
PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Hood River Production Program - Odfw M&E

BPA project number: 8805304

Contract renewal date (mm/yyyy):

10/1999

Multiple actions?

Business name of agency, institution or organization requesting funding

Oregon Department of Fish and Wildlife

Business acronym (if appropriate)

ODFW

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses

7.4L.1, 7.4L.2, 7.4N.1, 7.4N.2

FWS/NMFS Biological Opinion Number(s) which this project addresses

Other planning document references

Columbia River Intertribal Fish Commission. 1996. Wy-Kan-Ush-Mi Wa-Kish-Wit. Spirit of the salmon. The Columbia River anadromous fish restoration plan of the Nez Perce, Umatilla, Warm Springs, and Yakama tribes. Portland, Oregon, Volume II:25-26.

Short description

Monitor and evaluate actions taken to re-establish spring chinook salmon, and improve wild production of summer and winter steelhead, in the Hood River subbasin. Data will be used to develop, and refine, management objectives for the HRPP.

Target species

Summer steelhead, winter steelhead, and spring chinook salmon and resident cutthroat trout, bull trout, and rainbow trout.

Section 2. Sorting and evaluation

Subbasin

Hood

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
<input checked="" type="checkbox"/> Anadromous fish <input checked="" type="checkbox"/> Resident fish <input type="checkbox"/> Wildlife	<input checked="" type="checkbox"/> Multi-year (milestone-based evaluation) <input type="checkbox"/> Watershed project evaluation	<input type="checkbox"/> Watershed councils/model watersheds <input type="checkbox"/> Information dissemination <input type="checkbox"/> Operation & maintenance <input type="checkbox"/> New construction <input checked="" type="checkbox"/> Research & monitoring <input type="checkbox"/> Implementation & management <input type="checkbox"/> Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description
20513	Hood River/Fifteenmile Creek (umbrella proposal)
8805303	Hood River Production Program - CTWS M&E
8902900	Hood River Production Program - Round Butte Hatchery/Pelton ladder
9145	Evaluate the Status of Columbia River Sea-Run Cutthroat Trout
9301900	Hood River Production Program - CTWS & ODFW
9304000	Fifteenmile Creek Habitat Restoration Project
9304001	Fifteenmile Creek Wild Winter Steelhead Smolt Production
9500700	Hood River Production Program - PGE: O&M
9705909	Securing Wildlife Mitigation Sites - Oregon, Mitchell Point
9802100	Hood River Fish Habitat Project

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9304000	Fifteenmile Creek Habitat Restoration Project	Share equipment, machine shop, and office expenses.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1997	Completed Environmental Impact Statement (EIS) for the Hood River Production Program (HRPP).	Yes - An EIS was required before the HRPP could be fully implemented.
1996	Completed physical inventory of all anadromous salmonid bearing streams located on private lands and selected USFS lands in the Hood River subbasin.	Yes - Required to refine estimates of subbasin carrying capacity and to identify cost effective actions for improving habitat in the Hood River subbasin with the goal of increasing subbasin carrying capacity.
1998	Estimated age specific wild steelhead and spring	Yes - Data will be used to estimate both

	chinook salmon smolt production from the Hood River subbasin for the years 1994-98.	subbasin carrying capacity and smolt to adult survival rates and to evaluate the HRPP relative to the programs performance goals.
1998	Estimated the number of hatchery summer and winter steelhead smolts leaving the Hood River subbasin from the 1993-97 brood releases.	Yes - Data will be used to evaluate the HRPP's acclimation facilities and the HRPP's potential impact on indigenous populations of anadromous salmonids.
1998	Estimated jack and adult anadromous salmonid sport harvest in the Hood River subbasin for the years 1996-98.	Yes - Data will be used to evaluate the HRPP relative to the programs performance goals and to evaluate the programs impact on indigenous populations of anadromous salmonids.
1998	Estimated age specific jack and adult anadromous salmonid escapements to Powerdale Dam for the years 1992-98.	Yes - Data will be used to 1) evaluate the HRPP relative to the programs performance goals, 2) evaluate the programs impact on indigenous populations of anadromous salmonids, and 3) develop stock recruitment curves..
1996	Determined spatial distribution of summer and winter steelhead, spring and fall chinook salmon, and coho salmon populations in the Hood River subbasin.	Yes - Data was used to develop guidelines for supplementing the Hood River subbasin in a manner that would minimize the HRPP's impact on indigenous populations of anadromous salmonids.
1998	Determined the temporal distribution of the summer and winter steelhead and spring and fall chinook salmon runs to the Hood River subbasin.	Yes - Data was used to develop guidelines for collecting hatchery broodstock for the HRPP in a manner that would minimize the programs impact on indigenous populations of anadromous salmonids.
1998	Collected whole fish and tissue samples from wild and hatchery steelhead and resident rainbow and cutthroat trout from 1994-1997 in the Hood River subbasin.	Yes - Data will be used to identify genetically unique steelhead and resident rainbow and cutthroat trout populations in the Hood River subbasin and to minimize HRPP's impact on those populations.
1998	Monitored stream flows at selected sites in the Hood River subbasin from 1992-98	Yes - Data will be used to refine estimates of subbasin carrying capacity and provide information needed to more accurately evaluate the HRPP relative to it's performance goals.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Determine abundance, distribution, and life history patterns of anadromous and resident fishes in the Hood River subbasin.	a	Estimate numbers of downstream migrant wild steelhead and spring chinook salmon smolts and hatchery summer and winter steelhead smolts leaving the Hood River subbasin.
		b	Estimate relative abundance of non-supplemented species of downstream migrant salmonids leaving the Hood River subbasin.
		c	Enumerate and count all species of

			migratory salmonids and trout (i.e., bull and cutthroat trout) escaping to Powerdale Dam.
		d	Estimate, by brood year, escapement of natural and hatchery produced spring chinook salmon and summer and winter steelhead to Powerdale Dam.
		e	Estimate age structure of downstream migrant wild rainbow/steelhead.
		f	Estimate temporal distribution of downstream migrant steelhead smolts.
		g	Estimate selected morphometric characteristics of downstream migrant wild steelhead: including mean fork length and condition factor.
		h	Estimate selected morphometric characteristics of downstream migrant spring chinook salmon, coho salmon, migratory bull trout, and cutthroat trout; including mean fork length and condition factor.
		i	Estimate age structure for Hood River stocks of natural and subbasin hatchery produced jack and adult migratory anadromous salmonids.
		j	Estimate the temporal distribution of migration to the Hood River subbasin for Hood River stocks of migratory anadromous salmonids.
		k	Estimate selected morphometric characteristics for Hood River stocks of natural and subbasin hatchery produced migratory anadromous salmonids: including mean fork length and mean weight.
		l	Estimate morphometric characteristics for Hood River stocks of natural and subbasin hatchery produced migratory anadromous salmonids: including mean fecundity and sex ratios.
		m	Estimate harvest of hatchery summer and winter steelhead below Powerdale Dam.
		n	Estimate harvest of natural and hatchery spring chinook salmon below Powerdale Dam.
		o	Collect scale samples from summer and winter steelhead and spring chinook salmon harvested below Powerdale Dam.
		p	Estimate age structure of hatchery summer and winter steelhead and natural and hatchery spring chinook salmon harvested below Powerdale Dam.
		q	Collect coded wire tags from harvested marked anadromous salmonids.
		r	Estimate mean fork length and sex ratio for harvested summer and winter steelhead and spring chinook salmon.

		s	Estimate age structure, mean fork length, and sex ratio, by age class, for harvested summer and winter steelhead and spring chinook salmon.
		t	Summarize coded wire tags recovered from summer and winter steelhead and spring chinook salmon.
		u	Coordinate activities with other project cooperators to ensure effective integration of all projects in the Hood River subbasin.
2	Identify the population genetic structure, systematics, and distribution of genetically unique steelhead, cutthroat, and resident trout populations in the Hood River subbasin.	a	Describe the systematics, population structure and distribution of wild <i>Oncorhynchus mykiss</i> .
		b	Describe the systematics, population structure and distribution of wild <i>Oncorhynchus clarki</i> .
		c	Describe the impacts of past hatchery programs on indigenous populations of steelhead and resident rainbow and cutthroat trout.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999		This obj. will provide estimates of subbasin smolt prod., smolt to adult survival, harvest, escapements, and biological characteristics for anadromous salmonids and will be used to evaluate the HRPP relative to it performance goals.		93.00%
2	10/1999		This obj. will characterize genetic populations of summer and winter steelhead and resident cutthroat and rainbow trout in the Hood River subbasin and define how they have been impacted by past hatchery practices.		7.00%
				Total	100.00%

Schedule constraints

Completion of the final genetics report during this contract period will be dependent on time constraints at the University of Montana which is the sub-contractor for the proposed genetics work.

Completion date

Ongoing

Section 5. Budget

FY99 project budget (BPA obligated): \$412,224

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel		%38	164,792
Fringe benefits		%15	65,917
Supplies, materials, non-expendable property		%12	51,550
Operations & maintenance			
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%1	6,600
NEPA costs			
Construction-related support			
PIT tags	# of tags:		
Travel		%0	1,650
Indirect costs	@ 35.5%	%23	100,788
Subcontractor		%7	32,703
Other			
TOTAL BPA FY2000 BUDGET REQUEST			\$424,000

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount (\$)
Total project cost (including BPA portion)			\$424,000

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	\$437,000	\$450,000	\$462,000	\$476,000

Section 6. References

Watershed?	Reference
<input type="checkbox"/>	Bonneville Power Administration. 1996a. Draft environmental impact statement. Bonneville Power Administration (Contract DOE/EIS 0241), Portland, Oregon.
<input type="checkbox"/>	Bonneville Power Administration. 1996b. Final environmental impact statement (DOE/EIS 0241). Bonneville Power Administration (Contract DOE/EIS 0241), Portland, Oregon.
<input type="checkbox"/>	Columbia River Intertribal Fish Commission. 1996. Wy-Kan-Ush-Mi Wa-Kish-Wit. Spirit

	of the salmon. The Columbia River anadromous fish restoration plan of the Nez Perce, Umatilla, Warm Springs, and Yakama tribes. Portland, Oregon, Volume II: 25-26
<input type="checkbox"/>	Olsen, E.A., R.A. French, and J.A. Newton. 1994. Hood River and pelton ladder evaluation studies. Annual Progress Report of The Confederated Tribes of the Warm Springs Reservation and Oregon Department of Fish and Wildlife to the BPA, Portland, Oregon.
<input type="checkbox"/>	Olsen, E.A., R.A. French, and A.D. Ritchey. 1995. Hood River and pelton ladder evaluation studies. Annual Progress Report of Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation to BPA, Portland, Oregon.
<input type="checkbox"/>	Olsen, E.A., R.A. French, and A.D. Ritchey. 1996. Hood River and pelton ladder evaluation studies. Annual Progress Report of Oregon Department of Fish And Wildlife to the Bonneville Power Administration, Portland, Oregon.
<input type="checkbox"/>	Olsen, E.A., and R.A. French. 1996. Report A: Hood River and Pelton ladder evaluation studies. In ODFW and CTWS. Hood River production program monitoring and evaluation. Annual Progress Report of ODFW and CTWS to BPA, Portland, Oregon.
<input type="checkbox"/>	Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon. 1990. Hood River subbasin salmon and steelhead production plan. Columbia Basin System Planning Report to the NPPC, Portland, Oregon.
<input type="checkbox"/>	ODFW and CTWS. Undated. Hood River/Pelton ladder master agreement. Project Plan of Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon to the BPA, Portland, Oregon.
<input type="checkbox"/>	O'Toole, P. and Oregon Department of Fish and Wildlife. 1991a. Hood River production master plan. Final Report of The Confederated Tribes of the Warm Springs Reservation and the Oregon Department of Fish and Wildlife to the BPA, Portland, Oregon.
<input type="checkbox"/>	O'Toole, P. and Oregon Department of Fish and Wildlife. 1991b. Hood River production master plan (Appendices). Final Report of the CTWS and ODFW to BPA, Portland, Oregon.
<input type="checkbox"/>	Smith, M. and Confederated Tribes of the Warm Springs Reservation of Oregon. 1991. Pelton ladder master plan. Final Report of the ODFW and CTWS to Bonneville Power Administration, Portland, Oregon.

PART II - NARRATIVE

Section 7. Abstract

A monitoring and evaluation (M&E) project was implemented in December 1991 to collect life history and production information on stocks of anadromous salmonids returning to the Hood River subbasin. This information is being used to evaluate various activities of the Hood River Production Program (HRPP) and to develop management guidelines that will minimize the HRPP's impact on indigenous populations of fish. ODFW funded the project until July 1992, after which time funding was provided by the BPA (Project #88-053-04). Jack and adult escapements and selected jack and adult life history patterns, and meristic and morphometric characteristics, have been estimated for six complete run years of winter steelhead, spring and fall chinook salmon, and coho salmon and five complete run years of summer steelhead. Subbasin jack and adult anadromous salmonid harvest and exploitation rates have been estimated for two calendar years. Rainbow-steelhead rearing densities, mean fork length, mean weight, and condition factor have been estimated for four years in selected reaches of stream located throughout the Hood River subbasin. Estimates of subbasin steelhead smolt production and data on selected types of steelhead smolt life history, meristic, and morphometric characteristics, has been collected for four years. Estimates of in-basin hatchery summer and winter steelhead smolt mortality have also been estimated for four years. Information collected by this project has been used to 1) determine the current status of indigenous populations of resident and anadromous salmonids, 2) identify measures that will minimize any potentially detrimental impacts the HRPP could have on indigenous

populations of resident trout and anadromous salmonids, and 3) develop and fine tune management guidelines that will optimize the benefits associated with the HRPP.

Section 8. Project description

a. Technical and/or scientific background

The Northwest Power Planning Council approved the Hood River and Pelton ladder master plans in 1992. The program implemented in the Hood River subbasin was initially called the Hood River Production Program (HRPP) and had two primary goals: 1) to increase subbasin production of wild summer and winter steelhead and 2) re-establish spring chinook salmon in the subbasin. The ODFW began funding a monitoring program in December 1991 and continued funding the program through July 1992. The monitoring program provided stock specific estimates of wild, natural, and hatchery produced anadromous salmonids escaping to an adult migrant trap located in the mainstem Hood River at Powerdale Dam (RM 4.5). The ODFW's monitoring program also collected corresponding information on selected life history patterns and morphometric and meristic characteristics. BPA began funding the monitoring and evaluation (M&E) component of the HRPP in August of 1992 and has funded this project annually through September 1999 (i.e., FY 99).

Current and previous projects have funded work which has provided stock specific empirical data on resident trout and wild, natural and hatchery produced anadromous salmonids in the Hood River subbasin (Olsen et al. 1994, Olsen et al. 1995, Olsen et al. 1996, and Olsen and French 1996). Annual progress reports document information collected on 1) juvenile rearing densities, 2) subbasin steelhead smolt production, 3) the percentage of acclimated and direct released hatchery summer and winter steelhead smolts that leave the subbasin from a given production release, 4) wild and hatchery smolt to adult survival rates, 5) jack and adult escapements and harvest, 6) spatial distribution of adult holding, 7) life history patterns, and 8) selected morphological and meristic characteristics. This quantitative data has been used to more accurately define 1) the spatial distribution of spawning and rearing populations of anadromous salmonids; 2) the current status of indigenous populations of wild summer and winter steelhead; 3) potential impacts the historical subbasin hatchery program may have had on indigenous populations of fish; 4) smolt to adult survival; and 5) the in-basin post-release survival of hatchery summer and winter steelhead production releases.

This project has collected, summarized, and documented over the past five years a significant amount of stock and race specific information on juvenile and adult anadromous salmonids in the Hood River subbasin. This information has been critical in the development of strategies for implementing the HRPP in a manner that will minimize the program's impact on indigenous populations of fish. In particular, initial baseline data has been used extensively to 1) provide a more biologically sound approach as to how and where hatchery smolts will be released into the subbasin, 2) develop strict race specific guidelines for collecting hatchery summer and winter steelhead broodstock, 3) develop strict race specific guidelines for passing hatchery summer and winter steelhead above Powerdale Dam, and 4) begin evaluating the HRPP relative to the programs performance goals. Preliminary streamflow data, collected in the East Fork of the Hood River, also indicates that it may be necessary to take a more proactive approach towards enforcing existing water rights in the Hood River subbasin in order to achieve the biological fish objectives defined in the Hood River/Fifteenmile Creek (umbrella proposal).

Data collected to date has helped to provide resource managers with a better understanding of the current status and biology of indigenous populations of fish but a much longer term dataset will be required to 1) estimate such parameters as subbasin carrying capacity and smolt to adult survival rates; 2) determine what impact the HRPP may be having on indigenous populations of fish and what measures need to be taken to minimize the programs impact, 3) develop predictive tools for estimating future run sizes (i.e.,

stock recruitment curves), and 4) evaluate the HRPP. This is based on the fact that the Hood River subbasin is a very biologically complex system supporting populations of virtually all species of resident trout and anadromous salmonids which may be either directly, or indirectly, impacted by the HRPP. They include wild populations of resident rainbow, cutthroat, and bull trout; summer and winter steelhead; and natural populations of spring and fall chinook salmon and coho salmon. Juvenile and adult life history patterns are typically more complex for steelhead but resident trout and salmon also exhibit a diversity of patterns, although significantly fewer combinations may occur as is the case with coho salmon. This inherent biological diversity precludes a short term study that can achieve the M&E projects biological objectives.

The hatchery winter steelhead component of the HRPP provides an example of the problem. This component of the HRPP was the first to be implemented in the Hood River subbasin and, consequently, will be the first program that we will be able to evaluate. Hatchery winter steelhead smolts were first released as part of the HRPP in the spring of 1994 (1993 brood; direct released). The very first year in which a noticeable impact on subbasin steelhead smolt production might be anticipated from this brood release will not occur until the spring of 1998. Freshwater age 2 smolts migrating in the spring of 1998 would have the potential for being progeny of 1993 brood age 1.2 (freshwater.ocean age) hatchery adult winter steelhead that spawned in the Hood River subbasin 1996. Detecting a statistically significant increase in subbasin smolt production would require that we estimate subbasin smolt production for at least an additional 4-6 years which means that we would not be able to determine if the HRPP has improved subbasin winter steelhead production until FY 2002 at the earliest. Also, any changes in life history patterns and morphometric and meristic characteristics probably could not be statistically detected for juvenile steelhead until FY 2002 and for adult winter steelhead until FY 2006.

The multiplicity of freshwater and ocean life history patterns precludes our ability to implement a short term (i.e., less than five years) M&E program in which the primary goals are to 1) evaluate a complex hatchery supplementation program, 2) determine the hatchery supplementation programs impact on indigenous populations of fish, and 3) develop biologically based guidelines for implementing the program in a manner that will minimize its impact on indigenous populations of fish. If we are to collect a minimum of four complete brood year specific estimates of subbasin smolt production, in-basin hatchery smolt survival, wild and hatchery smolt to adult survival rates, and subbasin harvest and escapement then the following minimum time lines (i.e., interim milestones) will apply given the existing dataset:

- 1) subbasin wild steelhead smolt production in Sept. of 2000,
- 2) in-basin survival of acclimated hatchery winter steelhead smolts in Sept. of 1999,
- 3) in-basin survival of acclimated hatchery summer steelhead smolts in Sept. of 2002,
- 4) wild steelhead smolt to adult survival rate in Sept. of 2005,
- 5) acclimated Hood River stock hatchery winter steelhead smolt to adult survival rate in Aug. of 2003,
- 6) acclimated Hood River stock hatchery summer steelhead smolt to adult survival rate in June of 2007,
- 7) subbasin harvest and escapements of Hood River stock winter steelhead in Aug. of 2003, and
- 8) subbasin harvest and escapements of Hood River stock summer steelhead in June of 2007,

The previous time lines are based on stock specific freshwater and ocean life history patterns identified on scale samples collected from wild and hatchery anadromous salmonids sampled at Powerdale Dam.

b. Rationale and significance to Regional Programs

In 1992, the Northwest Power Planning Council approved the Hood River and Pelton ladder master plans (O'Toole and Oregon Department of Fish and Wildlife 1991a, O'Toole and Oregon Department of Fish

and Wildlife 1991b, and Smith and The Confederated Tribes of the Warm Springs Reservation of Oregon 1991) within the framework of the Columbia River Basin Fish and Wildlife Program. The master plans define an approach for implementing a hatchery supplementation program in the Hood River subbasin.

The primary goals of the HRPP are 1) to increase production of wild summer and winter steelhead (*Oncorhynchus mykiss*) and 2) to reintroduce spring chinook salmon (*Oncorhynchus tshawytscha*) into the Hood River subbasin. Harvest and escapement goals are identified in O'Toole and Oregon Department of Fish and Wildlife (1991a), O'Toole and Oregon Department of Fish and Wildlife (1991b), and Smith and The Confederated Tribes of the Warm Springs Reservation of Oregon (1991). Strategies for achieving the production goals were initially devised based on various assumptions about subbasin carrying capacity, smolt to adult survival rates, in-river harvest rates, and current escapements of anadromous salmonids to the Hood River subbasin. This project proposes operating an adult migrant trap at Powerdale Dam to collect life history and escapement information on jack and adult anadromous salmonids escaping to the Hood River subbasin to more accurately estimate each parameter. This project also proposes operating several juvenile downstream migrant traps to collect life history and subbasin smolt production estimates for wild steelhead and salmon and to collect information on in-basin post-release survival of hatchery summer and winter steelhead smolts and hatchery spring chinook salmon smolts. Information collected at the adult and juvenile migrant traps will be used to 1) refine the wild, natural, and hatchery production goal's of the HRPP using subbasin and stock specific empirical data; 2) evaluate acclimation facilities operated under Project #89-053-03; 3) develop guidelines for implementing the hatchery supplementation project implemented under Project Numbers 95-007-00, 89-029-00, 93-01-900, and 88-053-03; 4) evaluate the Pelton ladder rearing facilities operated under Project Numbers 95-007-00 and 89-029-00; 5) develop guidelines for implementing the hatchery supplementation program in a manner that will minimize the HRPP's impact on indigenous populations of resident and anadromous salmonids; and 6) develop and refine strategies for implementing the HRPP in a manner that will improve efficiency and programmatic benefits.

Populations of summer and winter steelhead and bull trout in the Hood River subbasin were recently listed by the National Marine Fisheries Service (NMFS) as threatened under the Endangered Species Act (ESA). The M&E program will provide information critical to ensuring that the HRPP, and other subbasin management actions, are in compliance with the ESA.

c. Relationships to other projects

The HRPP is composed of six separate BPA funded projects (i.e., Project Numbers 95-007-00, 89-029-00, 93-019-00, 88053-03, 88-053-04, and 98-021-00; *see* Hood River/Fifteenmile Creek [umbrella proposal]). The six projects primarily provide funding for three broad categories of activities. These include hatchery supplementation, habitat restoration, and monitoring and evaluation studies. The hatchery supplementation component of the HRPP is funded under Project Numbers 95-007-00, 89-029-00, 93-01-900, and 88-053-03. These projects provide funding for the hatchery programs broodstock collection, adult holding and spawning, egg incubation, juvenile rearing, marking and coded wire tagging, and acclimation and release of hatchery smolts. The habitat restoration component of the HRPP is funded under the Project #98-021-00. This project provides funding for several projects primarily designed to improve in-basin egg to smolt survival (*see* Hood River/Fifteenmile Creek [umbrella proposal]). The monitoring and evaluation component of the HRPP is funded under Project Numbers 88-053-03 and 88-053-04.

This project provides funding to monitor and evaluate the various actions taken by the five other BPA funded projects collectively involved in implementing the HRPP. Information from the M&E project will be used to evaluate the HRPP relative to the programs performance goals and to provide information critical to implementing the program in a biologically sound manner. Inadequate, or loss of, funding for

any component of the HRPP will jeopardize our ability to achieve the biological fish objectives defined in the Hood River/Fifteenmile Creek (umbrella proposal). The hatchery supplementation and habitat restoration components of the HRPP are critical to achieving the numerical goals defined in the biological fish objectives of the Hood River/Fifteenmile Creek (umbrella proposal) and the M&E project is critical to optimizing the benefits associated with the HRPP while at the same time minimizing the HRPP's impact on indigenous populations of anadromous salmonids.

In addition to the BPA funded projects, implementation of the HRPP relies heavily on the close cooperation of the USFS, PacifiCorp, CTWS, ODFW, Hood River Watershed Council, Farmers Irrigation District, East Fork Irrigation District, Middle Fork Irrigation District, Longview Fiber, and the Oregon State Police. These various entities have supported project goals by way of 1) facilitating or allowing access to public and private lands, 2) providing consent to develop facilities on private lands, and 3) assisting in the implementation of project related tasks. This support has provided, and continues to provide, a significant cost savings in the overall implementation of the HRPP (*see Section 5*, Hood River/Fifteenmile Creek [umbrella proposal]). Continued cooperation among these entities is not only crucial, but necessary, to achieving the biological fish objectives defined in the Hood River/Fifteenmile Creek (umbrella proposal).

This project is located in the same office as The Fifteenmile Creek Habitat Improvement Project (Fifteenmile Creek project; Project #93-040-00). Combining the two projects into one field office has allowed us to significantly lower the annual costs associated with the implementation of this M&E project. The primary savings are achieved by having ready access to equipment and machine tools that would be exceedingly expensive to buy, but which are needed on a periodic basis throughout the year. The Fifteenmile Creek project owns or leases virtually all the machine tools needed to maintain and repair our field equipment, and also provides our project staff with the expertise of personnel trained in the operation and maintenance of the machine tools. Additionally, the general expenses associated with maintaining the field office and shop are equally shared with the Fifteenmile Creek project, which also helps to significantly reduce the overhead associated with this project.

d. Project history (for ongoing projects)

A monitoring and evaluation (M&E) project was implemented in the Hood River subbasin beginning in December 1991 to collect life history and production information on stocks of anadromous salmonids returning to the Hood River subbasin. ODFW funded the project until July of 1992, after which time funding was provided by BPA (Project # 88-053-04). This project has been reauthorized, and fully funded, by BPA through FY 99. Project amounts for Fiscal Years (FY) 1994-98 were \$358,361, \$353,927, \$393,964, \$388,659, and \$412,224, respectively. Projects for FY 94-97 included funding for both the M&E studies and the operation of an existing fish ladder at Powerdale Dam. The operation and maintenance of the newly constructed Powerdale Dam fish facility was shifted to Project #93-01-900, and Project #88-053-04 was used exclusively to provide funding for the M&E studies, beginning with the 1998 fiscal year.

Data collected to date from the M&E program has been used to provide some of the baseline jack and adult life history and escapement information needed to 1) evaluate various management options for implementing the HRPP and 2) identify any potential areas in which the HRPP might have a negative impact on indigenous populations of resident fish. Information was also used in the preparation of an environmental impact statement (EIS; Bonneville Power Administration 1996a; Bonneville Power Administration 1996b) which was completed in 1997. The Bonneville Power Administration (BPA) prepared the EIS in compliance with federal guidelines established in the National Environmental Policy Act (NEPA).

Jack and adult anadromous salmonid escapements and selected life history patterns and meristic and morphometric characteristics have been estimated on six complete run years of winter steelhead, spring and fall chinook salmon, and coho salmon and five complete run years of summer steelhead. Subbasin jack and adult anadromous salmonid harvest and exploitation rates have been estimated for three calendar years. Rainbow-steelhead and cutthroat trout rearing densities, mean fork length, mean weight, and condition factor have been estimated for four years in selected reaches of stream located throughout the Hood River subbasin. Downstream migrant wild rainbow-steelhead have been sampled for four years to estimate subbasin steelhead smolt production and selected life history patterns and meristic and morphometric characteristics. Estimates of in-basin hatchery summer and winter steelhead smolt mortality have also been estimated for four years.

Data collected on this project has been summarized annually in the following progress reports: Olsen et al. 1994, Olsen et al. 1995, Olsen et al. 1996, Olsen and French 1996. Information collected by this project will be used to 1) determine the current status of indigenous populations of resident and anadromous salmonids, 2) identify actions that will minimize any potentially detrimental impacts the HRPP might have on indigenous populations of resident trout and anadromous salmonids, 3) develop and fine tune management guidelines that will optimize the benefits associated with the HRPP, and 4) evaluate the HRPP relative to its performance goals.

e. Proposal objectives

Objective 1. Determine abundance, distribution, and life history patterns of anadromous and resident fishes in the Hood River subbasin.

Sub-objective 1. Determine abundance of downstream migrant anadromous salmonids leaving the Hood River subbasin. (Associated with Tasks a-b in **Section 4**)

Null Hypothesis 1: Implementation of the HRPP has not significantly increased wild steelhead smolt production in the Hood River subbasin.

Alternative: Implementation of the HRPP has significantly increased wild steelhead smolt production in the Hood River subbasin.

Null Hypothesis 2: Implementation of the HRPP has not successfully re-introduced a naturally producing population of spring chinook salmon in the Hood River subbasin.

Alternative: Implementation of the HRPP has successfully re-introduced a naturally producing population of spring chinook salmon in the Hood River subbasin.

Null Hypothesis 3: Hatchery acclimation facilities have not significantly increased numbers of hatchery smolts leaving the Hood River subbasin.

Alternative: Hatchery acclimation facilities have significantly increased numbers of hatchery smolts leaving the Hood River subbasin.

We propose conducting a mark and recapture program at a downstream juvenile migrant trap located near RM 4.5 in the mainstem of the Hood River. The program will be used to estimate numbers of wild steelhead and salmon smolts and hatchery summer and winter steelhead smolts leaving the Hood River subbasin. Data will be used to ascertain current wild steelhead and salmon smolt production and to determine if the HRPP is successful in 1) increasing subbasin wild steelhead smolt production and 2) re-introducing a naturally producing population of spring chinook salmon. Data will also be used to determine if acclimation facilities significantly increase the numbers of hatchery smolts leaving the Hood River subbasin and, in conjunction with estimates of escapement (*see Sub-objective 2*) and harvest (*see Sub-objective 5*), will be used to determine if acclimation facilities significantly increase hatchery smolt to adult survival rates. Estimates will be summarized annually in a research progress report. Ancillary life history, morphometric, and meristic data collected at the migrant trap (*see Sub-objective 3*) will also be summarized in the annual progress report.

Sub-objective 2. Determine abundance of upstream migrant jack and adult anadromous salmonids in the Hood River subbasin. (Associated with Tasks c-d in **Section 4**)

Null Hypothesis 1: Summer and winter steelhead and spring chinook salmon subbasin escapement goals have not been achieved subsequent to implementation of the HRPP.

Alternative: Summer and winter steelhead and spring chinook salmon subbasin escapement goals have been achieved subsequent to implementation of the HRPP.

Null Hypothesis 2: Summer and winter steelhead and spring chinook salmon spawner escapement goals have not been achieved subsequent to implementation of the HRPP.

Alternative: Summer and winter steelhead and spring chinook salmon spawner escapement goals have been achieved subsequent to implementation of the HRPP.

We propose counting upstream migrant jack and adult anadromous salmonids at an adult migrant trap located in the mainstem Hood River at Powerdale Dam (RM 4.5). Data will be used, in conjunction with estimates of harvest (*see Sub-objective 5*), to estimate escapements of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon to the Hood River subbasin. Data will primarily be used to determine if the biological fish objectives in the Hood River/Fifteenmile Creek (umbrella proposal) are being achieved but will also be used to develop stock recruitment curves for projecting future run sizes based on escapements to Powerdale Dam. Estimates will be summarized annually in a research progress report. Ancillary life history, morphometric, and meristic data collected at the adult migrant trap (*see Sub-objective 4*) will also be summarized in the annual progress report.

Sub-objective 3. Determine selected life history patterns for juvenile anadromous salmonids in the Hood River subbasin. (Associated with Tasks e-h in **Section 4**)

Null Hypothesis 1: Implementation of the HRPP has significantly altered selected life history patterns of indigenous populations of anadromous salmonids in the Hood River subbasin.

Alternative: Implementation of the HRPP has not significantly altered selected life history patterns of indigenous populations of anadromous salmonids in the Hood River subbasin.

Null Hypothesis 2: Implementation of the HRPP has significantly altered selected morphometric and meristic characteristics of indigenous populations of anadromous salmonids in the Hood River subbasin.

Alternative: Implementation of the HRPP has not significantly altered selected morphometric and meristic characteristics of indigenous populations of anadromous salmonids in the Hood River subbasin.

We propose sampling downstream migrant rainbow-steelhead and salmon at a juvenile migrant trap located near RM 4.5 in the mainstem of the Hood River and at other selected sites in the subbasin. Age structure of downstream migrants will be determined and freshwater age specific data will be collected on juvenile migration timing, mean fork length (mm), and condition factor. Information will be used to determine if any of the selected parameters are changing subsequent to implementation of the HRPP and to what extent changes may be due to implementation of the hatchery supplementation component of the HRPP. Data will be summarized annually in a research progress report.

Sub-objective 4. Determine selected life history patterns for jack and adult anadromous salmonids escaping to the Hood River subbasin. (Associated with Tasks i-l in **Section 4**)

Null Hypothesis 1: Implementation of the HRPP has significantly altered the life history patterns of indigenous populations of anadromous salmonids in the Hood River subbasin.

Alternative: Implementation of the HRPP has not significantly altered the life history patterns of indigenous populations of anadromous salmonids in the Hood River subbasin.

Null Hypothesis 2: Implementation of the HRPP has significantly altered the morphometric and meristic characteristics of indigenous populations of anadromous salmonids in the Hood River subbasin.

Alternative: Implementation of the HRPP has significantly altered the morphometric and meristic characteristics of indigenous populations of anadromous salmonids in the Hood River subbasin.

We propose sampling upstream migrant jack and adult anadromous salmonids at an adult migrant trap located in the mainstem of the Hood River at Powerdale Dam (RM 4.5). Age structure of upstream migrants will be determined and freshwater/ocean age specific data will be collected on jack and adult migration timing, mean fork length (cm), mean weight (kg), fecundity, and sex ratio. Information will be used to determine if any of the selected parameters are changing subsequent to implementation of the HRPP and to what extent changes may be due to implementation of the hatchery supplementation component of the HRPP. Data will be summarized annually in a research progress report.

Sub-objective 5. Determine harvest and catch contribution of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon. (Associated with Tasks m-p in **Section 4**)

Null Hypothesis 1: Summer and winter steelhead and spring chinook salmon subbasin harvest goals have not been achieved subsequent to implementation of the HRPP.

Alternative: Summer and winter steelhead and spring chinook salmon subbasin harvest goals have been achieved subsequent to implementation of the HRPP.

We propose conducting a creel program below Powerdale Dam to estimate harvest of wild (i.e., catch and release) and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon in the Hood River subbasin. Data will primarily be used to determine if the biological fish objectives defined in the Hood River/Fifteenmile Creek (umbrella proposal) are being achieved but will also be used to monitor the fisheries impact on listed stocks of wild steelhead (*see* Hood River/Fifteenmile Creek [umbrella proposal]). Data will also be used, in conjunction with estimates of escapement at Powerdale Dam, to develop stock recruitment curves (*see* **Sub-objective 2**). Harvest goal's have not been established at this time but will be developed jointly by the Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Indians upon full implementation of the HRPP. Data will be summarized annually in a research progress report.

Sub-objective 6. Determine selected life history patterns of jack and adult anadromous salmonids harvested in the Hood River subbasin. (Associated with Tasks q-t in **Section 4**)

Null Hypothesis 1: Subbasin fisheries are selectively modifying life history patterns of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon.

Alternative: Subbasin fisheries are not selectively modifying life history patterns of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon.

Null Hypothesis 2: Subbasin fisheries are selectively modifying the morphometric and meristic characteristics of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon.

Alternative: Subbasin fisheries are not selectively modifying the morphometric and meristic characteristics of wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon.

We propose sampling jack and adult anadromous salmonids harvested in fisheries located in the mainstem Hood River below Powerdale Dam (RM 4.5). Age structure of fish sampled in the creel will be determined and freshwater/ocean age specific data will be collected on the temporal distribution of

harvest, mean fork length (mm), and sex ratio. Estimates obtained from the fishery will be compared to estimates obtained at Powerdale Dam (*see* **Sub-objective 4**) to determine if the fishery is selectively harvesting jack and adult fish from unique components of the wild, natural, and hatchery runs. Selectively harvesting fish from unique components of the wild, natural, and hatchery runs has the potential for altering either the genetic diversity or genetic composition of indigenous populations of anadromous salmonids. Data will be summarized annually in a research progress report.

Sub-objective 7. Implement a cost effective, efficient, and biologically sound program for achieving the biological fish objectives defined in the Hood River/Fifteenmile Creek (umbrella proposal). (Associated with Task u in **Section 4**)

Null Hypothesis 1: None.

Alternative: None

This proposed monitoring and evaluation (M&E) project is one component of a comprehensive program designed to achieve the biological fish objectives outlined in the Hood River/Fifteenmile Creek (umbrella proposal). Active coordination with other program cooperators is required to 1) effectively evaluate all projects (*see* Hood River/Fifteenmile Creek [umbrella proposal]) relative to the programs performance goals, 2) implement the most cost effective and biologically sound program, 3) provide proper integration of all projects in the Hood River/Fifteenmile Creek Basin, and 4) optimize programmatic benefits. This objective primarily addresses activities required to efficiently integrate all the activities related to the Hood River Production Program with this project's M&E activities. The product deliverable is the annual progress report summarizing data collected during FY 2000.

Objective 2. Identify the population genetic structure, systematics, and distribution of genetically unique steelhead, cutthroat, and resident rainbow trout populations in the Hood River subbasin and determine whether past hatchery programs have affected this structure.

Null Hypothesis 1: Both species are independent, entirely reproductively isolated breeding units.

Alternative: Some level of hybridization is occurring between *O. clarki* and *O. mykiss*.

Null Hypothesis 2: The Hood River subbasin is occupied only by coastal subspecies of the two species (*O.m. irideus* and *O.c. clarki*)

Alternative: Inland subspecies (*O.m. gairdneri* and *O.c. lewisi*) or some undescribed subspecies are at least partly present.

Null Hypothesis 3: Each species is a completely homogenized, randomly breeding group. There are no population structure or isolated gene pools within subspecies of *O. mykiss* and *O. clarki* in the Hood River subbasin.

Alternative: There are isolated gene pools within subspecies of *O. mykiss* and *O. clarki* in the Hood River subbasin.

Null Hypothesis 4: Past hatchery programs for *O. mykiss* have not resulted in inter-breeding between hatchery and wild populations in the subbasin.

Alternative: Past hatchery programs for *O. mykiss* have resulted in inter-breeding between hatchery and wild populations in the subbasin.

The proper management of wild fish species requires a good understanding of the population structure and pattern of biodiversity present in the system. This is particularly critical if a management action may modify or manipulate the structure of that system. The management activity most likely to modify population structure is artificial propagation. Hatchery programs have the unique capacity to significantly impact indigenous populations of fish by modify the fitness of individuals and causing gene flow between populations.

This study provides important baseline information about *O. mykiss* and *O. clarki* population structure and the possible influence of past hatchery practices that is important for good management in the Hood River subbasin. As a consequence of this study the population structure of the two species in this subbasin will be clarified. The Hood River subbasin is located in a geographical area of great complexity for these species. The subbasin is on the boundary of two subspecies of *O. mykiss* (inland and coastal) and on the periphery of the *O. clarki* subspecies (coastal). Both conditions can contribute to exceptional patterns of diversity. Hatchery broodstocks from both *O. mykiss* subspecies have been used in the subbasin, along with an *O. clarki* stock from elsewhere in the subspecies distribution. Further, it has become apparent that the two species hybridize in the subbasin and in adjacent areas.

This study will investigate aspects of the biodiversity of *O. mykiss* and *O. clarki* within the Hood River subbasin, but also from adjacent subbasins from the Willamette to the Deschutes. Isolated sampling in the Hood River subbasin alone would not be meaningful. Samples from adjacent subbasins are necessary in order to put the complex genetic variation observed within the Hood River subbasin into proper context across a wider distribution of the species.

Genetic samples were collected from wild and hatchery summer and winter steelhead and from resident rainbow and cutthroat trout from 1994-96. Most samples have been analyzed to date. We propose analyzing the last of the samples in FY 2000 and preparing a final report which characterizes populations in the Hood River subbasin and the impact of past hatchery practices.

f. Methods

Objective 1.

Sub-objective 1. (Associated with Tasks a-b in Section 4)

Downstream migrant rainbow-steelhead (rb-st) and hatchery summer and winter steelhead smolts will be trapped at a rotary-screw trap located at approximately RM 4.5 in the mainstem Hood River. The screw trap will be sampled on a daily basis. Sampling will be conducted primarily in the morning to reduce temperature related stress. Migrants will be anesthetized, examined for marks, and counted. Counts of downstream migrant rainbow-steelhead (rb-st) will be made for two size categories; they will include fish greater than or equal to 150 mm fork length and fish less than 150 mm fork length. This separation into two size categories will be made because data indicates the smaller size category is predominately comprised of age 0 migrants which are not considered to be smolts (Olsen and French 1996). A random sample of juveniles, collected from both size categories, will be measured to the nearest millimeter fork length, weighed to the nearest 0.1 gram, and have a sample of scales taken for purposes of aging the juveniles. Data will be recorded on computerized data entry forms and keypunched into a computer database. Scale samples will be transferred to glass slides and read by trained personnel located at ODFW's research lab in Corvallis.

Downstream migrant rb-st trapped at the screw trap will be used to indirectly estimate steelhead smolt migration timing and production because no accurate methodology exists to visually identify rainbow trout from downstream migrant steelhead smolts. A mark and recapture methodology will be used to estimate numbers of migrant rb-st passing the migrant trap. Downstream migrants will be marked with a panjet needle-less injector. The panjet will be used to shoot a narrow high speed stream of colored dye at selected fins. This process will be used to mark the fin with a unique color code by infusing a small amount of colored dye below the epidermal layer. The dye color and marked fin combination will be changed every two weeks to uniquely mark fish at defined time intervals throughout the period of smolt migration.

A pooled Petersen estimate with Chapman's modification will be used to estimate numbers of downstream migrants, by size category (*see* Olsen and French 1996). Approximate 95% confidence intervals will be calculated according to methods described in Olsen and French (1996).

Data will be summarized to provide estimates of 1) subbasin wild steelhead smolt production and 2) numbers of hatchery summer and winter steelhead smolts leaving the subbasin. Summaries will be formatted both by brood year and year of sampling. Data will be summarized in an annual progress report.

Constraints: We have effectively operated a downstream migrant screw trap from 1994-98 to estimate numbers of downstream migrant wild rainbow-steelhead and hatchery summer and winter steelhead smolts migrating from the Hood River subbasin. With the exception of estimates made in 1995, the 95% confidence limits have ranged from plus or minus 30-50% of the estimate. The primary constraint limiting our ability to achieve this objective is associated with the highly variable streamflows occurring in the Hood River subbasin. Our ability to accurately estimate downstream migrants is highly dependent upon the severity, and periodicity, of storms encountered in the Hood River subbasin.

Sub-objective 2. (Associated with Tasks c-d in **Section 4**)

Upstream migrant wild, natural, and hatchery produced jack and adult anadromous salmonids will be trapped at an adult migrant trap located in the mainstem Hood River at Powerdale Dam (RM 4.5). The trapping facility will be operated daily, to weekly, throughout the year. The trap will be checked in the morning to minimize potential handling stress associated with sampling fish during the afternoon when water temperatures are typically higher. Spring and fall races of chinook salmon will be distinguished based on run timing, external coloration, and general appearance. Summer and winter races of steelhead will be distinguished based on fin marks, external coloration, degree of scale tightness and scale erosion, state of sexual maturity relative to the time of year, external parasite load, color of gill filaments, and general appearance.

All jack and adult salmonids trapped at the migrant facility will be anesthetized with CO₂, classified by sex, and examined for hatchery mark combinations and injuries. Injuries will be categorized as either a predator scar, net mark, hook scar, or scrape. Predator scars will include both closed and open wounds. A closed wound is typically identified as an "M" shaped marine mammal scar where scales are missing and the skin is scratched. An open wound is identified as one in which the skin is broken. Net marks are distinguished by a raw, rubbed mark on the leading edge of the dorsal fin. Generally, marks from the net twine can be seen encircling the fish. Hook scars include both fresh and healed wounds. Fresh hook scars are any wound in the area of the mouth in which the skin is torn or abraded. Healed hook scars are identified by a missing maxillary or deformed jaw.

A random sample of wild, natural, and hatchery produced jack and adult salmonids will be weighed to the nearest kg, measured to the nearest centimeter fork length, and have a sample of scales taken to age the fish. Fecundity will also be estimated for wild and hatchery produced summer and winter steelhead and natural and hatchery produced spring chinook salmon that are collected at Powerdale Dam for hatchery broodstock. Data will be recorded on computerized data entry forms and keypunched into a computer database. Jack and adult scale samples will be transferred to gummed cards and sent to ODFW's research lab in Corvallis where an acetate impression will be made of each card and they will be read by trained personnel. All jack and adult fish collected at the adult migrant trap will be tagged with uniquely numbered floy tags prior to release. The uniquely numbered tags will allow the capability of identifying recaptures at the adult migrant trap.

Data will be summarized to provide stock specific estimates of the number of wild, natural, and hatchery produced jack and adult salmonids escaping to Powerdale Dam. Data will be formatted to provide summaries by both brood year and run year. Data will be summarized in an annual progress report.

Constraints: The adult trapping facility at Powerdale Dam has been successfully operated since December 1991. We do not anticipate any constraints limiting our ability to achieve the stated objective.

Sub-objective 3. (Associated with Tasks e-h in **Section 4**)

Selected juvenile life history patterns and morphometric and meristic characteristics will be characterized for wild, natural, and hatchery produced migrants sampled at a juvenile migrant trap located in the mainstem Hood River and at several other selected sites in the Hood River subbasin. Sampling methodologies are outlined under **Sub-objective 1**.

Data collected at the juvenile migrant traps will be summarized to provide estimates of age structure, mean fork length (mm), mean weight (gm), and condition factor for downstream migrant 1) wild rainbow-steelhead, 2) naturally produced chinook and coho salmon, and 3) hatchery produced summer and winter steelhead. Data will be formatted to provide summaries by both brood year and run year. Migration timing of wild downstream migrants will also be characterized by age category and for the sample population. Data will be summarized in an annual progress report.

Constraints: We have effectively operated downstream migrant screw traps at various sites in the Hood River subbasin from 1994-98. Highly variable streamflows in the Hood River subbasin could limit our ability to obtain adequate sample sizes to accurately estimate specific parameters but we do not anticipate any constraints limiting our ability to satisfactorily achieve the stated objective.

Sub-objective 4. (Associated with Tasks i-l in **Section 4**)

Selected jack and adult life history patterns and morphometric and meristic characteristics will be characterized for wild, natural, and hatchery produced anadromous salmonids sampled at an adult migrant trap located in the mainstem Hood River at Powerdale Dam (RM 4.5). Sampling methodologies are outlined under **Sub-objective 2**.

Data will be summarized to provide stock specific estimates of age structure, sex ratio, mean fork length (cm), mean weight (kg), and fecundity (i.e., for summer and winter steelhead and spring chinook salmon) for wild, natural, and hatchery produced jack and adult anadromous salmonids sampled at Powerdale Dam. Data will be formatted to provide summaries by both brood year and run year. Stock specific estimates of the temporal distribution of migration will also be estimated for wild, natural, and hatchery components of the run. Data will be summarized in an annual progress report.

Constraints: The adult trapping facility at Powerdale Dam has been successfully operated since December 1991. We do not anticipate any constraints limiting our ability to achieve the stated objective.

Sub-objective 5. (Associated with Tasks m-p in **Section 4**)

Creel surveys will be conducted on the Hood River from 1 January through 31 December. The survey area will extend from the mouth of the Hood River to Powerdale Dam (approximately RM 4.5). The creel will be limited to this reach of stream because the fishery above Powerdale Dam was closed in April of 1998. Access to the survey area below Powerdale Dam is primarily limited to three main sites.

Two levels of stratification (day type and two week period) will be used in summarizing the data, and estimates of catch, catch rate, and effort will be determined for both strata. Sampling days will be categorized as either a weekend-holiday or week day and total catch will be summarized by two week periods (bi-monthly) that will encompass the first through the fifteenth and the sixteenth through the end of each month.

Hours of effort for each sample day will be estimated by developing a pressure curve from periodic pressure counts and calculating area under the curve. The first and last pressure counts will be considered as zero points and will be assumed to be ½ hour before sunrise and ½ hour after sunset. Pressure counts will be conducted three times during the day. Times will be determined by dividing the sampling day into three equal length periods and conducting a pressure count at the point when angler numbers appear to be the highest during the period. The direction of surveyor travel for the first pressure count will be randomly selected. Subsequent pressure counts will be made in the opposite direction of the previous count. Anglers will be interviewed throughout the day to obtain catch rate information on both fishers that had completed angling as well as for those that had not completed angling.

Estimates of total catch and variance in the estimate of total catch, for a given category of fish (i.e., hatchery summer or winter steelhead, hatchery spring chinook salmon, etc.) , will be determined by summing the corresponding stratum estimates. Calculations for estimating harvest and 95% C.L. are presented in Olsen and French (1996).

All harvested jack and adult salmonids will be classified by sex and examined for hatchery mark combinations. Spring and fall races of chinook salmon will be distinguished based on run timing, external coloration, and general appearance. Summer and winter races of steelhead will be distinguished based on hatchery mark combination, external coloration, degree of scale tightness and scale erosion, state of sexual maturity relative to the time of year, external parasite load, color of gill filaments, and general appearance.

A random sample of wild, natural, and hatchery produced jack and adult salmonids will be measured to the nearest centimeter fork length and have a sample of scales taken to age the fish. Snouts will also be collected from fish having a fin mark indicating they have been coded wire tagged. Data will be recorded on computerized data entry forms and keypunched into a computer database. Jack and adult scale samples will be transferred to gummed cards and sent to ODFW's research lab in Corvallis where an acetate impression will be made of each card and they will be read by trained personnel.

Data will be summarized to provide species and race specific estimates of age structure and harvest for wild, natural, and hatchery produced jack and adult anadromous salmonids harvested in the fishery located below Powerdale Dam. Data will be formatted to provide summaries by both brood year and run year. Data will be summarized in an annual progress report.

Constraints: We have successfully estimated harvest from 1996-98. We do not anticipate any constraints limiting our ability to achieve the stated objective.

Sub-objective 6. (Associated with Tasks q-t in **Section 4**)

Selected jack and adult life history patterns and morphometric and meristic characteristics will be characterized for wild, natural, and hatchery produced anadromous salmonids harvested in fisheries located below Powerdale Dam (RM 4.5). Sampling methodologies are outlined under **Sub-objective 5**.

Data will be summarized to provide stock specific estimates of age structure, sex ratio, and mean fork length (cm) for wild, natural, and hatchery produced jack and adult anadromous salmonids harvested in the fishery located below Powerdale Dam. Data will be formatted to provide summaries by both brood year and run year. Stock specific estimates of the temporal distribution of harvest will also be estimated for wild, natural, and hatchery produced components of the run. Data will be summarized in an annual progress report.

Constraints: We have successfully implemented the creel program from 1996-98. We do not anticipate any constraints limiting our ability to satisfactorily achieve the stated objective.

Sub-objective 7. (Associated with Task u in **Section 4**)

This M&E project is designed to 1) evaluate selected activities implemented under several projects funded by the BPA and 2) collect the empirical stock specific biological data needed by fishery managers to implement the HRPP in the most cost effective, efficient, and biologically sound manner. The ability to collect the needed information, and to submit product deliverables in a timely manner, requires the close integration of this projects M&E activities with a complexity of other actions taken in the subbasin to improve wild and natural production of anadromous salmonids; actions which include not only those specific to the HRPP but also include the actions of other projects implemented by both the public and private sector. The tasks associated with this objective provide for the basic administrative structure needed to ensure that this project 1) is effectively coordinated with other subbasin activities designed to improve wild and natural production of anadromous salmonids, 2) provides the biological information needed to implement the HRPP in the most cost efficient and biologically sound manner, and 3) delivers the stated contract deliverables (*see Sub-objectives 1-6*).

Objective 2.

Population structure within these unique systems, along with the influence of past hatchery practices on this structure, will be investigated by comparing genetic variation within and between populations within each species. The genetic markers that are being selected for this part of the study will distinguish differences between populations by differences in frequency levels. Because of the subspecies boundary in the area of the Hood River subbasin, a further focus will be on the use of markers that can distinguish, to a nearly diagnostic level, between the subspecies. And finally, it is apparent that hybridization between *O. mykiss* and *O. clarki* is far more prevalent than expected. Among other implications of this pattern is the potential of hatchery impacts due to interbreeding across species boundaries. Therefore markers are also being selected according to their ability to diagnostically distinguish between the two species and, thereby, clearly identify hybrid zones.

The pattern of natural variation in Hood River *O. mykiss* and *O. clarki*, as well as the potential influence hatchery practices may have on this pattern, will be investigated using micro-satellite DNA markers. Micro-satellite DNA, which is nuclear DNA, can be extracted and amplified, either from whole fish or from any tissue samples that contain nucleated cells. DNA markers range from highly conserved (differences may be evident only between species or even higher taxa) to highly variable (differences occur between individuals). Different markers can, therefore, be selected depending on the questions under investigation.

In this study, whole fish, or fish tissue samples, have been collected from populations throughout the Hood River subbasin as well as from adjacent subbasins and from all *O. mykiss* and *O. clarki* hatchery stocks that have been planted in the Hood River subbasin.

The lab analysis is being conducted by Fred Allendorf's lab at the University of Montana.

Constraints: The primary constraint in the completion of this study, as it was originally designed, is the extraordinary and unexpected level of hybridization between the two study species. It is currently unclear whether these events are entirely natural, or whether some management activity or subbasin condition may be contributing to the events. A further implication of hybridization is that hatchery programs for either species could potentially impact the other. The resolution of this issue may require that additional samples be collected in FY 2000. This may delay completion of the final progress report.

g. Facilities and equipment

This project is currently being operated out of a field station located in The Dalles, Oregon. The field station provides an office, conference room, lobby, large shop, storage area, and parking. The shop is supplied with the machine tools required to repair the downstream migrant traps and other field equipment used by this project. This project has three vehicles (i.e., 4x4 pickup, Suburban, and Jeep) which are parked at the field station. All major office and field equipment, needed to implement this project, have been purchased under previous contracts. Major office equipment include three computers and associated software, FAX machine, copier, laserjet printer, and several desks and filing cabinets. Major field equipment includes: five downstream migrant traps, drift boat, one flow meter, three panjet needless dye injectors, capstan winch, freezer, two microscopes, two balances, and assorted tools. We do not anticipate the need to purchase any high-cost equipment in FY 2000 other than one or more replacement cones for several of the downstream migrant traps.

The downstream migrant traps are presently stored at the HRPP's hatchery facility located at Powerdale Dam. The operation and maintenance of the facility is currently funded by BPA under the project entitled Hood River Production Program (Parkdale & Oak Springs) - O&M (Project #93-019-00). The adult migrant trap is also located at this facility and the continued operation and maintenance of this facility is required to collect the information needed to achieve **Sub-objectives 2 and 4** identified in **Section 7b**.

h. Budget

The budget identified in Section 5 for **Objective 1** primarily provides funding for the personal services (PS) required to 1) operate and maintain downstream migrant traps, 2) conduct a creel, and 3) summarize and analyze data. The budget identified in Section 5 for **Objective 2** primarily provides funding for the PS and services and supplies (S&S) required to finish analyzing whole fish and tissue samples collected under previous contracts as well as to analyze any samples that may need to be collected in FY 2000 to fill critical information gaps identified from previous analysis. Funding for **Objective 2** also provides for the preparation of the final genetics progress report.

Section 9. Key personnel

Program Leader (Chip Dale; FTE 0.17)

Education

- 1986 Colorado State University, Fort Collins, CO.
Degree: MS in Wildlife Biology
- 1977 Colorado State University, Fort Collins, CO.
Degree: BS in Wildlife Biology

Training

- AFS Habitat Workshop, Bellevue, WA. 1991
- State of Oregon DAS Core Curriculum for Managers and Supervisors.

USFS GAWS Aquatic Habitat Inventory.

Experience

1993 – Present

Oregon Department of Fish and Wildlife Assistant Regional Supervisor (Fisheries). Administer the fisheries resources of the High Desert Region of ODFW. Programs include research, habitat, Fisheries, and Propagation. Administer Programs involving ~60 FTE's and ~\$3.5 million dollar budget.

1983-1990

Denver Water Department, Environmental Planner.

Responsible for planning and implementation of habitat restoration projects for mitigation of impacts related to dam construction. Also oversaw inventory programs conducted jointly with Colorado Division of Wildlife to measure fish population abundance in impacted reaches of rivers affected by Denver Water District's operations.

Reports authored or co-authored

Dale, A. R. and J. A. Bailey. 1982. Application of optimal foraging theory for bighorn sheep habitat analysis. Proc. 3rd Bienn. Symp. North Wild Sheep and Goat Council. Pp 254-264.

Chilcote, M., K. Kostow, H. Weeks, H. Schaller, and A. Dale. 1991. First Biennial Report on Status of Oregon's Wild Fish Populations. ODFW.

Project Leader (Erik Olsen; Hood River/Pelton ladder project; FTE 1.0)

Education

1970-1974 Portland State University, Portland, Oregon
Major: Biology

1974-1976 Oregon State University, Corvallis, Oregon
Degree: B.S. in Fisheries Science

Experience

12/92-Present

Oregon Department of Fish and Wildlife

Project leader on the Hood River/Pelton ladder project (Project No. 88-053-04). Primary responsibilities include: 1) project administration, 2) preparation of a research sampling plan to evaluate the HRPP and to collect information on the life history and biology of anadromous and resident salmonids in the Hood River subbasin, 3) summarizing and analyzing project data, and 4) preparation of annual progress reports and statements of work. Experience gained in 1) the development and maintenance of databases, 2) development of software to summarize data using both FORTRAN and Fox Pro programming languages, and 3) the life history and biology of anadromous salmonids.

06/90-11/92

Oregon Department of Fish and Wildlife

Project leader on the Coordinated Information System (Project No. 88-108; Contract No. DE-FC79-89BP94402). Primary responsibilities included: 1) project administration, 2) preparation of a standardized reporting format for reporting information on the life history and biology of anadromous salmonids in Oregon subbasins to the Columbia River basin, 3) preparation of a report, summarizing in a standardized format, all available information on the life history and biology of anadromous salmonids in Oregon subbasins to the Columbia River Basin, and 4) preparation of quarterly reports and statements of work. Experience gained in 1) the presentation and summarization of complex biological data, 2) development and maintenance of databases, 3) development of software to summarize data using FORTRAN, Dbase, and Fox Pro programming languages, 4) the life history and biology of stocks of anadromous salmonids located throughout the

Columbia River Basin, and 5) issues pertaining to the management of stocks of anadromous salmonids in the Columbia River Basin.

Reports authored or co-authored

- Lindsay, R.B., W.J. Knox, M.W. Flesher, B.J. Smith, E.A. Olsen, and L.S. Lutz. 1986. Study of wild spring chinook salmon in the John Day River system. Final Report of Oregon Department of Fish and Wildlife (Project No. 79-4; Contract No. DE-A179-83BP39796) to Bonneville Power Administration, Portland, Oregon.
- Olsen, E.A., and R.A. French. 1996. Report A: Hood River and Pelton ladder evaluation studies. *in* Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon. Hood River production program monitoring and evaluation. Annual Progress Report of Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon (Project No. 88-053-03 and 88-053-04; Contract No. 89BP00631 and 89RP00632) to Bonneville Power Administration, Portland, Oregon.
- Olsen, E.A., R.A. French, and J.A. Newton. 1994. Hood River and pelton ladder evaluation studies. Annual Progress Report of The Confederated Tribes of the Warm Springs Reservation and Oregon Department of Fish and Wildlife (Project Numbers 89-29, 89-29-01, 89-053-03, 89-053-04, and 93-019; Contract Numbers DE-BI79-89BP00631, DE-BI79-89BP00632, DE-BI79-93BP81756, DE-BI79-93BP81758, DE-BI79-93BP99921) to Bonneville Power Administration, Portland, Oregon.
- Olsen, E.A., R.A. French, and A.D. Ritchey. 1995. Hood River and pelton ladder evaluation studies. Annual Progress Report of Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation (Project Numbers 88-29, 89-29-01, 89-053-03, 89-053-04, and 93-019; Contract Numbers DE-BI79-89BP00631, DE-BI79-89BP00632, DE-BI79 93BP81756, DE-BI79-93BP81758, DE-BI79 93BP99921) to Bonneville Power Administration, Portland, Oregon.
- Olsen, E.A., R.A. French, and A.D. Ritchey. 1996. Hood River and pelton ladder evaluation studies. Annual Progress Report of Oregon Department of Fish And Wildlife (Project Numbers 88-29, 89-29-01, 89-053-03, 89-053-04, and 93-019; Contract Numbers DE-BI79-89BP00631, DE-BI79-89BP00632, DE-BI79-93BP81756, DE-BI79-93BP81758, DE-BI79-93BP99921) to Bonneville Power Administration, Portland, Oregon.
- Olsen, E.A., and R.B. Lindsay. 1984. Evaluation of habitat improvements – John Day River. Closing Quarterly Report of Oregon Department of Fish and Wildlife (Project Number 82-9) to Bonneville Power Administration, Portland, Oregon.
- Olsen, E.A., and R.B. Lindsay. Undated. Summer steelhead in the Deschutes River, Oregon. Information Reports (Fish) of the Oregon Department of Fish and Wildlife, Portland, Oregon. (Unpublished draft.)
- Olsen, E., P. Pierce, M. McLean, and K. Hatch. 1992. Stock summary reports for Columbia River anadromous salmonids, volume I: Oregon. Final Report of Oregon Department of Fish and Wildlife (Project No. 88-108; Contract No. DE-FC79-89BP94402) to Bonneville Power Administration, Portland, Oregon.
- Olsen, E., P. Pierce, M. McLean, and K. Hatch. 1992. Stock summary reports for Columbia River anadromous salmonids, volume II: Oregon. Final Report of Oregon Department of Fish and Wildlife (Project No. 88-108; Contract No. DE-FC79-89BP94402) to Bonneville Power Administration, Portland, Oregon.
- Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon. 1990. Hood River subbasin salmon and steelhead

production plan. Columbia Basin System Planning Report to Northwest Power Planning Council, Portland, Oregon.

Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs. Undated. Hood River/Pelton ladder master agreement. Project Plan of Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon (Project 89-029; Contract DE-BI79-93BP81758) to Bonneville Power Administration, Portland, Oregon. (Unpublished draft.)

Assistant Project Leader (Rod French; Hood River/Pelton ladder project; FTE 1.0)

Education

1986 Oregon State University, Corvallis, Oregon
Degree: B.S. in Fisheries Science

Experience

12/92-Present

Oregon Department of Fish and Wildlife

Assistant project leader on the Hood River/Pelton ladder project (Project No. 88-053-04). Primary responsibilities include: 1) the implementation of project field work, 2) assisting the project leader in the preparation of a research sampling plan for the HRPP and to collect information on the life history and biology of anadromous and resident salmonids in the Hood River subbasin, 3) summarizing and analyzing project data, 4) the purchase of field equipment, 5) the coordination of field work with other project cooperators, 6) assisting the project leader in the preparation of annual progress reports and statements of work, and 7) giving presentations on project results and findings. Experience gained in 1) the use of downstream migrant screw traps, 2) the use of adult trapping facilities, and 3) the life history and biology of anadromous salmonids.

06/92-11/92

Oregon Department of Fish and Wildlife

Assistant project leader on the Umatilla Hatchery Monitoring and Evaluation Project. Primary responsibilities include 1) the implementation of project tasks designed to collect information on water chemistry; life history and biology of anadromous salmonids; and harvest, 2) the summarization and analysis of project data, 3) assisting the project leader in preparation of annual progress report, and 4) giving presentations at professional society meetings.

01/88-05/92

Oregon Department of Fish and Wildlife

Fisheries Biologist 1 on the Native Trout Research Project. Primary responsibilities include assisting project leader in the collection of data on native trout in Klamath, Harney and Deschutes river subbasins. Data was collected on 1) migration timing, 2) numbers of downstream migrants, temporal and spatial distribution of spawning, 3) life history and biology of resident salmonids, and 4) relative resistance of trout to specific pathogens. Assisted with preparation of monthly and annual reports and with the preparation of publications for scientific journals. Prepared and presented presentations for professional societies and sportsman's groups.

Report's authored or co-authored

Buchanan, D.V., A.R. Hemmingsen, D.L. Bottom, R.A. French, and K.P. Currens. 1989. Native trout project. Annual Progress Report of Oregon Department of Fish and Wildlife (Fish Research Project F-136-R), Portland, Oregon.

Buchanan, D.V., A.R. Hemmingsen, D.L. Bottom, P.J. Howell, R.A. French, and K.P. Currens. 1990. Native trout project. Annual Progress Report of Oregon Department of Fish and Wildlife (Fish Research Project F-136-R), Portland, Oregon.

- Buchanan, D.V., A.R. Hemmingsen, D.L. Bottom, P.J. Howell, R.A. French, and K.P. Currents. 1991. Native trout project. Annual Progress Report of Oregon Department of Fish and Wildlife (Fish Research Project F-136-R), Portland, Oregon.
- Currens, K.P., A.R. Hemmingsen, R.A. French, D.V. Buchanan, C.B. Schreck, and H.W. Li. 1997. Introgression and susceptibility to disease in a wild population of rainbow trout (*Oncorhynchus mykiss*). North American Journal of Fisheries Management. In Press.
- Hemmingsen, A.R., D.V. Buchanan, D.L. Bottom, R.A. French, K.P. Currents, and F.C. Shrier. 1988. Native trout project. Annual Progress Report of Oregon Department of Fish and Wildlife (Fish Research Project F-136-R), Portland, Oregon.
- Hemmingsen, A.R., R.A. French, D.V. Buchanan, D.L. Bottom, and K.P. Currents. 1992. Native trout project. Annual Progress Report of Oregon Department of Fish and Wildlife (Fish Research Project F-136-R), Portland, Oregon.
- Hemmingsen, A.R., R.A. French, and D.V. Buchanan. 1993. Native trout project. Annual Progress Report of Oregon Department of Fish and Wildlife (Fish Research Project F-136-R), Portland, Oregon.
- Olsen, E.A., and R.A. French. 1996. Report A: Hood River and Pelton ladder evaluation studies. *in* Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon. Hood River production program monitoring and evaluation. Annual Progress Report of Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon (Project No. 88-053-03 and 88-053-04; Contract No. 89BP00631 and 89RP00632) to Bonneville Power Administration, Portland, Oregon.
- Olsen, E.A., R.A. French, and J.A. Newton. 1994. Hood River and pelton ladder evaluation studies. Annual Progress Report of The Confederated Tribes of the Warm Springs Reservation and Oregon Department of Fish and Wildlife (Project Numbers 89-29, 89-29-01, 89-053-03, 89-053-04, and 93-019; Contract Numbers DE-BI79-89BP00631, DE-BI79-89BP00632, DE-BI79-93BP81756, DE-BI79-93BP81758, DE-BI79-93BP99921) to Bonneville Power Administration, Portland, Oregon.
- Olsen, E.A., R.A. French, and A.D. Ritchey. 1995. Hood River and pelton ladder evaluation studies. Annual Progress Report of Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation (Project Numbers 88-29, 89-29-01, 89-053-03, 89-053-04, and 93-019; Contract Numbers DE-BI79-89BP00631, DE-BI79-89BP00632, DE-BI79 93BP81756, DE-BI79-93BP81758, DE-BI79 93BP99921) to Bonneville Power Administration, Portland, Oregon.
- Olsen, E.A., R.A. French, and A.D. Ritchey. 1996. Hood River and pelton ladder evaluation studies. Annual Progress Report of Oregon Department of Fish And Wildlife (Project Numbers 88-29, 89-29-01, 89-053-03, 89-053-04, and 93-019; Contract Numbers DE-BI79-89BP00631, DE-BI79-89BP00632, DE-BI79-93BP81756, DE-BI79-93BP81758, DE-BI79-93BP99921) to Bonneville Power Administration, Portland, Oregon.

Section 10. Information/technology transfer

Data collected from this project will be summarized in an annual progress report and distributed to fishery managers. Project personnel will present information to local watershed council's and

sport's groups; other participant's working on the HRPP; the NPPC, CBFWA, and BPA; and ODFW staff.

Congratulations!