PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Snake River Native Salmonid Assessment

BPA project number: 9800200
Contract renewal date (mm/yyyy): 7/1999 ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Idaho Department of Fish & Game

Business acronym (if appropriate) IDFG

Proposal contact person or principal investigator:

Name	Kevin Meyer
Mailing Address	1414 East Locust Lane
City, ST Zip	Nampa, ID 83686
Phone	208-465-8404
Fax	208-465-8434
Email address	kmeyer@idfg.state.id.us

NPPC Program Measure Number(s) which this project addresses
10.5B.1

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

Other planning document references
IDFG Fish Management Plan, 1996-2000 (sec. 1, sec. 2); State of Idaho Bull Trout Conservation Plan (part I, Part II); NPPC's Fish and Wildlife Program (10.5B.1); CBFWA's Draft Resident Fish Multi-year Implementation Plan (sec. 6.6, sec. 6.8)

Short description
Investigate population status and trends, life histories, habitat needs, limiting factors, and threats to persistence of native salmonids in the Snake River and tributaries upstream of Hells Canyon Dam in Idaho, and implement recovery/protection plans.

Target species
Bull trout, redband trout, cutthroat trout, whitefish

Section 2. Sorting and evaluation

Subbasin
Boise River, Payette River, Weiser River, Owyhee River, Mid Snake-Powder, Mid Snake-Boise, Upper Snake, Snake Headwaters

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
☐ Anadromous fish ☒ Resident fish ☐ Wildlife	☐ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☒ Implementation & management ☐ 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

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
98	Conducted basin-wide population surveys of bull trout and other aquatic	Yes. Determined that bull trout densities are extremely low and

	species in the headwaters of the North Fork Payette and upper Weiser River drainages.	distribution is extremely limited in both drainages. Will require intensive presence/absence survey to assess whether populations are sufficiently robust to be salvagable.
98	Conducted bull trout spawning surveys in selected portions of the Boise River drainage in an effort to identify critical spawning habitat and establish a baseline for future trend monitoring.	Yes. Determined that redd counts will not be effective in the Boise drainage to estimate adult bull trout population size; trapping of migrating fish will commence in FY99 to estimate adult and juvenile bull trout abundance.
98	Coordinated with other ongoing projects and entities to avoid duplicating data collection and to assist in prioritizing field work.	Yes. Used information to determine sampling locations in population surveys of Payette and Weiser River drainages and will continue to serve as starting points for presence/ absence and population abundance surveys in FY99, FY2000, etc.
98	Began construction of Native Fish Database.	Not yet. We initiated efforts which in the long term will serve as storage location for population/habitat data and will facilitate GIS analysis with a statewide perspective of population trends, current status, and identification of populations at risk.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Coordinate with other ongoing projects and other entities	a	Conduct literature search to determine where data is lacking, to avoid duplicating effort, to assist in prioritizing field work, and gain an historical perspective on the salmonid populations in the upper Snake River Basin relative to today.
		b	Coordinate with other entities including IDFG fish managers and researchers, StreamNet, BLM, USFS, BOR (SR3), Shoshone-Bannock and Shoshone-Pauite Tribes, Idaho DEQ, and Watershed Advisory Groups to prioritize field work and avoid duplication of effort.

		c	Based on results of tasks 1.a and 1.b, prioritize and develop a detailed workplan for FY2001.
2	Assess the current stock status, life history traits, and potential limiting factors and threats to persistence of native salmonid populations in the Snake River Basin upstream of Hells Canyon Dam.	a	Use snorkeling, electrofishing, trapping, and hook-and-line sampling to estimate current presence/absence and abundance of salmonids in 50-100 Upper Snake River tributaries per year. Use input from coordination efforts to focus on most important streams.
		b	Identify, describe, and measure habitat characteristics in 50-100 fish sampling locations, and analyze the effect habitat variables have on native salmonid distribution using logit analysis and multiple regression.
		c	Based on results of tasks 2.a and 2.b, identify populations at risk and investigate limiting factors on a case by case basis.
3	Compile stock status and habitat survey information into a Basin-wide Native Salmonid Database.	a	Complete construction of Native Salmonid Database.
		b	Scrutinize state and other documents to retrieve existing data and enter it into the database along with data collected from tasks 2.a and 2.b.
		c	Use GIS analysis of current and past native salmonid distribution and abundance to determine trends. In conjunction with this analysis and task 2.b, identify populations at risk and in need of recovery strategies.
4	Determine genetic composition of native salmonid populations from 15 representative or most important streams per year.	a	Collect and preserve samples (fin sections) from native trout populations for mitochondrial DNA testing.
		b	Collect tissues (eye, liver, heart, and muscle) from incidental sampling mortalities for starch-gel electrophoresis.
		c	Send samples to lab for analysis. Use results to identify pure and introgressed populations to assist in

			developing recovery and protection plans and stream stocking adjustments.
5	Assess whether, in the next five years, a concerted brook trout removal effort in a small stream can increase bull trout numbers to a density of 15 fish/km.	a	Use removal-depletion electrofishing over multiple years to remove brook trout from 4 km of stream above a man-made barrier.
		b	Use removal-depletion data to calculate population densities and removal efficiencies for age-0 and age-1+ brook trout. Compare brook trout population densities in subsequent years to assess overall removal effectiveness.
		c	Use scales and otoliths from captured brook trout to determine age structure.
		d	Calculate total annual mortality (Z) using catch curves. Compare estimates of Z in subsequent years to assess whether brook trout compensation occurs.
		e	Calculate growth by comparing average length of each age group and compare over subsequent years and to control stream to determine removal effects.
		f	Calculate age at sexual maturity for each year and compare between years and between the control and treatment stream to assess removal effects on compensatory capacity.
		g	Assess the removal impacts on the reduction in overall egg production based on length/fecundity, length frequency, and population size relationships.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999	9/2000			15.00%
2	6/2000	12/2000	stock status assessment		40.00%
3	11/1999	4/2000			25.00%

4	6/2000	9/2000	genetic purity assessment		5.00%
5	8/2000	12/2000	non-native salmonid removal assessment		15.00%
				Total	100.00%

Schedule constraints
A potential constraint is the ESA listing of bull trout, redband trout, Yellowstone cutthroat trout, or any other native aquatic species in the study area on the endangered species list, which could delay field work or increase coordination and NEPA work.

Completion date
2015

Section 5. Budget

FY99 project budget (BPA obligated): $250,000

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	One full time biologist, one full time technician, and 4 seasonals	%52	116,595
Fringe benefits		%20	45,193
Supplies, materials, non-expendable property	vehicle rental, other misc. items	%9	19,538
Operations & maintenance		%3	7,553
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%5	10,524
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags:	%0	
Travel		%6	13,402
Indirect costs		%0	
Subcontractor	genetics analysis	%6	12,403
Other		%0	
TOTAL BPA FY2000 BUDGET REQUEST			$225,208

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
		%0	
		%0	
		%0	
		%0	
Total project cost (including BPA portion)			$225,208

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$250,000	$250,000	$262,000	$262,000

Section 6. References

Watershed?	Reference
☐	Behnke, R. 1992. Native trout of Western North America. American Fisheries Society Monograph 6.
☐	Bonar, S., M. Divens, and B. Bolding. 1997. Methods for sampling the distribution and abundance of bull trout and dolly varden. WA Dept. of Fish & Wildlife, Resources Assessment Division. Report #RAD97-05. Olympia, WA.
☐	Columbia Basin Fish and Wildlife Authority. 1997. Draft multi-year implementation plan for resident fish protection, enhancement, and mitigation in the Columbia River Basin. Technical Planning Document. June 3, 1997.
☐	Frissell, C. 1993. A new strategy for watershed restoration and recovery of Pacific salmon in the Pacific Northwest. The Pacific Rivers Council. Eugene, OR.
☐	Gamblin, M., and B. Schrader. 1997. The South Fork Snake River Yellowstone cutthroat trout fishery: threats and management options for its conservation. Pages 135-141 in R. Gresswell, P. Dwyer, and R. Hamre, eds. Wild Trout VI, MSU, Bozeman, MT.
☐	Gresswell, R. 1995. Yellowstone cutthroat trout. Pages 36-54 in M. Young, ed. Conservation assessment for inland cutthroat trout. Gen. Tech. Rep. RM-256. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest & Range Experiment Station.
☐	Hankin, D., and G. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. Canadian Journal of Fisheries and Aquatic Sciences 45:834-844.
☐	Hillman, T., and W. Platts. 1993. Survey plan to detect the presence of bull trout. Report of Don Chapman Consultants to the Intermountain Forest Industry Association, Coeur d'Alene, ID.
☐	Hubert, W., and E. Bergersen. 1998. Define the purpose of habitat analysis

	and avoid the activity trap. Fisheries 23(5):20-21.
☐	Idaho Department of Fish & Game. 1996. Fisheries management plan 1996-2000. Boise, ID.
☐	McFadden, J. 1961. A population study of the brook trout, Salvelinus fontinalis. Wildlife Monographs 7. 73p.
☐	McFadden, J. 1976. Environmental impact assessment for fish populations. Pages 89-137 in P. Gustafson, editor. The biological significance of environmental impacts. University of Michigan, Ann Arbor, MI.
☐	Moore, S., B. Ridley, and G. Larson. 1983. Standing crops of brook trout concurrent with removal of rainbow trout from selected streams in Great Smoky Mountain National Park. North American Journal of Fisheries Management 3:72-80.
☐	Northwest Power Planning Council. 1994, amended 1995. Columbia River Basin Fish and Wildlife Program. As amended in 1995. Portland, OR.
☐	Overton, C., S. Wolrab, B. Roberts, and M. Radko. 1997. R1/R4 (Northern/Intermountain Regions) fish and fish habitat standard inventory procedures handbook. Gen. Tech. Rep. INT-GTR-346. Ogden, UT: USDA Forest Service, Intermountain Research Station.
☐	Reiman, B., and J. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. Gen. Tech. Rep. INT-302. Ogden, UT: USDA Forest Service, Intermountain Research Station.
☐	State of Idaho. 1996. Governor Philip E. Batt's State of Idaho Bull Trout Conservation Plan.
☐	Thompson, P., and F. Rahel. 1996. Evaluation of depletion-removal electrofishing of brook trout in small Rocky Mountain streams. North American Journal of Fisheries Management 16:332-339.
☐	Thurow, R. 1994. Underwater methods for study of salmonids in the Intermountain West. Gen. Tech. Rep. INT-GTR-307. Ogden, UT: USDA Forest Service, Intermountain Research Station.
☐	Van Deventer, J., and W. Platts. 1985. A computer software system for entering, managing, and analyzing fish capture data from streams. Research Note INT-352. Ogden, UT: USDA Forest Service, Intermountain Research Station.

PART II - NARRATIVE

Section 7. Abstract

Native resident salmonid populations are in decline throughout much of their range. Bull trout have recently been listed as threatened under the Endangered Species Act, and redband trout and Yellowstone cutthroat trout have been petitioned to be listed. Section 10.5B.1 of the Fish and Wildlife Program calls for the "investigation of the life history, habitat needs and threats to persistence of native salmonids upstream of Hells Canyon Dam…" This project is a multi-phased project with an overall goal of protecting

and restoring populations of native salmonids (redband trout, cutthroat trout, bull trout, whitefish) in the Upper Snake River Basin to self-sustaining, harvestable levels. The long-term objectives are to: 1) Assess stock status, population trends, and fish habitat; 2) Identify life history and habitat needs, and limiting factors; 3) Develop and implement recovery and protection plans; and 4) Monitor effectiveness of recovery and protection plans. The first phase of inventorying fish populations and their habitat will follow standard methods (Hankin and Reeves 1988; Hillman and Platts 1993; Bonar et al. 1997; Overton et al. 1997), and will continue through the first several years of the project, including FY2000. Data collected during this phase will be entered into a Basin-wide Database. Multiple regression and logit analysis will be used to relate fish populations to habitat data; this analysis will begin the second phase of the project, which will identify life history and habitat needs, causes for population declines (limiting factors, threats to persistence, genetic introgression), and opportunities for restoration. Once identified, the third phase will use this information to develop and implement recovery and protection plans for populations at risk. Expected outcomes will be activities that result in recovery, protection, and long-term persistence of native salmonids.

Section 8. Project description

a. Technical and/or scientific background

Since the construction of Swan Falls Dam in 1901, the upper Snake River basin has been heavily impacted by hydroelectric development. Currently there are approximately 92 hydroprojects and countless irrigation diversions making use of Snake River water in the Idaho portion of the basin. These activities have had significant impacts on native salmonids. Anadromous salmon and steelhead that used to inhabit the Snake River and its tributaries below Shoshone Falls have been extirpated by dam construction and hydroelectric operations.

Bull trout, redband trout, and Yellowstone cutthroat trout distribution, habitat, and populations have been reduced in much of their historic range (Behnke 1992; Reiman and McIntyre 1993; Gresswell 1995; Gamblin and Schrader 1997). In June 1998, Columbia basin bull trout were listed as a threatened species by the U.S. Fish and Wildlife Service. Petitions have also been recently filed to list redband trout and Yellowstone cutthroat trout under the Endangered Species Act. All three species are listed by IDFG (1996) as species of special concern category A, which are top priority species, and by BLM and USFS as sensitive species.

Despite the sensitive status of these salmonids, quantified data on the current distribution, trends, habitat, life history needs, limiting factors, extent of genetic introgresstion, and threats to persistence of native salmonids in the upper Snake River basin is minimal for most populations. Moreover, much of the data that is available has been collected in a variety of manners, making it difficult to compare populations among drainages over time and between drainages across a species' geographical range. The paucity of information demonstrates the need to determine current status and population trends of salmonids throughout the upper Snake River. Work will be focused in the

tributaries and headwaters of the Boise, Payette, Owyhee, Weiser, Bruneau, Blackfoot, Wood, Portneuf, Salmon Falls, Willow Creek, upper mainstem Snake River (above Shoshone Falls), and the Henrys and South forks of the Snake River. Because of the listing of bull trout under the Endangered Species Act, much of the work in the first three years of the project will be conducted in the first four streams listed.

b. Rationale and significance to Regional Programs

The overall goal of the project is to protect and restore native resident salmonid populations in the Snake River basin upstream of Hells Canyon Dam in Idaho to self-sustaining, harvestable levels. This goal closely mirrors the goals of the Northwest Power Planning Council's (NPPC) Fish and Wildlife Program (FWP), IDFG's Fish Management Plan, the Columbia Basin Fish and Wildlife Authority's (CBFWA) Multi-Year Implementation Plan (MYIP), and Idaho's Bull Trout Conservation Plan.

The system-wide goal in the NPPC's FWP (NPPC 1994, amended 1995) is "a healthy Columbia Basin, one that supports both human settlement and the long-term sustainability of native fish and wildlife species in native habitats…". The FWP's resident fish goal mirrors the system-wide goal by emphasizing the "long-term sustainability of native species in native habitat where possible…". The goal of the CBFWA draft resident fish multi-year implementation plan is to promote the long-term viability of native species in native habitats (CBFWA 1997). IDFG's fish management plan (IDFG 1996) states that wild, native, self-sustaining fish populations are a management priority, as is protection and restoration of habitats and water quality for these species. One of the goals of the plan is to maintain and restore wild, native fish populations. The project also relates to the State of Idaho's Bull Trout Conservation Plan (State of Idaho 1996). The mission of this plan is to "maintain and/or restore complex interacting groups of bull trout populations throughout their native range in Idaho." The goals of the plan are to "maintain the conditions of those areas presently supporting critical bull trout habitat" and "institute recovery strategies that produce measurable improvement in the status, abundance, and habitats of bull trout."

The goals of this project are analogous to those of the above plans, namely to promote the long-term viability of native resident salmonids. We will follow a logical sequence of steps designed to protect and recover wild native salmonids. The first step is to survey the current stock status and trends of the fish populations, which will consist of: gathering historical data from literature searches and other agencies and entities; collecting current presence/absence and abundance data in areas with incomplete or no recent information, and; collecting genetic (i.e., the purity of population) and stream habitat data. Multiple regression and logit analysis will be used to relate fish presence/absence and abundance to stream habitat characteristics. This will begin the second phase of the project, to identify life history and habitat needs, limiting factors, threats to persistence, and opportunities for restoration, on both a site-specific and watershed-specific scale. We anticipate that limiting factors may be: temperature tolerance limitations; poor spawning habitat conditions; spawning migration or recolonization barriers (waterfalls, dams); competitive disadvantages with other native or

non-native salmonids; inadequate rearing or overwinter habitat; hybridization with non-native salmonids; degraded habitat conditions due to land use activities (logging, mining, grazing), and; fish losses through irrigation diversions. Care will be taken to ensure that limiting factor studies are of sufficient design and quality (Hubert and Bergersen 1997). The third step will be the development and implementation of protection and recovery plans designed to restore populations to healthy, self-sustaining and harvestable levels and to protect existing populations over the long-term. Thus, it is our intention that this project will actually find measures to restore or improve depressed populations. Once the recovery strategies have been outlined and implemented, the fifth step will be to monitor the population responses to these recovery actions, modifying them in locations where sufficient recovery of native salmonid populations is not occurring.

We recognize that the key to maintaining and restoring wild, native salmonids over the long-term will be to protect and restore the natural functioning of the watersheds and ecosystems. Without this, habitat or population restoration activities will probably fail. Consequently, an interdisciplinary approach using expertise in other fields such as hydrology, geology, soil science, range and forest science will be necessary to understand proper watershed function, identify threats to the watersheds and the fish populations in particular, and implement restoration and recovery plans. Thus, coordination with other entities throughout the project, from the inventorying stage to recovery strategies, will be critical. The recovery strategies implemented will follow Frissell (1993), who stated that restoration goals should "1) Maintain options for future recovery by ensuring a secure, well-distributed, and diverse constellation of natural habitats and co-adapted populations, and local examples of natural ecosystem processes, remain in place over the long-term; 2) Secure existing populations of aquatic species, including fishes, and maintain the critical areas supporting healthy ecosystem function; 3) Institute recovery measures that stand the greatest chance of producing measurable improvements in the status and abundance of wild fish populations, and improvements of ecosystem function, in the near term."

The introduction of nonnative salmonids is one of the most commonly cited explanations for imperiled native salmonids in North America. Removal of nonnative fish may be an effective strategy to foster recovery of threatened populations of bull trout, cutthroat trout, and redband trout in the upper Snake River basin. Because the use of icthyocides (i.e., rotenone, antimycin) requires environmental assessments (i.e., NEPA analysis), kills non-target species (fish and invertebrates), and has the potential for fishkills outside the target area, multi-year removal-depletion electrofishing may be an alternative removal technique used in the recovery of isolated populations of native salmonids (Moore et al. 1983; Thompson and Rahel 1996). Previous evaluations of the effectiveness of non-native trout removal have focused on removal efficiencies and subsequent fish densities (Moore et al. 1983; Thompson and Rahel 1996), and many of the ongoing removal projects are attempting only to maximize brook trout removal (B. Wingert, WY Game & Fish, personal communication, J. Zauner, OR Dept. Fish & Wildlife, personal communication). None of these projects have investigated brook trout population dynamics responses such as compensatory natural mortality declines which have been shown to occur in brook trout (McFadden 1961, 1976) and which have the potential to reduce the impact that removal can have on the population. Brook trout

removal has been identified by the Boise Basin Watershed Advisory Group as a high priority restoration alternative (S. Grunder, IDFG, personal communication). Before electrofishing removals are incorporated into recovery strategies of native populations of salmonids in the upper Snake River basin on a wider basis, a complete evaluation of the removal effectiveness and the population dynamics responses is warranted.

Achievement of the stated project goal will partially mitigate for fish losses due to the construction and operation of the federal hydropower system in Idaho, namely Anderson Ranch Dam, Boise Diversion Dam, Minidoka Dam, Palisades Dam, and Black Canyon Dam. It will include on-site and off-site mitigation activities.

c. Relationships to other projects

This project is related to several ongoing and proposed projects in the upper Snake River Basin. The existing Idaho Water Rental Project (BPA project 91-067) is designed to quantify the impacts of the salmon flow augmentation water released from the upper Snake River Basin on resident fish upstream from Brownlee Reservoir. The project looks at habitat versus flow relationships for several native species and has made recommendations on the release of the flow augmentation water to benefit resident fish. This information will serve as a starting point for identifying life history and habitat needs as well as opportunities for restoration.

The BOR is currently funding IDFG to conduct bull trout life history and habitat work in the upper Boise River Basin. We used the radio telemetry locations gathered through this BOR funding to determine locations where bull trout redd counts would be made during fall 1998 field work on this project. Similar opportunities for collaberation are expected in the future.

BOR is also conducting a project called the Snake River Resources Review (SR3). The SR3 is building a decision support system (DSS) to improve the overall water management of the upper Snake river subregion (upstream of Brownlee Dam). The DSS will allow managers to make better informed decisions on water management in the upper Snake River Basin. They will be able to see and analyze the trade-offs (benefits and risks) of different management (water releases) strategies. Information from the salmonid assessment project (habitat and flow requirements, threats to persistence, limiting factors, etc.) will be incorporated directly into the DSS so that impacts (positive and negative) to native resident fisheries from various flow scenarios can be evaluated.

Coordination will also be made with two similar BPA-funded projects, Habitat Enhancement and Protection Project funded to the Shoshone-Pauite Tribe (#9701100) and the Stinkingwater Salmonid Project funded to the Burns-Pauite Tribe (#9701900). Although these projects are outside the geographical area of consideration of our project for the most part, coordination will nevertheless be made to avoid any duplication of effort and also to compare data collection techniques and ensure data compatability and comparability.

d. Project history (for ongoing projects)

The project has been underway for 5 months. The position of principal investigator was filled in August 1998. There has been one quarterly report written and sent to BPA in November 1998, and the first annual report will be written and a final draft sent to BPA in March 1999. Major accomplishments to date include: an inventory of trout distribution and abundance in the Payette and Weiser River drainages, covering 108 streams; bull trout spawning surveys in 11 tributaries of the South, Middle, and North forks of the Boise River; initial analysis of the effectiveness of a brook trout removal project from a stream with bull trout, and; preliminary work on the design of the Native Fish Database. Costs for FY98 and FY99 are $188,160 and $250,000 respectively. FY98 costs were lower because the project was not initiated fully until after the budget year began.

e. Proposal objectives

Objective 1: Coordinate with other ongoing projects and other entities regarding native salmonid populations.

Objective 2: Assess the current stock status, life history traits, and potential limiting factors and threats to persistence of native salmonid populations in the upper Snake River basin upstream of Hells Canyon Dam.
Hypothesis: Native trout are declining throughout the upper Snake River basin.
Assumption: Native trout are declining due to human activities, not natural processes.
Native salmonids can be recovered to self-sustaining, harvestable levels in much or all of their range.

Objective 3: Compile stock status and habitat survey information into a basin-wide Native Salmonid Database.

Objective 4: Determine genetic composition of native salmonid populations from 15 representative or most important streams per year.
Hypothesis: Native trout genetics in many drainages have been altered due to past stocking practices and genetic bottlenecks caused by severe population declines.
Assumption:

Objective 5: Assess the effectiveness of brook trout removal as an enhancement tool for native salmonid recovery.
Hypotheses: Brook trout are having a negative impact on native trout growth, survival, and reproductive success.
Removing brook trout will result in an increase in native fish growth, survival, and populations size.
Assumptions: Brook trout will not be able to recolonize the area from above or

below the removal zone.
Population responses of brook trout and native trout after removal efforts will be due to the removal and not other factors.
Population responses in the reaches we select are representative of population responses throughout the entire stream.

Products from this project: Annual progress reports and quarterly reports will be submitted to BPA. Results will be presented to BPA at project review meetings and at annual American Fisheries Society meetings. After completion of phase 3, we anticipate a series of implementation recovery measures for each population of native salmonid deemed to be at risk. Results from the project will be submitted to peer-reviewed scientific journals for publication when appropriate. The Native Salmonid Database will be used by IDFG personnel as well as shared with entities such as SR3 (BOR), DEQ, USFS, BLM, and USFWS, Shoshone-Bannock and Shoshone-Pauite Tribes, Boise Basin and other Watershed Advisory Groups, and others to manage native salmonids in the Snake River basin.

f. Methods

The tasks associated with the specific objectives listed in 7.e are listed below.

Task 1.a A literature review of all reports and publications will be made for any population information in the upper Snake River basin to: avoid duplicating effort; determine where data is lacking; prioritize field work, and; gain historical perspective on salmonid populations in the basin.

Task 1.b Coordination will be made with other entities including IDFG fish managers and researchers, StreamNet, USFS, BLM, Shoshone-Bannock and Shoshone-Pauite Tribes, Idaho DEQ, and Watershed Advisory Groups to locate existing data that is not found in reports. This will also help prioritize field work, insure data is collected in a consistent manner, avoid duplication of effort, etc.

Task 1.c Based on results from tasks 1.a and 1.b, develop a detailed workplan for FY2001.

Task 2.a Current presence/absence and population abundance of native salmonids will be assessed in 50-100 Upper Snake River tributaries per year, using electrofishing, snorkeling, trapping, and/or hook-and-line sampling, depending on the stream and river conditions and the objective of the sampling for each particular stream. Fish densities and 95% confidence limits will be estimated using the Zippin removal-depletion method (Van Deventer and Platts 1985). Presence/absence surveys will follow Hillman and Platts (1993). Snorkeling may be used when appropriate (Thurow 1994) and when electrofishing is infeasible.

Task 2.b Stream habitat conditions will be assessed in all fish sampling locations to

assess the relationship between the occurrence of native salmonids and the physical and biotic factors at the sampling location. Inventorying will follow IDFG's standard stream survey protocol, as well as Hillman and Platts (1993) and Hankin and Reeves (1988). Logistic and multiple regressions will be used to assess the strength of the relationships between fish occurrence or abundance and habitat variables.

Task 2.c Based on the analysis of data collected in tasks 1.a, 1.b, 2.a, and 2.b, we will begin to identify populations most at risk and potential limiting factors. The analysis of limiting factors will initiate the onset of Phase 2 of the project.

Task 3.a A Native Salmonid Database will be constructed as a depository for basin-wide fish and stream surveys.

Task 3.b Data collected from tasks 1.a, 1.b, 2.a, and 2.b will be retrieved and added to the database in as uniform a manner as possible.

Task 3.c GIS analysis will be used to assess current stock status and population trends. In conjunction with task 2.3, populations at risk will be identified and limiting factors and threats to persistence will be investigated, initiating Phase 2 of the project and leading to development of recovery and protection plans (Phase 3).

Task 4.a Fin samples will be collected from 15 native salmonids annually from 15 separate streams or populations for mitochondrial DNA testing.

Task 4.b Tissue samples (eye, liver, heart, muscle) from incidental sampling mortalities will also be collected for starch-gel electrophoresis.

Task 4.c Samples will be sent to labs for analysis. Results will be used to identify pure and introgressed populations to assist in developing recovery and protection plans.

Task 5.a In conjunction with other agencies and volunteers, we will use removal-Depletion electrofishing over multiple years to remove brook trout above a man-made barrier.

Task 5.b Removal-depletion data will be used to calculate population densities and removal efficiencies for age-0 and age-1+ brook trout. Densities in subsequent years will be used for comparison to assess the overall effectiveness of the removal efforts.

Task 5.c Scales and otoliths will be used from captured brook trout to determine age structure of the population for use in developing total mortality estimates.

Task 5.d Mortality will be assessed using catch curves (age frequency) from all trout captured. Heincke's and Jackson's estimates of survival rate will be used to

test the validity of the catch curve assumptions that year class strength and survival rate from year class to year class are constant. Ninety-five percent confidence intervals will be calculated around the mortality estimates. Mortality estimates in subsequent years will be estimated from the same reaches and compared to test for changes.

Task 5.e Growth will be assessed by comparing average length of each age group of brook trout captured. Growth in subsequent years will be compared from the same reaches to test for changes due to removal efforts.

Task 5.f Age at sexual maturity and maturity percentages for each age class, and sex ratios, will be calculated. Confidence limits will be calculated from McFadden (1961). Calculations before and after removal will be compared to test for changes due to brook trout removal.

Task 5.g The impact of brook trout removal on overall egg production will be assessed using the relationships between length/fecundity, length frequency, and population size. Comparison of overall egg production will be made between all years of the study to assess potential compensation by the remaining brook trout.

g. Facilities and equipment

Project personnel are working out of the IDFG resident fish hatchery in Nampa, Idaho, with the rest of the southern Idaho Resident Fish Research Program. We share office and storage space with the rest of the Resident Fish Research Program. We currently have one leased ½ ton, 4x4 truck and will be leasing another by June 1999. We have two desktop computers and one laptop computer, and will be purchasing a printer. We have recently purchased two electrofishers, two GPS units, a screw trap with a flatbed trailer, and other necessary camping and field gear for fish and habitat inventorying. We will be purchasing a generator, vehicle and portable radios, and two drysuits. We will also be purchasing a camping trailer to house personnel during the trapping seasons and during early spring and late fall when when the weather precludes tent camping. We also have access to bunk facilities at IDFG hatcheries and cabins throughout the Upper Snake River basin. There is a considerable amount of other equipment within IDFG which is available for use if needed. The Department can also provide volunteer workers, administrative and computer help, storage space, and expertise on many subjects.

h. Budget

(Replace this text with your response in paragraph form)

Section 9. Key personnel

The principal investigator on the project is Kevin A. Meyer, fisheries research biologist. He has been recently hired by IDFG to fill this full-time position after working 2½ years for the Winema National Forest. He received his B.S. from Michigan State University (1992), and M.S. from Idaho State University (1995) where he studied the winter ecology of juvenile rainbow trout and brook trout. He has been involved in native resident salmonid conservation activities over the last 5 years, including: bull trout redd counts and population status, and brook trout removal efforts, with the Klamath Basin Bull Trout Working Group; redband trout population status in Fremont National Forest streams in the Northern Great Basin; presence/absence of and habitat use by Colorado River cutthroat trout, and brook trout removal efforts, in western and south-central Wyoming, and; likelihood of adfluvial spawning activity by Yellowstone cutthroat trout in a South Fork Snake River tributary.

Meyer, K., J. Griffith. 1997. Effects of cobble-boulder substrate configuration on winter residency of juvenile rainbow trout. North American Journal of Fisheries Management 17:77-84.

Meyer, K., J. Griffith. 1997. First-winter survival of rainbow trout and brook trout in the Henrys Fork of the Snake River, Idaho. Canadian Journal of Zoology 75:59-63.

Young, M., D. Isaak, K. Meyer, R. Wilkison. In press. Habitat selection and movement by individual Colorado River cutthroat trout in the absence of competitors. Journal of Freshwater Ecology.

Section 10. Information/technology transfer

Information from this project will be disseminated in many ways. All activities will be coordinated with IDFG regional staff and other entities involved in native salmonid projects. Findings will be presented at project review meetings held by BPA, and at the Idaho Chapter of the American Fisheries Society annual meetings on a frequent basis. We will work closely with the BOR through their SR3 project, and with the USFS and BLM on fish habitat surveys and native salmonid population assessments. We have been and will continue to be a part of the local Basin and Watershed Advisory Groups to assist in prioritizing, coordinating, and implementing basin-wide salmonid surveys, and recovery and protection measures. The data collected will be entered into IDFG's Native Fish Database, which will be made available to interested parties and will be used for management decisions and Department recommendations. Quarterly and annual reports will be written in a timely manner and made available to interested parties working on bull trout and other native salmonid projects. Throughout the project, journal articles will be written when appropriate.

Congratulations!