

PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project Snake River Steelhead Hooking Mortality Study	
BPA project number	20016
Contract renewal date (mm/yyyy)	New WDFW Project
Multiple actions? (indicate Yes or No)	No
Business name of agency, institution or organization requesting funding Washington Department of Fish and Wildlife	
Business acronym (if appropriate)	WDFW
Proposal contact person or principal investigator:	
Name	Steve Martin
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NPPC Program Measure Number(s) which this project addresses 4.1A, 7.2, 7.2A1, 7.2A.6	
FWS/NMFS Biological Opinion Number(s) which this project addresses 7(d), and NMFS Biological Opinion: Reinitiation of Consultation to Consider Impacts to Listed Steelhead Resulting from 1998 Fall Season Fisheries Conducted under the Columbia River Fish Management Plan and 1996-1998 Management Agreement	
Other planning document references NMFS Recovery Plan: Recovery Team Report 1994 NPPC Snake River subbasin production plan 1990 NMFS Salmon Recovery Plan, 1995 Annual Implementation Work Plan, Vol I. 1998. WY-KAN-USH-MI-WA-KISH-WUT: Tribal Recovery Plan: The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes	
Short description Utilizing hatchery steelhead trout and two unique research methods, assess hooking mortality of wild Snake River steelhead trout.	
Target species Snake River Steelhead Trout (<i>Oncorhynchus mykiss</i>)	

Section 2. Sorting and evaluation

Subbasin
Snake River and Grande Ronde subbasins

Evaluation Process Sort

CBFWA caucus		CBFWA eval. process		ISRP project type
X one or more caucus		If your project fits either of these processes, X one or both		X one or more categories
X	Anadromous fish	X	Multi-year (milestone-based evaluation)	Watershed councils/model watersheds
	Resident Fish		Watershed project eval.	Information dissemination
	Wildlife			Operation & maintenance
				New construction
				X Research & monitoring
				X Implementation & mgmt
				Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

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

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
	Lower Snake River Compensation Plan	Hatchery Steelhead Production potentially affecting mortality of wild Snake River steelhead

9801003	Spawning Distribution of Fall Chinook Salmon Released as Sub-yearlings Above Lower Granite Dam	Remote receivers in the vicinity of the Grande Ronde River will detect radio tagged steelhead and project manager will provide data downloads to us.
	Adult Chinook Salmon Radio Telemetry in the Snake River Basin. University of Idaho. Ted Bjornn	Remote receivers in the vicinity of the Grande Ronde River will detect radio tagged steelhead and project manager will provide data downloads to us.
	WY-KAN-USH-MI-WA-KISH-WIT: The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes.	Hatchery Steelhead Production potentially affecting mortality of wild Snake River steelhead.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
	New Project for WDFW	

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Collect and radio tag adult steelhead in the Grande Ronde River for the natural environment group	a	During September and October, catch steelhead in the lower Grande Ronde River with hook and line and implant a radio tag into each hatchery steelhead caught.
2	Track radio tagged steelhead in the Grande Ronde River	a	Radio track (car or boat) the lower Grande Ronde River weekly from September 1 until December 1, and record location of radio tagged steelhead. Receive remote receiver data from University of Idaho and determine if radio tagged steelhead have passed those remote locations.
3	Assess hooking mortality of radio tagged steelhead in the Grande Ronde River	a	After 14 days of “no movement” determined by radio tracking, snorkel the site to determine if the fish is alive or dead.
4	Collect adult steelhead at the Lyons Ferry Hatchery for the controlled environment research group	a	Catch 50 adult steelhead at the Lyons Ferry Hatchery effluent with hook and line and mark and tag them (treatment group)

Obj 1,2,3	Objective	Task a,b,c	Task
		b	Catch 10 hatchery steelhead with hook and line at the Lyons Ferry Hatchery effluent and implant a “dummy” radio tag in them (control group for the fish tagged in the Grande Ronde River).
		c	Net 50 adult steelhead from the trap at Lyons Ferry Hatchery and tag them (control group)
		d	Transfer 110 (50 caught, +50 netted, +10 dummy tagged) steelhead to the Dayton acclimation pond
5	Assess fish survival/mortality in the acclimation pond in Dayton	a	Monitor fish daily for 3 months in the acclimation pond in Dayton and record when a fish dies as well as it’s tag number.
6	Monitor water temperatures	a	Install thermographs: 1) in the Grande Ronde River near the mouth where fish will be captured, 2) in the Dayton acclimation pond, and 3) in the Snake River adjacent to the Lyons Ferry fish hatchery.
7	Report findings	a	Compile, analyze, and report information to peer reviewed fishery journals, project managers and agencies.
		b	Prepare a descriptive summary of the study and findings to be presented on the WDFW internet web page.
		c	Present findings to the public and angling groups in open-house forums.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	09/1999	10/2000	tag 50 steelhead in the Grande Ronde River	x	30
2	09/1999	12/2000	track 50 steelhead in the Grande Ronde River	x	40

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
3	09/1999	12/2000	Assess hooking mortality of steelhead tagged in the Grande Ronde River	x	5
4	09/1999	09/2000	Collect 50 treatment and 50 control steelhead at LFH	x	10
5	09/1999	12/2000	Assess hooking mortality of steelhead in Dayton acclimation pond	x	5
6	09/1999	11/1999	Monitor water temperatures	x	5
7	09/1999	06/2001	Report findings	x	5
				Total	100

Schedule constraints

Inability to capture adult steelhead in the Grande Ronde in September will result in re-scheduling that activity until October. The Dayton acclimation pond has an existing water right from the Washington State Department of Ecology for 6 c.f.s from January 1 through June 1 annually. Bill Neve, water master Walla Walla, has stated that a term permit for non-consumptive use of 6 c.f.s. can be issued if the NMFS is supports the project.

Completion date

June 2001

Section 5. Budget

FY99 project budget (BPA obligated):	New WDFW Project
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FY2000 budget by line item

Item	Note	% of total	FY2000 (\$)
Personnel	Fish Bio 2, 6 months. Tech 1, 3 months. (Project Manager 0.1 FTE, Principal Investigator 0.2 FTE)	37	43,500
Fringe benefits	28.5% of Personnel Costs	11	13,398
Supplies, materials, non-expendable property	50 radio transmitters (@ \$200), waders, rain gear, thermographs	13	15,000
Operations & maintenance	NONE		

Capital acquisitions or improvements (e.g. land, buildings, major equip.)	radio receiver (\$15,000), one raft and trailer (\$7,000), computer and printer (\$3,000)	21	25,000
NEPA costs	NONE		
Construction-related support	NONE		
PIT tags	# of tags:0		
Travel	500 miles/week @ \$0.34 x 20 weeks	3	3,400
Indirect costs	22.5% (excludes capitol equipment)	14	16,942
Subcontractor			
Other			
TOTAL BPA REQUESTED BUDGET			\$117,240

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount (\$)
WDFW	Used Vehicle	5	\$5,864
Various steelhead fishing clubs	Angling	10	\$11,724
WDFW LSRCP	Creel data	5	\$5,864
Total project cost (including BPA portion)			\$140,692

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	\$92,240			

Section 6. References

Watershed?	Reference
	Bruesewitz, S.L. 1995. Hook placement in steelhead. Washington Department of Fish and Wildlife. Technical Report Number AF95-01.
	Mongillo. P. 1084. A summary of salmonid hooking mortality, Washington Department of Game, Seattle.
	Martin, S.W., J.A. Long, and T.N. Peterson. 1995. Comparison of survival, gonad development, and growth between rainbow trout with and without surgically implanted dummy radio transmitters. North American Journal of Fisheries Management, 15:494-498.
	U. S. Army Corps of Engineers. 1987. Annual fish passage report Columbia and

	Snake Rivers for salmon, steelhead, and shad. Prepared by U.S. Army Engineers District, Walla Walla, Wa.
	Oregon Department of Fish and Wildlife (ODFW) 1994. Data for hatchery steelhead releases, 1980 to 1994. <i>In</i> Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-27. August 1996.
	U.S. Army Corps of Engineers. 1997 Annual Fish Passage Report Columbia and Snake Rivers for Salmon Steelhead and Shad.
	National Marine Fisheries Service (NMFS) 1994a. Snake River Recovery Team: Final Recommendations to the National Marine Fisheries Service.
	National Marine Fisheries Service (NMFS) 1994b. Factors for Decline; A supplement to the notice of determination for west coast steelhead under the Endangered Species Act.
	Columbia River Inter Tribal Fish Commission (CRITFIC). 1995. WY-KAN-USH-MI-WA-KISH-WIT: The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs, and Yakama Tribe.
	Washington Department of Fish and Wildlife. 1998. Water temperature data for the Touchet River provided by Glen Mendel
	Washington Department of Fish and Wildlife. 1997. 1995-96 Annual Report: Lyons Ferry Trout Evaluation Study. Report # H97-08. September 1997.
	Wedemeyer, G.A., B.A.Barton, and D.J.Mcleay, chapter 14. <i>In</i> Methods for Fish Biology, C.B.Schreck and P.B. Moyle, editors. American Fisheries Society, Bethesda, Maryland, USA.
	Mazeaud, M.M., F.Mazeaud, and E.M.Donaldson. 1977. Primary and secondary effects of stress in fish: some new data with a general review. Transactions of the American Fisheries Society 106:201-212.
	Barton, B.A. and C. B. Schreck. 1987. Influence of acclimation temperature on interrenal and carbohydrate stress response in juvenile chinook salmon (<i>Oncorhynchus tshawytscha</i>). Aquaculture 62:299-310.
	Wild Salmonid Policy: State of Washington. 1997.

PART II - NARRATIVE

Section 7. Abstract

Snake River steelhead trout are listed under the Endangered Species Act as “threatened”. When a species is listed, state and federal agencies are required to comply with the specific laws of the Act. Section 7 of the ESA states “Each federal agency shall insure that any actions authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of an endangered or threatened species”. Because a sport fishery for hatchery steelhead exists in the Snake River basin and because production of these hatchery steelhead is funded by the federal government, compliance with ESA is mandatory.

The goal of this study is to determine if the fall season sport fishery results in hooking mortality of wild Snake River steelhead trout. The proposal objectives are to catch adult steelhead trout in the Grande Ronde River using hook and line, fight them to exhaustion, and then radio track them to assess post-hooking survival. Concurrent with the assessment of this group of fish, we will catch hatchery adult steelhead at the mouth of the Lyons Ferry Hatchery trap on the Snake River with hook and line, fight them to exhaustion and transport them to a pond for post-hooking assessment. This group of fish will also have an equal number of control fish netted from the trap and transported to the pond. Catching, tagging, and tracking of fish will occur annually in FY 1999 and FY 2000 between September 1, 1999 and November 31, 1999 with a completion report in the spring of 2001.

Knowledge of hooking mortality rates will allow managers to make wise decisions to provide the maximum protection to wild steelhead trout in the Snake River basin. This information is critical to Bonneville Power Administration because it funds production of steelhead as part of the Lower Snake River Compensation Plan; the steelhead fishery, aimed at catching hatchery steelhead may be indirectly responsible for mortality of wild fish through incidental harvest. The 4d rule under ESA which allows for “take” of listed species may be questioned without knowledge of management strategies to minimize or avoid “taking” a listed species.

Although we are focusing research in the Snake River basin, the potential for other geographical regions in the Pacific Northwest faced with this issue (incidental harvest of wild fish during warm water temperatures) to utilize this research methodology exists. A final report recommending the most appropriate management strategy for the Snake River basin will be written.

Section 8. Project description

a. Technical and/or scientific background

Hatchery summer steelhead trout have been produced in Oregon, Washington, and Idaho and released into the Snake River since 1983 to mitigate for losses due to construction of the four lower Snake River dams (COE 1987). Steelhead return to numerous Snake River tributaries including the Grande Ronde and Tucannon Rivers where September and October water temperatures often exceed 70 degrees. The number of steelhead smolts released from these hatcheries exceeded 10 million in 1993 (ODFW 1994). The number of adult steelhead returning to the Snake River has varied, but in 1997 there were 103,830 adult steelhead that entered the Snake River (COE 1997). Although these fish enter the Snake River most months of the year, the majority enter between July and November. Within that time frame, 68% of the wild steelhead return in September and October (COE 1997). Water temperatures in the Snake River and its tributaries, including the Grande Ronde, Tucannon and Walla Walla Rivers exceeds 70 degrees in September and are often higher than 65 degrees in October (COE 1997, WDFW 1998). It is known that warm water can be unhealthy and stressful for steelhead and salmon (Barton 1987). It is also reported that hooking results in mortality of salmonids (Bruesewitz 1995) and is related to environmental conditions. Hooking a fish and playing it until it can no longer swim results in adverse physiological effects (Wedemeyer 1990). Further, after fighting until exhausted, a fish will experience a reduction in resistance to infectious diseases, reproductive success and survival (Mazeaud 1981). Coincidentally, it is during the months of September and October that anglers begin to catch steelhead in the Snake River and its tributaries. The total number of steelhead caught in the Tucannon, Snake and Grande Ronde rivers in Washington State for run year 1995-96 was 15,329 (WDFW 1997). Of those, 5,672 were caught in September and October. During September and October 20% of the steelhead caught are wild (Schuck, WDFW pers. com). So, the number of adult wild steelhead caught and released in the Snake River basin in Washington State in the months of September and October during run year 1995-96 was approximately 1,134.

Although there is no directed fishing for wild steelhead, they are caught, sometimes in relatively large numbers, incidentally when they mix with other catchable stocks, like hatchery-produced steelhead. It is this incidental harvest and factors associated with incidental harvest (caught, exhausted, possibly wounded and returned to the river) that the National Marine Fisheries Service addressed in their recent biological opinion on 1998 Columbia River fall fishing seasons. The NMFS identified factors associated with the harvest of hatchery steelhead as being partially responsible for the decline of wild Snake River Steelhead (NMFS 1994a, NMFS 1996b). The CBFWA Fish and Wildlife Program has prioritized maintaining species diversity while increasing the number of salmon in the basin. Increasing the number of salmon and steelhead may result in decreasing species diversity due to mortality of wild fish incidentally harvested in the fishery. For these reasons, it is imperative that we know the incidence of wild fish caught in the fishery that succumb to post-hooking mortality.

b. Rationale and significance to Regional Programs

The proposed project's goal is to determine hooking mortality rates of steelhead in the Snake River basin. The relationships of the project goal to the 1994 Fish and Wildlife Program are numerous, including the ambitious goal of doubling salmon and steelhead runs without loss of biological diversity (NPPC 1994). If doubling the steelhead run requires hatchery production and if wild fish mortality comes at the expense of doubling the runs, then the goal of maintaining biological diversity may never be met. We must ensure that wild fish are protected while producing fish to meet tribal, commercial and recreational harvest needs. The Council, through its Fish and Wildlife Program supports the adaptive management process, stating that priority should be given to activities that address critical uncertainties and test important hypotheses (NPPC 1994).

As stated earlier, the Lower Snake River Compensation Program has been successful at producing large numbers of hatchery steelhead returning to the Snake River. As a result of the successful hatchery programs, a fall season fishery conducted under the Columbia River Fish Management Plan exists in the Snake River basin, even though it has been documented that incidental harvest of wild steelhead occurs as a result of that fishery. Due to harvest of wild steelhead NMFS has determined that this activity is likely to jeopardize the continued existence of the threatened Snake River steelhead. We believe that a critical uncertainty exists regarding hooking mortality of wild steelhead in the Snake River basin, especially during warm water temperature seasons. The Council's Program states that concern exists regarding carrying capacity and hatchery produced fish affecting those that spawn naturally. The Columbia River Anadromous Fish Restoration Plan of the Nez Perce, Umatilla, Warm Springs, and Yakama tribes, entitled WY-KAN-USH-MI-WA-KISH-WIT, (CRITFIC 1995) also emphasizes natural production by native stocks. Natural production by native stocks is difficult to achieve if naturally produced fish are exposed to unnecessary mortality prior to spawning. Potential suppression of naturally produced fish numbers due to post-hooking mortality may reveal an unexpected aspect of hatchery fish and wild fish interactions.

c. Relationships to other projects

This proposed project is directly related to the Lower Snake River Compensation Program. Hatchery steelhead released into the Snake River basin as a result of this program may be indirectly responsible for "taking" wild Snake River steelhead. As part of the LSRCP, creel surveys of steelhead anglers is conducted to document the number, and temporal and spatial distribution of steelhead caught by anglers. This information will allow for extrapolation of our findings to predict the total number of wild steelhead affected by the fishery. Not only we will be able to determine how many are affected, but also when and where they are affected. Knowledge of these relationships will allow for management decisions to reduce or eliminate impacts to wild steelhead that result from the sport fishery.

Currently the University of Idaho has multiple radio tracking stations located in the mid-Snake River basin. We will use Lotek radio tags that will be detected by the U of I receivers and information will be available. This project relationship will allow us to focus on radio tracking a smaller geographic area.

d. Project history (for ongoing projects)

None

5. Proposal objectives

1. Collect and radio tag adult steelhead in the Grande Ronde River for the natural environment group

We will radio tag 50 adult steelhead in the Grande Ronde River. The fish will be caught with hook and line, fought to exhaustion, tagged, data recorded, and then released. Collection will occur in September with the possibility of tagging occurring in October if 50 fish are not caught in September. These fish will most accurately reflect post-hooking mortality if the tag itself has no effect. To determine tag effect, 10 adult hatchery steelhead will be caught at the Lyons Ferry hatchery trap effluent, fought to exhaustion, tagged with a dummy radio tag (no electronics) and then transported to an acclimation pond in Dayton for assessment.

2. Track radio tagged steelhead in the Grande Ronde River

After release, those 50 steelhead radio tagged in the Grande Ronde River will be radio tracked twice weekly for up to three months. The assumption is that if a fish is alive three months after being caught, that it will not die as a result of being hooked.

3. Assess hooking mortality of radio tagged steelhead in the Grande Ronde River

If a radio tagged fish is recorded at the same location for 14 days the location will be snorkeled to determine the status of the fish. If the radio tag has been expelled, the fish will be deleted from the analysis, if neither the tag nor the fish can be found, the site will be snorkeled after one additional week. Unrecovered tagged fish will be reported separately from those fish whose fate was determined on or before December 01.

4. Collect adult steelhead at the Lyons Ferry Hatchery for the controlled environment research group

Fifty fish will be caught with hook and line at the Lyons Ferry Hatchery trap effluent, fought to exhaustion, tagged with an external tag (floy type), data recorded, and transported to the Dayton acclimation pond for assessment. Also, 50 fish will be dip netted out of the Lyons Ferry Fish Hatchery trap, tagged with an external tag (floy type), data recorded, and transported to the Dayton acclimation pond for assessment.

5. Assess fish survival/mortality in the acclimation pond in Dayton

Fish will be observed for three months after release into the pond. Dead fish will be removed, data recorded and the carcass will be buried after all biological samples are recovered.

6. Monitor water temperatures

To determine and describe similarities in water condition between the controlled and natural environment groups, water temperatures will be recorded in the acclimation pond in Dayton, the Grande Ronde River and the Snake River adjacent to Lyons Ferry hatchery.

7. Report findings to funding agencies, partnering agencies, and to the public in multiple open-house settings throughout the region

This is a significant objective as hooking mortality rates/incidence on adult anadromous salmonids in freshwater is clearly unknown. The findings of this study have considerable implications for fish managers in the Pacific Northwest, and elsewhere. Due to the importance of our findings, we will dedicate a site on the WDFW internet web page on which our findings will be presented. A report of our results will be mailed to fish managers of CRITFIC, CTUIR, the Nez Perce Tribe, ODFW, and IDFG, COE, USFS, and NMFS. Public presentations will be given in Clarkston, Walla

Walla, Kennewick, and Wenatchee. The ISRP, CBFWA, Governor's task force for salmon recovery, BPA, and regional universities will receive a report of our findings. Lastly, if the findings have ecological, fish management or social significance, they will be published in a peer reviewed fisheries or ecology journal.

Research Hypothesis and assumptions necessary to test the hypothesis:

Ho: There is no difference in mortality rates between hooked fish (treatment group) and control fish.

Assumptions:

1. Hooking mortality rates for adult hatchery summer steelhead are the same as for naturally produced adult summer steelhead within a season.
2. Control and treatment groups of steelhead captured and transported to the acclimation pond in Dayton will not differ, except for the treatment (hooking, played to exhaustion and landed).
3. The effects of radio tagging will not alter the survival or behavior of fish caught by hook and line and tagged in the Grande Ronde River (will be tested with 10 dummy tagged fish)
4. Fish that die post-hooking, died as a result of being caught. Tag effect will be factored in based on mortality rate of those "dummy tagged" fish who experienced the same treatment as their Grande Ronde River radio tagged counterparts.
5. A fish that is alive three months after treatment (hooking), or has migrated at least 20 miles is not going to die from being caught with hook and line.
6. The location of radio tagged fish can be determined for three months.

f. Methods

Two unique research methods will be used to address the hypothesis. The first method uses treatment/control groups assessed in a controlled environment. The second method uses radio tags to assess fish in the natural environment. This group will be compared to a group of 10 dummy tagged (tag size identical to real radio tag, but the dummy tag contains no electronics) fish that will be caught with hook and line, fought to exhaustion, tagged, and transported to the acclimation pond in Dayton. The pond is supplied by 6 c.f.s. of water from the adjacent Touchet River. Water temperature data collected from the Touchet River near the pond and temperatures recorded for the Grande Ronde River were similar in September and October, 1998. Parametric statistics will be used to describe differences in survival between the treatment and control groups in the first method. The second method is purely descriptive and contains no statistical analysis criteria, except the comparison of mortality rate between the dummy tagged fish and the fish tagged and tracked in the Grande Ronde River. We could compare survival rates, post hoc between natural river radio tagged fish and those held in the acclimation pond. However, due to environmental and handling differences between these groups, statistical analysis involving these two groups would be for purely descriptive comparison purposes.

Regardless of statistical analysis techniques, random samples of the population will be collected for each research method. The sample size necessary to detect a statistical difference between the control and treatment groups has been determined to be at least 45 fish for each group based on observed mortalities at the hatchery for adult steelhead at the same time of year.

Controlled Environment Approach (treatment/control):

At the hatchery, 50 hatchery steelhead will be caught by hook and line with barbless hooks (barbless hook management has been implemented statewide for steelhead fishing). These fish will be the treatment group. The control group will be a group of 50 fish randomly selected by dip netting them from a pool of hundreds of fish in the trap.

Upon capture, the fish will be tagged with an external tag possessing a specific number. The tag number, fish length, and anatomical location where the fish was hooked will be recorded. The fish will then be transported in a fish transport tube to a fish transport truck and hauled to the acclimation pond in Dayton. The truck will not exceed hatchery loading density criteria, nor will the water temperature in the truck be allowed to exceed 21 C (70 F). The control group of fish

will be dip netted from the pool, tagged with a uniquely numbered external tag, measured and placed in the transport truck. It is anticipated that this process will take no longer than 4 days and we will attempt to sample each group equally so that not all fish are dip netted prior to fish caught by hook and line, and vice versa.

After transport to the acclimation pond, the fish will be released. The pond will be inspected daily for carcasses. Any dead fish will be recovered and information (length, sex, treatment or control including tag number) will be recorded. The acclimation pond is 200' long, 100' wide, and 8' deep. An existing water right for 6 cubic feet per second of water diverted from the Touchet Rive will be used to provide ambient river water to the pond. Water temperature and flow will be recorded daily in the pond. Water volume will be determined and stocking density will be recorded.

Natural Environment Group (radio tags):

Steelhead angling groups will be solicited to assist us in capturing steelhead in the lower Grande Ronde River in September, and October if needed. Each angler will be instructed to immediately release any wild steelhead captured. Anglers will use barbless hooks either with or without bait and will record anatomical location where the fish was hooked and if bait was used. If a hatchery steelhead is captured, the angler is to land the fish and place it in a fish transport tube (48" inner tube sealed at one end permanently and re-sealable at the other end) and keep it in the water. They are to flag the tube's location and place a marker along the road adjacent to the tube's location. We will roam in the vicinity of the fishermen and when a marker along the road is seen, we will remove the fish from the tube, anaesthetize it, measure it, insert the radio tag and release the fish. This data, along with the anatomical hooking location and whether bait was used will be recorded. Anglers will be notified of the days on which we will be available for tagging the fish, only at these times are they to place fish in the tubes.

Lotek radio tags will be used because the University of Idaho currently has remote receivers in the Snake River basin that can detect the presence of this type of tag. Coordination with the U of I will occur so that we get tags with frequencies that are unique and can be detected by thier receivers.

Radio tracking of tagged fish will begin the day after the first fish is tagged. Initially we will begin at Joseph Creek (river mile 3) and float to Heller's Bar on the Snake River at the confluence of the Grande Ronde and Snake Rivers. As fish distribute themselves, sampling (tracking) will increasingly cover greater reaches of the Grande Ronde River and possibly the Snake River. Tracking will occur twice weekly.

If a radio tagged fish is recorded at the same location for 14 days the location will be snorkeled to determine the status of the fish. A critical assumption is that the tags will be found either in the dead fish or regurgitated. If a tag is not recovered, we will pin-point the tag's location and return to the location and snorkel it seven days later. If we can not locate the tag or the fish, that fish will be reported separately from those fish tracked successfully and determined to be either a dead or alive, through November.

To assess the affects of the radio tag, dummy radio tags will be placed in 10 steelhead caught at the Lyons Ferry trap. These fish will be transported to the acclimation pond in Dayton and mortality assessed.

The last assumption is that if a fish survives through November or has migrated at least 20 miles from the location of tagging, it will not die from being hooked.

g. Facilities and equipment

Steelhead are currently trapped at Lyons Ferry Hatchery. Fifty steelhead will be netted from the trap and transported in a fish hatchery truck to an existing acclimation pond in Dayton. The treatment group of steelhead will be collected by hook and line while angling from a boat anchored near the entrance to the fish trap at Lyons Ferry Hatchery. WDFW owns the boat. Fishing equipment will be provided by each angler, at no cost to the program. The only equipment needed will be a raft, raft trailer, radio tags, radio receiver, miscellaneous field gear and a computer. Remote radio tracking receivers exist in the mid-Snake River (Univeristy of Idaho), therefore, we will not need to purchase remote receivers.

h. Budget

Personnel requests are for a field biologist and one technician. Additionally, a percentage of my time as principal investigator needs to be covered by this contract, as well as a small percentage of the project manager's time. I will be involved on a daily basis from September through December coordinating activities and ensuring that field techniques are correct. The project manager will be required to spend smaller amounts of time on this project, but he will still need to be involved to address information requests, federal permit compliance, budgetary oversight, and project oversight.

Estimated fringe benefits for state employees are 28.5% of salaries. Indirect costs are estimated to be 22.5% in FY 2000.

Supplies include field gear, three thermographs and software, and 50 radio transmitters. We will be able to use mid-priced transmitters because they need to last no longer than three months. A raft with a trailer will be required to float the river and track the fish. Rafts are less expensive than drift boats and are less technical to operate. A computer and printer will be necessary for the field biologist to input data and complete preliminary findings reports. The study area (Grande Ronde River) is 120 miles from this office, while the Lyons Ferry Hatchery is 30 miles away. For these reasons that position will be located in Dayton.

Section 9. Key personnel

Project Manager: Mark L. Schuck, Fish Biologist 4. 0.1 FTE

Duties: Oversee administrative duties and respond to data requests.

Degrees Earned: Colorado State University, 1974, B.S. Fish Biology

Current Employer: Washington State Department of Fish and Wildlife

Current Duties: Project Leader; Lower Snake River Compensation Plan hatcheries evaluation program. Responsible for overseeing WDFW's evaluation of a federal mitigation program designed to replace fish resources lost due to construction of the four Snake River power dams. Evaluation activities are currently being undertaken for spring and fall chinook salmon and steelhead in several rivers in S.E. Washington. Duties include assisting with experimental design and implementation of studies, budgeting and report writing. Reports are submitted in both annual progress report and final refereed journal formats.

Previous Duties: Served as District Fish Management Biologist for WDFW in Asotin, Columbia, Garfield and Walla Walla counties; 1984-1994.

Expertise: Have managed or researched the fish resource in S.E. Washington since 1982. Have been actively involved with evaluation of a major hatchery trout/steelhead mitigation program since its inception in 1982 and with salmon and trout under the mitigation program since 1995. Helped conduct an evaluation of instream habitat improvements in Asotin Creek and Tucannon River in 1989 as part of the mitigation program.

Publications: Schuck, M., A. Viola, J. Bumgarner and J. Dedloff. 1998. Lyons Ferry Trout Evaluation Study: 1996-97 Annual Report. Washington Department of Fish and Wildlife Report # H98-10.

Viola, A.E. and M.L. Schuck. 1995. A Method to Reduce the Abundance of Residual Hatchery Steelhead in Rivers. North American Journal of Fisheries Management 15(2) 488-493.

Principal Investigator: Steven Martin, Fish Biologist 3. 0.2 FTE

Duties: Directly responsible for experimental design, project

implementation, equipment procurement, personnel hiring and supervising.

Degrees Earned: Eastern Washington University: BS - Biology 1990 MS - Fisheries Biology 1992

Current Employer: State of Washington, Department of Fish and Wildlife

Current Responsibilities: Conducting research, monitoring, and evaluating the Lower Snake River Compensation Salmon and Steelhead program. Supervise a diverse work crew, procure equipment, write annual reports and publications.

Previous Employment: State of Washington Department of Fish and Wildlife, Snake River Fish Habitat Biologist.

Expertise: Experimental design, field methods, salmonid ecology, hatchery production, sport fishing, and research presentations.

Publication (5 max):

Martin, S.W. et. al. 1993. Investigations of the interactions among hatchery reared summer steelhead, rainbow trout, and wild spring chinook salmon in southeast Washington. Project report.

Martin, S. W., T. N. Pearsons, and S. A. Leider. 1994. Rainbow and steelhead trout temporal spawning distribution in the upper Yakima River basin. Annual report.

Martin, S.W., J.A. Long and T.N. Pearsons. 1995. Comparisons of survival, gonad development, and growth between rainbow trout with and without surgically implanted dummy radio transmitters. North American Journal of Fisheries Management. 15:494-498.

Martin, S. W. 1995. Salmonid distribution and rainbow trout population abundance variation in the upper Yakima River. Annual report.

Martin, S.W. 1992. Investigations of bull trout, steelhead trout, and spring chinook salmon interactions in southeast Washington streams. Master's Thesis, 1992.

Section 10. Information/technology transfer

The findings of this study have considerable implications for fish managers in the Pacific Northwest, and elsewhere. Due to the importance of our findings, we will dedicate a site on the WDFW internet web page on which our findings will be presented. A report of our results will be mailed to fish managers of CRITFIC, CTUIR, the Nez Perce Tribe, ODFW, and IDFG, COE,

USFS, and NMFS. Public presentations will be given in Clarkston, Walla Walla, Kennewick, and Wenatchee. The ISRP, CBFWA, Governor's task force for salmon recovery, BPA, and regional universities will receive a report of our findings. Lastly, if the findings have ecological, fish management or social significance, they will be published in a peer reviewed fisheries or ecology journal.

Technologies used in this study are fairly well demonstrated and proven. If new technology is developed or used, it's application in this study will be transferred to the other agencies and universities stated above.

Congratulations!