distribution of these fish.

Current restoration efforts include supplementation strategies. A promising supplementation strategy will utilize a donor stock with genetic and life history patterns that are comparable to the endemic stock being supplemented (Bryson 1993, Snake River Recovery Team 1993). We need to learn and recognize the importance of the diversified life history strategies of endemic spring chinook salmon populations so we can develop hatchery supplementation stocks that will mimic but not alter life history characteristics of the endemic fish.

The ultimate goal of this study is to describe the early life history strategies exhibited by spring chinook salmon in the Grande Ronde basin. Initially, we will determine juvenile migration patterns and smolt detection rates at the mainstem Columbia and Snake River dams, and will estimate the winter rearing distribution for spring chinook salmon in the upper Grande Ronde River, Catherine Creek, and Wallowa subbasin streams. Once we have identified the rearing distributions, we will evaluate habitat utilization and habitat preference. We will estimate juvenile survival by life stage and annual smolt production. In addition, we will begin to evaluate the significance of alternate life history strategies to the persistence of these local spring chinook salmon populations.

b. Proposal objectives.

Objective 1: Document the in-basin migration patterns for spring chinook salmon juveniles in the upper Grande Ronde River, including the abundance of migrants, migration timing and duration.

The information obtained by this objective is descriptive and does not conform to hypothesis testing.

Objective 2: Estimate and compare smolt detection rates at mainstem Columbia and Snake River dams for fall and spring migrating spring chinook salmon from the upper Grande Ronde River.

H_o2: Dam detection rates for tag groups that exhibit different life history strategies are similar.

H_a2: Dam detection rates for tag groups that exhibit different life history strategies are different.

H_o2a: Dam detection rates of fall-tagged salmon are similar to dam detection rates of spring-tagged salmon.
H_a2a: Dam detection rates of fall-tagged salmon are different from dam detection rates of spring-tagged salmon.

Objective 3: Document the in-basin migration patterns, including abundance of migrants, timing, and duration, for spring chinook salmon juveniles in Catherine Creek.

The information obtained by this objective is descriptive and does not conform to hypothesis testing.

Objective 4: Estimate and compare smolt detection rates at mainstem Columbia and Snake River dams for fall and spring migrating spring chinook salmon from Catherine Creek.

H_o4: Dam detection rates for tag groups that exhibit different life history strategies are similar.
H_a4: Dam detection rates for tag groups that exhibit different life history strategies are different.

H_o4a: Dam detection rates of fall-tagged salmon are similar to dam detection rates of spring-tagged salmon.
H_a4a: Dam detection rates of fall-tagged salmon are different from dam detection rates of spring-tagged salmon.

Objective 5: Document the in-basin migration patterns, including abundance of migrants, timing, and duration, for spring chinook salmon juveniles in the Wallowa subbasin.

The information obtained by this objective is descriptive and does not conform to hypothesis testing.

Objective 6: Estimate and compare smolt detection rates at mainstem Columbia and Snake River dams for fall and spring migrating spring chinook salmon from the Wallowa subbasin.

H_o6: Dam detection rates for tag groups that exhibit different life history strategies are similar.
H_a6: Dam detection rates for tag groups that exhibit different life history strategies are different.

H_o6a: Dam detection rates of fall-tagged salmon are similar to dam detection rates of spring-tagged salmon.
H_a6a: Dam detection rates of fall-tagged salmon are different from dam detection rates of spring-tagged salmon.

Objective 7: Determine seasonal habitat utilization and preference of juvenile spring chinook salmon in the upper Grande Ronde River, Catherine Creek, and the Lostine River.

H_o7: Juvenile spring chinook salmon utilize available habitats equally during summer and winter.
H_a7: Juvenile spring chinook salmon do not utilize available habitats equally during summer and winter.

Objective 8: Characterize cold- and warm-water areas located in the Grande Ronde River basin and describe the patterns of use by juvenile spring chinook salmon.

The information obtained by this objective is descriptive and does not conform to hypothesis testing.

Objective 9: Estimate and compare smolt detection rates at mainstem Columbia and Snake River dams for migrants from four local, natural populations in the Grande Ronde and Imnaha River basins.

H_o9: Dam detection rates for spring chinook salmon from local populations are similar.
H_a9: Dam detection rates for spring chinook salmon from local populations are different.

Objective 10: Document the annual migration patterns for spring chinook salmon juveniles from four local, natural populations in the Grande Ronde and Imnaha River basins.

H_o10: Migration timing to Lower Granite Dam is similar among local populations of spring chinook salmon.
H_a10: Migration timing to Lower Granite Dam is different among local populations of spring chinook salmon.

Objective 11: Determine survival to parr stage for spring chinook salmon in two local, natural populations in the Grande Ronde River Basin.

The information obtained by this objective is descriptive and does not conform to hypothesis testing.

Objective 12: Investigate the significance of alternative life history strategies of spring chinook salmon in two local populations in the Grande Ronde and Imnaha river basins.

The information obtained by this objective is descriptive and does not conform to hypothesis testing.

c. Rationale and significance to Regional Programs.

Precipitous declines in Snake River spring chinook salmon resulted in these stocks, including the Grande Ronde River stocks, being listed as threatened under the Endangered Species Act (October 1992). Proposed recovery efforts for these stocks require knowledge of stock specific life history strategies and critical habitats for spawning, rearing, and downstream migration (Snake River Recovery Team 1993, Northwest Power Planning Council 1992, Oregon Department of Fish and Wildlife 1990). There is little information available on the early life history and critical rearing habitats in the Grande Ronde River basin. Recent calls for information include: a description of the spatial differences in spawning and rearing habitat (Snake River Recovery Team 1993), development of a profile on genetic , life history, and morphometric characteristics of wild and naturally spawning populations (Snake River Recovery Team 1993; Northwest Power Planning Council 1992, Oregon Department of Fish and Wildlife 1990), and evaluation of critical habitat needs and factors limiting production (Northwest Power Planning Council 1992, Oregon Department of Fish and Wildlife 1990).

This study will provide information as directed under four measures of the Columbia River Basin Fish and Wildlife Program. Measure 7.7 B directs funding for model watershed projects in Idaho, Oregon, and Washington and directs the model watershed commission to identify actions that address key limiting factors for salmon. At a board of director's meeting on March 11, 1994 the Grande Ronde Model Watershed Board approved a motion to support action item 5 "support application to BPA for funding chinook juvenile life history study by ODFW (R. Carmichael)". This project is a direct result of that watershed board action.

This study also is relevant to program measures 7.1 C and D. The long term objective of the program is to collect information on sustainability of wild and naturally spawning, salmonid populations. This necessary information includes a description of the genetic, life history and morphological characteristics of wild and naturally spawning populations, identifying population limiting factors and carrying capacity of salmonid habitat. The proposed study will define critical early life history characteristics, provide estimates of juvenile production, and quantify juvenile habitat preference for naturally produced spring chinook salmon in the upper Grande Ronde system. Furthermore, program measure 7.4 F directed the establishment of Northeast Oregon Hatcheries project (NEOH). Task 3.3.4, identified in the Northeast Oregon Hatchery Grand Ronde River Final Report is the completion of early life history studies in the upper Grande Ronde system.

Three independent studies are ongoing in the Grande Ronde basin that will provide a means for collaboration with the proposed early life history study. Collaboration will occur with a spring chinook spawning ground survey project conducted by our program under the Lower Snake River Compensation Plan. The spawning ground survey project is an ongoing study to monitor escapement to the Grande Ronde and Imnaha rivers. This spawning ground survey project will share redd count data and estimates of total escapement to the upper Grande Ronde River, Catherine Creek, and the Lostine River. Combining our parr and smolt production estimates with escapement data will allow us to track the relationship between spawning escapement and juvenile production in these drainages and estimate egg to parr and egg to smolt survival. We will also collaborate with the smolt monitoring study on the lower Grande Ronde River conducted under the Fish Passage Center's Smolt Monitoring Program. The smolt monitoring project's goal is to monitor and assess smolt travel time from the Grande Ronde Basin to Lower Granite Dam. Currently we provide the smolt monitoring project personnel with weekly trapping reports so that they have expectations of forthcoming trap catches. In addition, recoveries of PIT tagged salmon at this trap will provide us with migration timing through lower reaches of the Grande Ronde River.

d. Project history

Monthly and quarterly progress reports.

Annual Reports:

1994. Investigations into the life history of spring chinook salmon in the Grande Ronde River basin.

1995. Early life history study of Grande Ronde River basin chinook salmon.
1996. Investigations into the life history of naturally produced spring chinook salmon in the Grande Ronde River basin.

Presentations of results have been made to Grande Ronde Model Watershed Board, Technical Committee; and other Grande Ronde organizations; and Oregon Chapter American Fisheries Society.

Adaptive Management Implications:
Results of this study have been used to make recommendations for protection and enhancement of Grande Ronde basin spring chinook populations and their critical rearing habitats. Data from the first two years of this study demonstrated reduced survival among spring chinook salmon that overwinter in the upper Grande Ronde River as compared with those salmon that migrate out of the upper Grande Ronde in the fall. Thus, we recommended to local managers that the upper Grande Ronde habitat be considered critical for overwintering salmon and that immediate habitat restoration efforts should be directed there. Grande Ronde valley habitat also has been shown to be important to overwintering salmon and we have recommended it as a high priority for protection and restoration. In addition, this Early Life History study provides population status information (Fish and Wildlife Program Measure 6.2.A) in the form of estimates of smolt production out of Grande Ronde River tributaries. Data collected as a part of this project can also be used by the Grande Ronde Model Watershed Program (Fish and Wildlife Program Measure 6.5B) and local managers to monitor changes in juvenile production as restoration and monitoring activities are implemented.

e. Methods.

Obj. 1 Methods: Rotary screw traps will be used to collect juvenile spring chinook salmon during their migration from the rearing areas. We will assume that all juveniles captured in these traps are migrants. The traps will be equipped with live boxes which can safely hold the numbers of chinook salmon expected to be trapped during the trapping time intervals. The traps will be checked at time intervals varying from several times a day to every third day dependent upon river conditions and the number of fish being captured. All juvenile spring chinook salmon will be removed from the traps for enumeration, sampling, or interrogation of PIT tags. Prior to sampling, juvenile chinook salmon will be anesthetized with MS-222. Fish will be sampled as quickly as possible and allowed to recover fully before release into the river. Trap efficiencies will be conducted as needed corresponding with changes in river conditions, or at a minimum of once per week. Trap efficiency will be determined by releasing known numbers of paint marked juveniles above the traps and determining the number of recaptures within a defined period of time.

Task 1.1: Collect juvenile spring chinook salmon migrants in the Grande Ronde River by operating two screw traps at selected trapping sites. The lower trap (RM 102) will be operated from fall to spring, while the upper trap (RM 186) will be operated from ice-out (February-March) until ice-up (November).

Task 1.2: Enumerate all spring chinook salmon collected in traps. Measure the length and weight for 80 migrants collected weekly at each trapping location. Calculate condition factor for these 80 salmon

Task 1.3: Mark approximately 50 spring chinook salmon migrants collected weekly at each trap. Salmon will receive a mark of water soluble acrylic paint that is applied with a Panjet marking instrument.

Task 1.4: Determine trapping efficiencies for each trap throughout the trapping period using fish marked in Task 1.3.

Task 1.5: Estimate the number of juvenile chinook salmon migrating from rearing areas based on number of chinook salmon collected in the traps, trap efficiencies, and mortality estimates associated with the marking procedure. Use Bootstrap estimation to calculate confidence intervals for the estimate of juvenile chinook migrating from rearing areas.

Task 1.6: For each trap location, plot estimated number of migrants against time of the year to determine timing and duration of the juvenile migration periods.

Task 1.7: Continuously monitor water temperature using a thermograph and monitor river height daily from a river gage at each trap.

Obj. 2. Methods: PIT tag technology allows fish to be individually marked and subsequent observations made on marked fish without sacrificing the fish. Presently, PIT tag monitors are used at six mainstem Columbia and Snake River dams to monitor PIT-tagged fish passage. Detection rates at the dams only allow us to estimate relative survival from the time of tagging to time of detection and do not allow us to separate parr and smolt mortality. In addition, fish that migrate at different times of the year and overwinter in different habitat types are subject to different environmental conditions which can result in variable survival. In addition to the typical spring smolt migration, there is a fall migration from summer rearing areas in the upper Grande Ronde River. To determine if juveniles migrating at different times of the year exhibit differential detection rates at mainstem dams we will PIT tag approximately 500 juvenile spring chinook salmon during both the fall and spring migration. We will define the fall migration as any downstream movement evident between September and December and the spring migration as any downstream movement evident between February and June. These times encompass the majority of spring and fall migrants. After the fall migration has passed we will also collect and PIT tag approximately 500 juveniles from rearing areas upstream of our traps. We will classify these fish as winter residents. Thus, there are three separate groups for comparisons of detection rates at mainstem dams. Comparing detection rates of smolts tagged during the spring migration with detection rates of smolts tagged in winter will allow us to estimate overwinter mortality. Comparing detection rates of smolts tagged during the fall migration with detection rates of smolts tagged as winter residents will allow us to evaluate the relative success of fall migrant and spring migrant life history types. For statistical comparisons between treatment groups we will use a contingency table designed for the analysis of frequencies. Parametric T-tests and ANOVA tests will be used to compare dam detection rates among groups. Appropriate nonparametric will be substituted if the data are found not to conform to parametric assumptions.

Task 2.1: Interrogate each chinook salmon collected in the screw traps for a previously implanted PIT tag. Record tag number and measure lengths and weights of all PIT-tagged recaptures.

Task 2.2: PIT-tag approximately 500 fall and spring migrating spring chinook salmon juveniles at the upper trap that were not previously tagged and create a PIT tag data base for tagged fish.

Task 2.3: Collect and PIT tag approximately 500 winter resident parr from rearing areas above the upper screw trap. Create a PIT tag data base for these fish.

Task 2.4: Monitor PIT-tagged migrants at the lower trap. Measure and record tag number, length and weight information for all PIT-tagged fish. Enter lower trap recovery data on PTAGIS database.

Task 2.5: Obtain detection information for PIT-tagged fish recovered at Lower Granite, Little Goose, Lower Monumental, McNary, John Day, and Bonneville dams.

Task 2.6: Determine mainstem dam detection rates for fall, winter and spring tagged fish.

Task 2.7: Compare detection rates between treatment groups. Derive estimates of overwinter mortality, the success of fall migration strategy, and the relative success of the fall migrant and spring migrant life history strategies.

Obj. 3 Methods: The same methods will be used as described for the Grande Ronde River in Objective 1.

Tasks 3.1 - 3.7: These tasks parallel tasks 1.1 - 1.7 as described for the Grande Ronde River.

Obj. 4 Methods: The same methods will be used as described for the Grande Ronde River in Objective 2.

Tasks 4.1 - 4.7: These tasks parallel tasks 2.1 - 2.7 as described for the Grande Ronde River.

Obj. 5 Methods: The same methods will be used as described above for the Grande Ronde River in Objective 1.

Tasks 5.1 - 5.7: These tasks parallel tasks 1.1 - 1.7 as described for the Grande Ronde River.

Obj. 6 Methods: The same methods will be used as described for the Grande Ronde River in Objective 2.

Task 6.1 - 6.7: These tasks parallel tasks 2.1 - 2.7 as described for the Grande Ronde River.

Obj. 7 Methods: We will determine the summer and winter rearing distribution of spring chinook salmon in the upper Grande Ronde River, Catherine Creek, and the Lostine River. This will allow us to begin to identify critical rearing habitats in the Grande Ronde basin. Summer and winter were chosen for examining rearing distributions because during these seasons river flow is low and rearing habitat may be limited. Rearing distribution in the upper Grande Ronde and upper Wallowa Rivers is thought to be limited by warm water temperatures in late summer and by ice build up in the winter. Understanding what habitat is utilized and preferred will allow us to make knowledgeable recommendations for habitat protection and enhancement projects. Data from 1993 and 1994 fall migrations indicate that spring chinook juveniles moved into the valley reaches of the Grande Ronde River and Catherine Creek and over wintered there. The habitat in the valley reaches of both these systems is degraded and winter flows are very slow and are either turbid or the river is iced over. Consequently we have been unsuccessful using snorkeling and seining surveys to locate juvenile salmon overwintering in these habitats. After defining the macrohabitat used by wintering fish we will return to these locations in the summer to assess habitat characteristics. In addition, we will estimate fish abundance and density and will determine habitat preferences of juvenile salmon in upper rearing areas. We will use the habitat classification system described in Bisson et al. (1982) with modifications for backwater pools (Nickelson et al 1992). Preferred habitat will be identified using preference/selectivity indices. The habitat and fish abundance surveys began in the summer of 1995 and will continue through the winter of 1999.

Task 7.1: Identify the limits of the summer and winter rearing distribution of salmon juveniles. This task will be accomplished in conjunction with spawning ground surveys.

Task 7.2: Identify and select sites to be sampled within upper rearing areas. Select replicate sites that are representative of all available habitat types (i.e. plunge pool, glide, etc.).

Task 7.3: At each sampling site enumerate spring chinook salmon juveniles using snorkeling observations.

Task 7.4: Record the habitat classification and describe the habitat of each sampling site. The following measurements will be taken: temperature, water velocity, maximum river depth, width at three different points, length, substrate composition, instream habitat, cover, and shade.

Task 7.5: Estimate surface area of each sampling site (S.A. = Length X mean width) and calculate the density of juvenile salmon per unit area of habitat.

Task 7.6: Determine habitat preference using preference/selectivity indices.

Obj. 8 Methods: Stream temperature can be a limiting factor in the behavior, ecology, and survival of salmonids. Recent data indicates that both adult and juvenile salmonids may utilize thermally moderated temperature zones to escape nonpreferred or even lethal temperatures. We propose to locate and characterize both cold- and warm-water zones in critical rearing habitat of juvenile chinook salmon in the Grande Ronde River. Based on the geomorphology of the river channel and basin we will attempt to predict where thermal zones may occur. The presence of a temperature moderated refuge will then be confirmed by conducting stream surveys. After the thermal refugia are mapped for the upper Grande Ronde River will attempt to determine how juvenile spring chinook salmon utilize these systems.

Task 8.1: Map potential thermal refugia in critical rearing habitats for juvenile chinook salmon based on USFS thermal imagery data.

Task 8.2: Conduct stream surveys to identify, map and characterize actual thermal refugia.

Task 8.3: Monitor temperature regimes within refugia and in surrounding waters using thermographs.

Task 8.4: Use snorkeling observations combined with marking techniques to monitor use of thermal refugia (identified in task 8.2) by juvenile chinook salmon.

Task 8.5: Conduct stream surveys to provide information that will help us to relate the frequency and characterization of thermal refugia to the current habitat conditions in the basin.

Obj. 9 Methods: We will collect and PIT tag naturally produced spring chinook parr from Catherine Creek, the Lostine, Minam and Imnaha rivers in the late summer of 1999. Sites and techniques providing the least harmful collection of parr will be used. Relative parr-to-smolt survival of each tagged population will be indexed from recovery rates of PIT-tagged smolts collected at mainstem Snake and Columbia river dams. This data will provide information on interpopulational variation in the parr-to-smolt survival of naturally-produced spring chinook salmon.

Task 9.1: Collect 500 juvenile salmon from Catherine Creek and the Lostine River and 1,000 juveniles from the Minam and Imnaha rivers in August and September 1998. We will locate juveniles using snorkel observations and will collect the fish with seines. Sanctuary dip nets will be used to minimize out of water transfers.

Task 9.2: Once collected, we will implant passive-integrated- transponder tags in the fish. Tags will be implanted as described in Prentice et al. (1990) and Mathews et al. (1990,1992). We will proceed with collection at temperatures up to 17°C and will tag at temperatures up to 15°C. We will tag fish that are 60 mm in fork length or longer and appear to be in good health. Fish will be anesthetized with 40-50 ppm MS-222. PIT tags will be injected manually with modified hypodermic syringes. The syringes will be disinfected for 10 minutes in 70% ethanol prior to tagging. Fish will be allowed to recover after tagging and will be released as near to the collection site as possible.

Task 9.3: Incorporate data into ASCII files according to criteria developed by the PIT Tag Steering Committee and submit files to the PIT Tag Information System (PTAGIS) database.

Task 9.4: Import data from collection stations at Lower Granite, Little Goose, and McNary dams on the Snake and Columbia rivers. Files will be downloaded from PTAGIS and parr-to-smolt survival of the PIT tagged populations will be determined.

Task 9.5: Analyze the results and interpret the analysis.

Obj. 10 Methods: As migrating smolts pass through the collection stations at Lower Granite, Little Goose, and McNary dams, PIT tagged fish will be detected, tags will be decoded, and the date recorded. We will plot and compare this migration timing data for the four populations of spring chinook salmon tagged. This data will provide information on the interpopulational variation in migration timing of naturally produced spring chinook salmon smolts.

Task 10.1: Plot the number of PIT tagged fish migrating over time for spring chinook from each population.

Task 10.2: Analyze the data using ANOVA of a distribution analysis and interpret the data.

Obj. 11 Methods: We will use habitat and spawning survey data to determine all potential summer rearing habitat and then will snorkel to locate spring chinook parr in Catherine Creek and the Lostine River. We will collect and mark up to 1,500 summer parr with either a PIT tag (including 500 from Objective 10) or a paint mark. Approximately three days after marking we will conduct a second snorkel survey to enumerate recaptures. Handling upon recapture will be minimized to allow only identification of PIT tag code or paint mark. Sampling recaptures two to three days after marking allows time for the fish to recover from handling and redistribute themselves and at the same time minimizes the potential for immigration and emigration in the collection area. All fish will be released as near to the collection site as possible.

Task 11.1: Use snorkeling observation to determine the summer rearing distribution of parr and the relationship of parr distribution to redd distribution.

Task 11.2: Collect parr using snorkelers to herd the fish into a seine, anesthetize parr, determine length and weight and give appropriate mark. Release fish at or near collection site after they recover from anesthesia.

Task 11.3: Repeat collection survey two to three days later to enumerate recaptures.

Task 11.4: Use mark-recapture methodology to estimate the total abundance of parr in summer.

Task 11.5: Estimate survival by life stage using data collected in Task 9.2 combined with smolt abundance and adult escapement data from an ongoing related study.

Obj. 12 Methods: During initial collection (Objective 11) all fish will be examined for evidence of precocious maturation and we will collect scales from them to determine age structure of the parr population. Precocious parr will receive a unique mark so that they may be treated as a separate group and the data collected on them can be analyzed independently from immature parr.

Task 12.1: Estimate the total abundance of precocious males in late summer and determine what portion of the population exhibits this alternate life history strategy.

Task 12.2: Estimate the abundance of juvenile salmon that remain in freshwater past their second spring and do not mature sexually and determine the portion of the total parr population that exhibits this alternate life history strategy.

Task 12.3: Estimate the number of two year old smolts that out migrate past the mainstem Snake and Columbia river dams.

f. Facilities and equipment.

All necessary field equipment has been obtained. The addition of one desktop computer for an assistant project leader is requested to facilitate data analysis, summary, and report writing.

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Section 8. Relationships to other projects

This Early Life History study cooperates with numerous ongoing projects both within the Grande Ronde basin and in the Columbia River region. Information collected by our project has been and continues to be utilized by other projects including but not limited to Grande Ronde Basin Captive Broodstock Program and the PATH project (see above for integration with other projects). This data integration eliminates potential duplication of efforts, increases the efficiency of project operation, and enhances the data base of these other projects. The Early Life History study also provides the opportunity to monitor changes in tributary smolt production and survival of wild smolts to Lower Granite Dam over time, thereby providing information for evaluating the Northeast Oregon Hatcheries and Grande Ronde Basin Spring Chinook Captive Broodstock programs, and other ‘on the ground’ restoration and enhancement activities. Lastly the Early Life History study has been approved by and is supported locally as an integral part of the Grande Ronde Model Watershed Program.

Section 9. Key personnel

Richard W. Carmichael, Program Leader, 0.1 FTE

Education

B.S., Fisheries Science, Oregon State University, 1979
M.S., Fisheries Science, Oregon State University, 1984

Current employment

Oregon Dept. Fish and Wildlife, Fish Research and Development, La Grande, OR. July 1990 - present. Program Leader - Executive Manager for NE Oregon Scientific Investigations Program. Primary responsibilities are to develop and direct implementation of a complex research program to evaluate success of protecting, reestablishing, and restoring ESA listed and non-listed stocks in eastern Oregon, oversee the work of 14 full-time fisheries biologists and up to 8 projects, and represent ODFW on regional and national scientific committees.

Past employment

Fisheries Research Biologist (Project Leader), Oregon Department of Fish and Wildlife, LaGrande, OR. December 1983 to July 1990.

Fisheries Research Biologist (Assistant Project Leader), Oregon Department of Fish and Wildlife, LaGrande, OR. March 1983 to December 1983.

Project Assistant (Experimental Biology Aid), Oregon Department of Fish and Wildlife, LaGrande, OR. Oct. 1982 to March 1983.

Expertise

Expertise in fisheries research project development and implementation, personnel management, budget development and tracking, technical report writing, natural production and supplementation research, statistical analysis, coded-wire tag implementation and assessment, bass and trout ecology, creel censusing.

Recent publications

1997. Straying of Umatilla River hatchery origin fall chinook salmon into the Snake River. (R. W. Carmichael). *In* Genetic effects of straying of non-native hatchery fish into natural populations (R. S. Waples, convenor). National Oceanic and Atmospheric Administration, Seattle, WA.

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MaryLouise Keefe, Project Leader, 0.7 FTE

Education

Ph.D., Biological Sciences, University of Rhode Island, August 1990. Dissertation topic: Chemical Ecology of brook trout, Salvelinus fontinalis.

Graduate courses, Oceanography, University of South Florida, 1984.

B.A., Biology, Smith College, May 1983.

Current employment

Oregon Dept. Fish and Wildlife, Fish Research and Development, La Grande, OR. Jan. 6, 1992 - present. Fish and Wildlife Biologist. Project leader for spring chinook salmon early life history, smolt migration, and natural escapement monitoring studies. Oversees and coordinates data collection and necessary project operations. Responsible for coordinating ESA and other research activities in the Grande Ronde basin. Prepares manuscripts, study plans, budgets, reports, permits, detailed sampling plans, and schedules. Assists supervisor in personnel activities. Presents project findings at professional fisheries meetings and to public interest groups.

Past employment

Post-doctoral Research Associate. Rutgers University Marine Field Station, Tuckerton, NJ. Jan. 1, 1991 - Dec. 30, 1991.

Instructor of General Animal Biology. College of Continuing Education, University of Rhode Island, Providence, RI. Sept. 11, 1990 - Jan. 1, 1991.

Instructor of Introductory Biology. Bristol Community College. Fall River, MA. Aug. 27, 1990 - Jan. 1, 1991.

Expertise

Early life history of fishes, salmonid ecology, fish migration, natural escapement monitoring, chemical signals, effects of electrofishing, population dynamics, habitat utilization and preference, and hatchery effectiveness studies.

Recent publications

1997. Accuracy of fork length estimates for chinook salmon and steelhead in compartmented and standard hatchery raceways. (M.C. Hayes, R.C. Carmichael, M. Keefe, and T.A. Whitesel). Prog. Fish Cult.

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1995. Smolt migration characteristics and mainstem Snake and Columbia River Detection Rates of PIT-tagged Grande Ronde and Imnaha River naturally produced spring chinook salmon. (Sankovich, P., M. Keefe, and R.W. Carmichael). Annual Progress Report to the Bonneville Power Administration, Portland, OR.

Brian C. Jonasson, Assistant Project Leader, 1.0 FTE

Education

B.S., Fisheries Science, Oregon State University, 1979
M.S., Fisheries Science, Oregon State University, 1984

Current employment

Oregon Department of Fish and Wildlife, Fish Research and Development, La Grande, OR. , October 1982 - present. Assistant Project Leader for spring chinook salmon early life history study. Duties include planning and coordination of field activities; collection, summary, and analysis of field data; writing manuscripts and reports

Past employment

Graduate Research Assistant, Oregon State University, September 1979 - September 1982
Biological Technician, US Forest Service, June 1979 - September 1979
Biological Intern, Weyerhaeuser Company, June 1978 - September 1978

Expertise

Life history studies of fishes, population estimation of salmonids in streams, sampling of stream fish populations, PIT-tagging of salmonids, estimation of stream habitat quantity and quality, fish culture, hatchery effectiveness.

Recent publications

1996. Investigations into the early life history of naturally produced spring chinook salmon in the Grande Ronde River basin. (Jonasson, B. C., R. W. Carmichael, and M. Keefe) Annual Progress Report. Bonneville Power Administration, Portland, OR

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Paul M. Sankovich, Assistant Project Leader, 1.0 FTE

Education

B.S. in Biology, University of Nevada, May 1987
M.S. in Fishery Resources, University of Idaho, June 1995

Current employment

Oregon Department of Fish and Wildlife, Fish Research and Development, LaGrande OR since August 1995. Assistant Project Leader, spring chinook salmon early life history study in the Grande Ronde River basin. Duties include planning and coordination of field activities, collection and analysis of data, and preparation of manuscripts and reports.

Previous employment

Temporary fishery research technician and fishery research biologist, Hatchery Evaluation Studies and Idaho Supplementation Studies, Idaho Department of Fish and Game, October 1992 - July 1995;
Graduate assistant, University of Idaho, August 1989 - June 1992.

Expertise

Spawning behavior of chinook salmon, migratory behavior of juvenile chinook salmon, hatchery effectiveness and influence of hatchery fish on wild populations, juvenile and adult capture techniques, PIT-tagging methods.

Recent reports

1997. Smolt migration characteristics and mainstem Snake and Columbia River detection rates of Grande Ronde and Imnaha River naturally produced spring chinook salmon. (Sankovich P., R.W. Carmichael, and M. Keefe) Oregon Department of Fish and Wildlife, Fish Research Project 97-56, Annual Progress Report, Portland.

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1995. Smolt migration characteristics and mainstem Snake and Columbia River detection rates of Grande Ronde and Imnaha River naturally produced spring chinook salmon. (Sankovich P., R.W. Carmichael, and M. Keefe) Oregon Department of Fish and Wildlife, Fish Research Project 95-37, Annual Progress Report, Portland.

1992. Distribution and spawning behavior of hatchery and natural adult chinook salmon released upstream of weirs in two Idaho rivers. (Sankovich P., and T.C. Bjornn) Idaho Cooperative Fish and Wildlife Research Unit, Technical Report 92-8, University of Idaho, Moscow, Idaho.

J. Vincent Tranquilli, Assistant Project Leader 1.0 FTE

Education

B.S., Zoology, Southern Illinois University at Carbondale, IL. May 1994

M.S., Natural Resource Ecology and Conservation Biology, University of Illinois at Urbana-Champaign, IL. August 1996

Current employment

Oregon Department of Fish and Wildlife, Fish Research and Development. Enterprise, OR. Assistant Project Leader for spring chinook salmon early life history study in the Grande Ronde River Basin. Duties include planning and coordination of field activities, collection and analysis of data, writing manuscripts and reports.

Previous employment

Experimental Biological Aide, Oregon Department of Fish and Wildlife, Fish Research, LaGrande, OR.

Graduate Research Assistant, Illinois Natural History Survey, Center for Aquatic Ecology, Champaign, IL.

Expertise

Conservation genetics, genetic analysis (protein electrophoresis, polymerase chain reaction (PCR), PCR based RFLP analysis, RAPD analysis, Southern blotting, DNA isolation). Salmonidae early life history strategies, collection and tagging methods, population estimation, and habitat utilization and preference.

Recent publications

1996. Molecular Ecology of Bluegill in the Upper Midwest. (J. V. Tranquilli) Masters Thesis, University of Illinois at Urbana-Champaign, IL.

Section 10. Information/technology transfer

Information and recommendations are distributed to local fisheries managers through meetings and monthly and annual reports. Results are presented to the Grande Ronde Model Watershed Board Technical Committee, other Grande Ronde area organizations, and the Oregon Chapter of the American Fisheries Society. Data are provided electronically and by written reports to other projects including, but not limited to, Northeast Oregon Hatcheries (NEOH) Master Plan, Grande Ronde Basin Spring Chinook Captive Broodstock Program, PATH: Plan for Analyzing and Testing Hypotheses, NEOH Grande Ronde (Nez Perce), NEOH Grande Ronde (CTUIR), and STREAMNET.