PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Idaho Natural Production Monitoring And Evaluation

BPA project number: 9107300
Contract renewal date (mm/yyyy): 7/1999 ☒ **Multiple actions?**

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

Business acronym (if appropriate) IDFG

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NPPC Program Measure Number(s) which this project addresses
3.2, 3.2c, 4.1a, 4.2a, 4.3c.1, 5.0a, 5,0b, 5.0e, 5,0f.7, 7.1c, 7.1c.3

FWS/NMFS Biological Opinion Number(s) which this project addresses
1995 NMFS Biological Opinion

Other planning document references
Snake R. Salmon Recovery Plan, NMFS 1997, August 8, Draft

Short description
Improves adult-to-smolt and smolt-to-adult survival of chinook salmon and steelhead. Identifies limiting factors and methods to improve survival. Provides monitoring to determine the effectiveness of recovery actions and population status.

Target species
Snake River spring and summer chinook salmon and steelhead

Section 2. Sorting and evaluation

Subbasin
Salmon River, Clearwater River

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more	If your project fits either of these	Mark one or more categories

caucus	processes, mark one or both	
☒ 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
8909800	Idaho supplementation studies	PIT tags chinook and steelhead used in smolt-to-adult return rate (SAR) analysis, collects samples from chinook carcasses for aging, estimates production, collects data for general parr monitoring sites
8909802	Salmon supplementation studies	PIT tags chinook and steelhead used in SAR analysis, collects samples from chinook carcasses for aging, estimates production and productivity for limiting factor analysis, collects data for general parr monitoring sites
8909803	Salmon supplementation studies	PIT tags chinook and steelhead used in SAR analysis, collects samples from chinook carcasses for aging, estimates production and productivity for limiting factor analysis, collects data for general parr monitoring sites
8909801	Salmon supplementation studies	PIT tags chinook and steelhead used in SAR analysis, collects samples from chinook carcasses for aging, estimates production and productivity for limiting factor analysis, collects data for general parr monitoring sites
9005500	Steelhead supplementation studies	PIT tags steelhead used in SAR analysis
9064	Chinook salmon spatial habitat analysis	Conducts salmon escapement monitoring which complements proposed work for increased escapement monitoring
9102800	Monitoring smolt migration of wild Snake River spring/summer chinook	PIT tags chinook used in SAR analysis
5520800	Listed stock adult escapement monitoring	Conducts salmon escapement monitoring which complements increased escapement monitoring

9801002	Captive rearing initiative for Salmon R. chinook salmon, M&E	The report on chinook population status will be used by project 9801002 to identify high risk populations that could potentially benefit from a captive program
9303501	Red R. Watershed Restoration Project	This project measures fish production and productivity in Red R. and as such is an integral monitoring component of the Red R. watershed restoration project.
9600600	PATH- Facilitation, Tech. Assistance & Peer Review	General parr monitoring and smolt-to-adult information produced by this project have been used in the PATH process
9600800	PATH- Participation by State and Tribal Agencies	General parr monitoring and smolt-to-adult information produced by this project have been used in the PATH process
9700200	PATH- UW Technical Support	General parr monitoring and smolt-to-adult information produced by this project have been used in the PATH process

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1984	The general parr monitoring database was started in 1984 and continues today. It represents the most comprehensive salmon and steelhead database in Idaho and is the only longterm database for steelhead.	Yes, this accomplishment established a means of monitoring Idaho salmon and steelhead on a population basis.
1985	Documented the relative success of instream structures versus off-channel habitat development to increase parr production.	Yes, this accomplishment provided information to direct future work to increase adult-to-smolt survival.
1988	Increased chinook and steelhead parr production by over 135,000 fish following habitat improvements.	Yes, this accomplishment increased adult-to-smolt survival.
1988	Identified factors affecting survival of chinook and steelhead parr.	Yes, this accomplishment provided information to direct future work to increase adult-to-smolt survival.
1988	Estimated chinook egg-to-parr survival in the headwaters of the Salmon River and Crooked River.	Yes, this accomplishment established a measure of chinook salmon productivity.
1988	Estimated chinook egg-to-parr survival of fish supplemented by different methods (e.g. adult outplants, fry releases, egg outplants).	
1988	Estimated survival impacts due to irrigation diversions.	Yes, this accomplishment provided information to direct future work to increase adult-to-smolt survival.
1989	Estimated seeding level for A-run and B-run steelhead in specific rearing areas.	Yes, this accomplishment established a means of monitoring Idaho salmon and steelhead on a population basis.
1992	Identified differences in peak arrival time to Lower Granite dam between hatchery and wild chinook.	Yes, this accomplishment provided information to improve survival of wild chinook salmon through adjustment of hydrosystem operation.

1993	Determined release strategies for hatchery chinook smolts and adults to increase survival and production.	
1994	Documented adult chinook and steelhead escapement to three pristine wilderness streams during 1994-1996.	Yes, this accomplishment identified smolt-to-adult survival as the factor most limiting wild chinook salmon and steelhead.
1997	Identified decreased survival associated with multiple collection and bypass.	Yes, this accomplishment resulted in a change in dam operations resulting in higher smolt-to-adult survival.
1997	Verified PATH chinook salmon smolt-to-adult recovery goals with Snake River basin smolts/female estimates.	Yes, this accomplishment confirmed goals for smolt-to-adult survival as accurate.
1998	Completed model for estimating smolt-to-adult return rate by migration route.	Yes, this accomplishment identifies migration routes with the greatest potential for achieving recovery.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Produce chinook salmon smolts per female consistent with the Snake R. basin average (220 smolts/female) in all major watersheds of the Salmon River and Clearwater River basins.	a	Synthesize information regarding population productivity, total smolt production, parr densities, and lifestage survival rates of spring and summer chinook in the Salmon and Clearwater River basins with information regarding habitat parameters obtained
			from appropriate agencies (e.g. BPA, USFS, BLM, IDEQ, etc.).
2	Achieve 2-6% smolt-to-adult suvival for chinook salmon and 3-7 % for steelhead in the Snake River basin.	a	Continue estimating smolt-to-adult survival of Snake River spring and summer chinook salmon (as an aggregate) and steelhead by migration route (transported, bypassed, never collected) and overall survival.
		b	PIT tag wild juvenile steelhead to increase the number of adult returns for the analysis in Task 2a.
		c	Continue estimating smolts/female for aggregate Snake River basin spring and summer chinook salmon to identify smolt-to-adult survival needed to achieve recovery.
		d	Continue reporting weekly smolt detection information for the entire Snake River basin during the spring outmigration to IDFG managers for recommending actions regarding hydrosystem operation.
3	Manage and collect long-term monitoring data on spring and summer chinook and steelhead population abundance and characteristics to document status and trend.	a	Continue managing the general parr monitoring database which includes information on densities of sp/su chinook salmon juveniles, steelhead juveniles, resident fish juveniles, and habitat parameters throughout the Salmon and Clearwater River basins.

		b	Investigate the need to expand general parr monitoring sites to integrate parr monitoring with escapement index areas
		c	Expand sp/su chinook escapement monitoring to include all metapopulations identified in the NMFS recovery plan.
		d	Determine the relationship between redds in index areas relative to redds in the entire drainage for key populations.
		e	Continue indexing steelhead escapement in the Salmon and Clearwater River basins by conducting aerial redd counts.
		f	Confirm age estimates of spring and summer chinook salmon from previous years if possible.
		g	Utilize coded-wire-tagged hatchery adults from as many sites as possible and wild PIT tagged adults to develop an archive of aging structures as a means of validating age estimates.
		h	Continue enumerating chinook and steelhead escapement over weirs and conducting redd counts.
		i	PIT tag a minimum of 700 emigrating chinook parr during the summer and fall, and 500 emigrating smolts during the spring, annually. PIT tag all steelhead juveniles of sufficient size.
		j	Continue monitoring chinook and steelhead parr densities in trend areas.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	7/1999	6/2007	Produce chinook salmon smolts per female consistent with the Snake R. basin average (220 smolts/female) in all major watersheds of the Salmon River and Clearwater River basins.	X	18.17%
	7/1996		Achieve 2-6% smolt-to-adult suvival for chinook salmon and 3-7 % for steelhead in the Snake River basin.		37.86%
3			Manage and collect long-term monitoring data on spring and summer chinook and steelhead population abundance and characteristics to document status and trend.		43.97%
				Total	100.00%

Schedule constraints
Completion of Objective 1 is dependent upon the nature of available data and the amount and kind of remedial work necessary. As such, the completion date of 6/2007 represents a rough estimate.

Completion date
It is expected that monitoring under Objectives 2 & 3 will continue at least until recovery is achieved. Objective 2 relies on detectors at the lower Snake R. dams. If these dams are breached tasks under this objective would cease.

Section 5. Budget

FY99 project budget (BPA obligated): $731,659

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel		%41	311,942
Fringe benefits		%15	112,299
Supplies, materials, non-expendable property		%7	55,015
Operations & maintenance		%6	48,640
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%5	37,500
NEPA costs		%0	0
Construction-related support		%0	0
PIT tags	# of tags: 0	%0	
Travel		%4	28,935
Indirect costs		%17	133,181
Subcontractor		%5	40,000
Other		%0	
		TOTAL BPA FY2000 BUDGET REQUEST	$767,512

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
		%0	
		%0	
		%0	
		%0	
		Total project cost (including BPA portion)	$767,512

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$838,439	$871,977	$906,856	$943,130

Section 6. References

Watershed?	Reference
☐	Baker, T., A. Wertheimer, R. Burkett, and seven others. 1996. Status of Pacific Salmon and Steelhead Escapements in Southeastern Alaska. Fisheries: Special Issue on Southeastern Alaska and British Columbia Salmonid Stocks at Risk. Vol 21, No 10.
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☐	Beamish, R. J. and G. A. McFarlane. 1983. The Forgotten Requirement for Age Validation in Fisheries Boilogy. Transactions of the American Fisheries Society 112:735-743.
☐	Chilton, D. E. and H. T. Bilton . 1986. New Method for Ageing Chinook Salmon (Onchorhynchus tshawytscha) Using Dorsal Fin Rays, and Evidence of Its Validity. Canadian Journal of Fisheries and Aquatic Science 43:1588-1594.
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☐	Hall, D.L. 1991. Age Validation and Aging Methods for Stunted Brook Trout. Transactions of the American Fisheries Society 120:644-649.
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☐	Hill, Ryan A. 1997. Optimizing Aerial count Frequency for the Area-Under-the Curve Method of Estimating Escapement. North American Journal for Fisheries Management. 17:461-466.
☐	Holubetz, T.B., 1995. Wild Steelhead Studies. FY 1993.
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☐	Kiefer, R. and K. Forster. 1991. Idaho Habitat and Natural Production Monitoring. Ann. Rept. FY 1989.
☐	Kiefer, R. and K. Forster. 1992. Idaho Habitat and Natural Production Monitoring, Part II. Ann. Rept. FY 1990.
☐	Kiefer, R. and J. Lockhart. 1994. Intensive Evaluation and Monitoring of Chinook Salmon and Steelhead Trout Production, Crooked River and Upper Salmon River Sites. Ann. Rept. FY 1992.
☐	Kiefer, R. and J. Lockhart. 1997. Intensive Evaluation and Monitoring of Chinook Salmon and Steelhead Trout Production, Crooked River and Upper Salmon River Sites. Ann. Rept. FY 1994.
☐	Leitzinger, E.J. and C. Petrosky. 1995. Idaho Habitat/Natural Production Monitoring, Part I. Ann. Rept. FY 1993.
☐	Leitzinger, E., K.Plaster, P. Hassemer, P. Sankovich. 1996. Idaho Supplementation Studies.

	Annual Report 1993. Project number 89-098, DE-BI79-89BP01466, Bonneville Power Administration, Portland, Oregon.
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☐	National Marine Fisheries Service. Reinitiation of consultation on 1994-1998 operation of the federal Columbia River power system and juvenile transportation program in 1995 and future years. Signed: March 2, 1995.
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☐	Park, D. 1985. A review of smolt transportation to by pass dams on the Snake and Columbia Rivers. In U.S. Army Corps of Engineers, Walla Walla district. Comprehensive report of juvenile salmonid transportation. Portland, OR.
☐	Petrosky, C.E. and T.B. Holubetz. 1985. Idaho Habitat Evaluation for Offsite Mitigation Record. Ann. Rept. FY 1984.
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☐	Ward, D. L., R.R. Boyce, F.R. Young, and others, 1997. A review and assessment of transportation studies for juvenile chinook salmon in the Snake River: North American Journal of Fisheries Management, v. 17, p. 652-662.
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PART II - NARRATIVE

Section 7. Abstract

Survival of Snake River basin spring and summer chinook and steelhead can be considered a product of survival in the spawning and rearing environment (adult-to-smolt) and in the migration corridor and ocean rearing environment (smolt-to-adult). The Columbia Basin Fish and Wildlife Plan and the Idaho Fish and Game Anadromous Plan have numerical escapement goals for salmon and steelhead to the Snake River basin. Improving survival during both the adult-to-smolt and smolt-to-adult stages is the only means of achieving these goals. This project provides data and analysis necessary to make informed decisions to improve survivals in the adult-to-smolt (Objective 1) and smolt-to-adult (Objective 2) stages. It also provides a means of tracking the efficacy of recovery measures undertaken to improve survival and achieve recovery (Objective 3).

Through information synthesis and analysis, Objective 1 will improve adult-to-smolt survival by identifying watersheds exhibiting below average productivity and providing recommendations regarding remedial actions and information needs necessary to improve survival. Objective 2 will improve smolt-to-adult survival by identifying migration routes and other actions with the greatest potential to increase smolt-to-adult survival. This objective also monitors the efficacy of mainstem recovery actions. Objective 3 determines the success of measures to improve survival of chinook and steelhead by monitoring population status and trends through long-term databases (such as parr production, adult escapement, and others).

Section 8. Project description

a. Technical and/or scientific background

Objective 1--The NMFS will make a decision in 1999 on how to ameliorate hydrosystem impacts to anadromous migrants (NMFS 1995). Although smolt-to-adult return rates are the factor most limiting recovery of Snake River basin anadromous populations, some watersheds have experienced significant habitat degradation (Platts et al. 1989). In order to maximize the benefit of the 1999 decision to Idaho's anadromous populations, it is prudent to ensure that spawning and rearing habitat in all major watersheds is of the best quality possible to speed recovery. There has been a significant increase in anadromous production monitoring during the 1990s primarily by IDFG and tribal entities in the Salmon and Clearwater River basins (Projects: 8909800, 8909801, 8909802, 8909803, 9005500, 8332300, 9064). During this same period, there has also been an increase in fish habitat-related surveys conducted by land management agencies. The fish production as well as habitat information is generally not readily accessible and has not been integrated. Under this objective fish production and habitat information will be synthesized on a watershed basis in FY 2000 as a first step toward increasing smolt production. This effort will produce a comprehensive report identifying the productivity of watersheds, potential limiting factors for chinook salmon and steelhead with recommendations for actions to improve survival. Population viability analysis for Salmon R. chinook populations will be a component of this report. Work on this objective began in 1999.

Objective 2-- Smolt-to-adult return rates decreased systematically as each of the lower Snake River dams and John Day dam became operational (Ebel 1977). Recovery actions to date have relied primarily on engineering solutions such as smolt transportation and bypass systems to improve survival. Transportation was initiated due to transport:control ratios which the NMFS felt justified the program (Park 1985). The NMFS control group did not meet any scientific definition of a control group, however (Mundy et al. 1994; Ward et al. 1997). This project has pioneered the development of a model to estimate the smolt-to-adult survival of a true in-river migrant (control group) as well as survivals for other migration routes (e.g., transported groups by dam of collection, bypassed groups, and NMFS "control" group). Smolt-to-adult return rate estimates have important implications in determining hydrosystem based recovery measures as well as short-term management decisions to improve survival (e.g. whether or not to transport all steelhead from McNary dam in 1998). A manuscript regarding overall SAR for chinook salmon was submitted for peer-reviewed publication in 1998, and two manuscripts will be submitted in 1999 regarding survival by migration route and survival by date of transportation.

Objective 3 is composed of a number of tasks which monitor chinook and steelhead populations. The Snake River Salmon Recovery Plan (NMFS 1997) states that monitoring is an essential element of adaptive management and that scientists must have methods to count salmon in their natural environment. This objective provides many of the monitoring functions for spring and summer chinook salmon and steelhead in Idaho. Discussion follows on monitoring activities by major categories.

-- General parr monitoring has been ongoing since 1985 and is the most comprehensive database on salmon and steelhead in Idaho. The database has information on more than 154 streams in the Salmon, Clearwater and lower Snake River drainages contained in approximately 5,000 records. Percent carrying capacity and density estimates are determined for the following classes of juvenile salmon: wild and natural A-run and B-run steelhead and wild and natural spring and summer chinook salmon. These data have been used to estimate lifestage survival rates, index abundance, estimate replacement rates, and estimate rearing potential of different habitats. Regression of chinook density against escapement over Lower Granite dam yielded r2 values of 0.32 to 0.56 depending upon specific variables used (e.g. wild or natural chinook salmon). Regression of steelhead density against escapement over Lower Granite dam yielded r2 values of .05 to .63 depending upon specific variables used (e.g. run type or aggregate). Work began in 1999 to examine the number and location of index sites as a means of improving the correlation of all groups of chinook and steelhead with escapement over Lower Granite dam. Cramer and Neeley (1993) noted that the general parr monitoring information was an important index of abundance and recommended that the utility of this information could be improved by integrating general parr monitoring sites with escapement index areas. NMFS (1997) concurred that general parr monitoring information provided an alternative method of estimating whether delisting criteria for chinook salmon had been met. The need to implement an expansion of general parr monitoring sites in chinook and steelhead escapement index areas will be investigated in 1999. The general parr monitoring database also contains information on bull trout, westslope cutthroat, rainbow trout and other resident species.

-- Adult escapement. Monitoring adult chinook and steelhead escapement through redd counts is an accepted method of indexing population strength (Baker et al. 1996; English et al. 1992; Hill 1997). Some index areas in Idaho were established during the 1950s (Elms-Cockrum 1997). The NMFS (1997) identified delisting criteria based on a relative replacement ratio and an estimate of the absolute number of fish escaped by metapopulation to achieve delisting. Currently, six of the 12 metapopulations identified by NMFS (1997) have few or no index sites. Additionally, metapopulation dynamics may not be represented by monitoring only a small number of streams (Rieman and McIntyre 1996). This project will establish baseline escapement data for all metapopulations so that the replacement ratio through time can be measured. Furthermore, there has been no work conducted to estimate total metapopulation escapement. Cramer and Neeley (1993) recommended a method to estimate total metapopulation escapement and other methods may also be appropriate (Skalski 1990). This is a new initiative with preliminary work undertaken in 1999.

-- Age structure of chinook salmon populations. Accurate age distribution information is important for spawner based recruit to parent ratios, estimates of brood year productivity, and as an indication of the amount of genetic exchange between brood years (Cramer and Neeley 1993). As salmon reach maturity, most scales are resorbed and total age cannot be estimated (Chilton and Bilton 1986). Due to the long migration of Snake River chinook this effect may be exacerbated (personal communications, Lisa Borgeson, ODFW aging lab and Shayne MacLellan, supervisor, fish aging lab, Fisheries and Oceans, Canada). Scales, ototliths, and fin rays have all been used to age chinook (Chilton and Bilton 1986) and other salmonids (Barber and McFarlane 1987; Hall 1991). Age validation is a critical step in achieving accurate age information (Beamish and McFarlane 1983). Scales from salmon carcasses have been collected for decades in Idaho, but verification was not necessarily conducted. This project will determine the most accurate method available to age Idaho's chinook salmon (scale, otolith, or fin ray). An archive of aging structures of known age chinook will be established for validation purposes from as many streams as possible. This method will be applied in the future and if possible, to past scale collections. This is a new initiative with work beginning in 1999.

-- Monitoring South Fork Clearwater River basin chinook salmon and steelhead production and productivity. Measurement of naturally produced juvenile chinook salmon and steelhead relative to adult escapement began in Crooked River in 1987 making it one of the longest datasets of its kind in Idaho. Lifestage survival rates such as egg-to-parr and parr-to-smolt, and stock:recruitment curves were produced (Kiefer and Lockhart 1994, 1997). Additional intensive monitoring began in two other tributaries, Red River and American River, in 1992 as part of project 8909800. This work is an important portion of the anadromous production and productivity monitoring occurring in Idaho. Weirs allow accurate counts of adult spawners (chinook and steelhead) and screw traps in conjunction with PIT tag detections allow estimation of smolt production.

b. Rationale and significance to Regional Programs

This project improves adult-to-smolt (Objective 1) and smolt-to-adult (Objective 2) survivals by providing information on limiting factors and recommendations to improve survival. This is accomplished by consolidating and analyzing data on an ecosystem basis and communicating the information to basin managers. This project also monitors the efficacy of recovery actions on a population basis and monitors population status (Objective 3). This is accomplished by collecting data, and managing and analyzing long-term databases necessary to evaluate and track chinook salmon and steelhead population trends, status, and characteristics.

Objective 1 specifically relates to FWP measures 4.1a, 4.2a, and 7.1 which deal with the need to address critical uncertainties, habitat, and fish production issues from a watershed perspective, and to identify population life history characteristics and limiting factors. The products from Objective 1 will: 1) maximize the utility of existing information through synthesis and analysis in a watershed context, 2) identify salmon and steelhead populations in eminent danger of extirpation, 3) identify watersheds which could benefit from habitat restoration activities, 4) identify specific remedial actions and information needs at the watershed level, and 5) through the aforementioned actions return more salmon and steelhead to the basin by improving adult-to-smolt survival. The Snake River Salmon Recovery Plan (NMFS 1997) states that low productivity of chinook salmon is a result of freshwater habitat degradation among other things (pg. 41). The extent to which habitat degradation is a limiting factor should be determined to help guide recovery measures. The NMFS (1997) also notes that effective population rehabilitation must begin with broad-scale analysis and assessment (pg. 57), and that monitoring should be accompanied with review of the information collected (pg. 55).

Objective 2 specifically relates to FWP measures 4.1a, 4.2a, 5.0a, 5.0b, 5.0e, and 5.0f.7 which call for the need to address critical uncertainties on a systemwide basis and to specifically address mainstem survival of emigrants by mainstem migration route. The NMFS (1997) calls for continued juvenile fish transportation until in-river migrants are shown to survive better (pg. ES 5) and the 1995 Biological Opinion calls for evaluation of survivals of in-river migrants versus transported fish. The model which was developed under this objective provides a method of estimating survival under current migration routes. Because increasing smolt-to-adult return rates is the single-most important step to achieving recovery of Snake R. anadromous fish, this objective is critical to the goals of the FWP.

Objective 3 specifically relates to FWP measures 4.3c, and 7.1c which recognize the need for long-term population monitoring of index populations including data collection on parameters such as population trend and life history traits. The NMFS (1997) recommends that monitoring and inventory programs be expanded (pg. 55); specifically noting the need to do so for chinook escapement index areas (Appendix D, pg. 6). Through this objective work will be conducted to expand chinook escapement monitoring to adequately represent metapopulations and to ensure that parr index sites adequately represent all species and races of listed anadromous fish. Overall, Objective 3 collects, analyzes, and manages data necessary for long-term monitoring through parr index sites established throughout the Salmon and Clearwater drainages, adult chinook and steelhead escapement monitoring, determination of chinook population age structure, and measuring chinook production and productivity in the South Fork Clearwater River basin.

c. Relationships to other projects

Objective 1. Escapement, production, and productivity data is collected by projects: 8909800, 9005500, 8909802, 8909803, 8909801, 9064, and 5520800. Additional life history information is collected by project 9102800 and habitat-related information is available though the Idaho Department of Environmental Quality, U.S. Forest Service, and Bureau of Land Management, and other agencies.

Objective 2. Smolt-to-adult return rate analysis requires that large numbers of PIT tags be implanted into wild spring and summer chinook salmon and steelhead annually. Much of this tagging is performed by projects: 8909800, 9005500, 8909802, 8909803, 8909801, and 5520800. This information was used in the PATH process (projects: 9700200, 9600800, 9600600).

Objective 3. Data for the general parr monitoring database and samples for aging chinook are collected by projects: 8909800, 9005500, 8909802, 8909803, and 8909801. The general parr monitoring database has been made compatible and joined with the USDA Eastside Assessment, a comprehensive watershed database. General parr monitoring information has also been used in PATH analyses (projects: 9700200, 9600800, 9600600).

Objective 3. Chinook escapement in the Middle Fork Salmon River, South Fork Salmon River, Pahsimeroi River, Lemhi River basins are being adequately monitored by Projects 9064, 8909800, 8909802, 8909803.

Objective 3. South Fork Clearwater River basin production and productivity monitoring is conducted in cooperation with the Salmon Supplementation Studies projects: 8909800, 9005500, 8909802, 8909803, and 8909801.

d. Project history (for ongoing projects)

From 1984-1989 this program evaluated habitat, conducted different types of habitat rehabilitation work, and measured changes in numbers of rearing chinook salmon and steelhead parr as a result of this enhancement activity. Additionally, carrying capacity for chinook salmon and steelhead was determined for study streams, fish density relative to habitat parameters was examined, and factors affecting survival in spawning and rearing areas were determined (Petrosky and Holubetz 1985, 1986, 1987; Petrosky, Holubetz, and Everson, 1988; IDFG 1990, 1991; Rich, Scully, and Petrosky 1992; Rich, Schrader, and Petrosky 1993; Rich and Petrosky 1994; Leitzinger and Petrosky 1995; Hall-Griswold, Leitzinger, and Petrosky in press; Hall-Griswold and Petrosky 1996). The general parr monitoring program was started.

In 1987, a subproject was begun under this contract to intensively study two streams to: 1) determine smolt production, 2) estimate egg-to-parr and parr-to-smolt survival rates for chinook salmon and steelhead, 3) to determine the mathematical relationship between spawning escapement, parr production, and smolt production; 4) determine migration characteristics; 5) to determine the most effective supplementation strategies; and 6) determine carry capacity. Most of these objectives were achieved to the extent possible under the escapement levels that occurred. Because of low escapement, activities in these study streams were reduced in 1996 to measuring escapement, production, productivity, and survival rates when possible (Kiefer and Forster 1991; Kiefer and Forster 1992; Kiefer and Lockhart 1993; Kiefer and Lockhart 1994; Kiefer and Lockhart 1996; Kiefer and Lockhart 1997; Kiefer and Lockhart, in progress). Between 1993 and 1996 two additional streams, Red River and American River, were added to this effort (Leitzinger, E., et al. 1996; Nemeth et al. 1996).

In 1993, an initiative was undertaken to accurately measure chinook salmon and steelhead escapement in 3 streams located in Idaho's pristine wilderness areas to determine adult-to-adult escapement under excellent spawning and rearing habitat conditions. Productivity measurements were also attempted in one of those streams (Holubetz 1995). High stream flows in 1997 destroyed or damaged the adult weirs and this effort was discontinued.

Beginning in 1996, the project began to emphasize data analysis and management. The most significant piece of information as a result of this effort has been the evaluation of smolt-to-adult survival. In 1998 and 1999, three manuscripts regarding smolt-to-adult survival of Idaho's chinook salmon and steelhead were submitted for peer-review publication.

Summary of Project Reports: (Section 6 contains complete citations)

Project 83-7, 9 reports, 1985-1992, Report titles: Idaho habitat evaluation for offsite mitigation record; Evaluation and monitoring of Idaho habitat enhancement and anadromous fish natural production; Idaho habitat and natural production monitoring.

Project 91-73, 16 reports, 1993-1998, Report titles: Idaho habitat/natural production monitoring, Part I, General monitoring subproject; Intensive evaluation and monitoring of chinook salmon and steelhead trout production, Crooked river and upper Salmon River sites; Wild steelhead studies.

Project 89-098, 3 reports, 1993-1996, The Idaho Supplementation Studies.

Summary of Major Results Achieved:

- Established long-term general parr monitoring database (1984 – current). *Adaptive Management Implication: Monitors success of management activities to achieve species recovery.*
- Determined the relative benefit of in-channel habitat rehabilitation work vs. out-of-channel rehabilitation measures. *Adaptive Management Implication: Determined the rehabilitation work with the best cost:benefit ratio.*
- Increased carrying capacity in study streams for rearing chinook salmon and steelhead.
- Identified factors in the spawning and rearing environment affecting chinook salmon survival. *Adaptive Management Implication: Identified habitat parameters affecting population rehabilitation. An important factor when considering funding for habitat and hatchery rehabilitation programs.*
-Documented differences in chinook salmon and steelhead parr densities in grazed vs. ungrazed streams. *Adaptive Management Implication: Identified rehabilitation work with the potential to increase natural production.*
- Estimated egg:parr survival for naturally-produced chinook salmon in study streams and in relation to sedimentation level. *Adaptive Management Implication: Identified habitat parameters affecting population rehabilitation. An important factor when considering funding for habitat and hatchery rehabilitation programs.*
- Estimated diversion impacts to chinook salmon survival. *Adaptive Management Implication: Quantified a factor limiting population rehabilitation.*
- Documented differences in peak arrival time at Lower Granite Dam for hatchery-produced chinook salmon and Idaho's wild/natural spring and summer chinook salmon. *Adaptive Management Implication: Identified the need to manage mainstem operations taking into consideration different life history characteristics.*
- Established steelhead trend redd counts (1990 – current). (*Adaptive Management Implication): Monitors success of management activities to achieve species recovery*.
- Determined smolts per female (or redds) for study streams.
- Developed a model predicting the number of spring and summer chinook salmon smolts emigrating from Idaho annually.
- Determined smolt-to-adult survival rates for chinook salmon which were transported, unhandled, and collected and bypassed. *Adaptive Management Implication: Implications for mainstem passage strategies to aid recovery*.

e. Proposal objectives

Objective 1. Produce chinook salmon smolts per female consistent with the Snake R. basin average (220 smolts/female) in all major watersheds of the Salmon River and Clearwater River basins.
Hypotheses: 1) The number of chinook salmon smolts produced, and smolts per redd, does not vary between watersheds in the Salmon and Clearwater River basins. 2) Smolt production is independent of habitat quality. 3) Measured habitat parameters (e.g. gradient, substrate composition, stream complexity, etc.) do not differentially effect chinook and steelhead production and productivity.

Assumptions: 1) Egg-to-smolt survival can be accurately estimated on a watershed level. 2) Available data regarding habitat quality parameters affect egg-to-smolt survival.
Products: A comprehensive report will be produced by June 2001, identifying watersheds where spawning and rearing habitat may be limiting anadromous fish production and providing recommendations to improve adult-to-smolt survival. This report will also include population status including population viability analysis for Salmon R. chinook. Benefits: 1) Improved adult-to-smolt survival. 2) Maximum utility of information from disparate projects and agencies by assimilating and presenting data in a more meaningful ecosystem context. 3) Identification of smolt-to-adult return rates necessary to recover stocks in watersheds with low productivity. 4) Identification of chinook salmon populations in eminent danger of extirpation.

Objective 2. Achieve 2-6% smolt-to-adult survival for chinook salmon and 3-7 % for steelhead in the Snake River basin.
Hypotheses: 1) Smolt-to-adult survival is not different between migrants using different mainstem migration routes (e.g. never collected, collected and transported, or collected and bypassed. 2) Smolt to adult survival for a given mainstem migration route is not different between spring and summer chinook salmon and steelhead. 3) Smolt-to-adult survival by migration route is not different between years.
Assumptions: 1) Juvenile chinook salmon and steelhead will be PIT-tagged in adequate numbers to allow enough adult returns to calculate a biologically and statistically meaningful survival estimate.
Products: 1) An accurate model for estimating smolt-to-adult survival of smolts that utilized various mainstem migration routes. 2)Three manuscripts will be submitted for peer-review publication during 1998-1999. 3) Detection reports (weekly during the spring emigration and an annual summary) are provided to anadromous managers.
Benefits: 1) A method for accurately measuring mainstem mitigation efforts in meeting survival goals. 2) A method of determining the level of mainstem survival improvements necessary for recovery. 3) A tool for comparing current survival between mainstem migration routes that will help predict the efficacy of future mainstem mitigation options. 4) Weekly smolt detection information is provided real time to aid in spill vs transport decisions so that spill is used for optimum benefit. 5) The annual detection summary report highlights differences in migration timing between populations and life history types within populations which is essential to implement mainstem recovery measures on a population basis as opposed to an aggregate basis.

Objective 3. Manage and collect long-term monitoring data on spring and summer chinook and steelhead population abundance and characteristics to document status and trend.
Hypotheses: 1) There is no difference between adult chinook and steelhead escapement and parr densities between populations. 2) Adult escapement and parr densities on a population level do not correlate with chinook salmon and steelhead escapement over Lower Granite dam. 3) There is no change in adult escapement and parr densities by watershed over time. 4) Chinook salmon age structure does not vary between watersheds or between years for a given watershed. 5) Supplementation-restoration utilizing existing hatchery stocks does not establish natural populations of chinook salmon in Idaho. 6) The effects of supplementation on natural production and productivity does not differ among life stages (parr, presmolt, smolt) of hatchery fish released.
Assumptions: 1) Aerial and ground counts are accurate methods of estimating adult chinook salmon and steelhead escapement. 2) Parr index sites are representative of Salmon and Clearwater River basin salmon and steelhead races and populations. 3) It is possible to accurately age Salmon and Clearwater River chinook salmon. 4) It is possible to accurately measure chinook smolt production.
Products: 1) Long-term escapement and parr density databases will be maintained and improved (Cramer and Neeley 1993, NMFS 1997) to ensure an accurate and sensitive monitoring program is established. 2) An accurate methodology will be established, providing population age structure information for spring and summer chinook salmon. 3) The best strategy for increasing production of naturally-reproducing chinook salmon will be determined (e.g. life stage at release, time of release, no releases, etc.).
Benefits: 1) An accurate and sensitive monitoring system (adults and parr) will ensure delisting occurs as soon as possible. 2) A measure of population health and an additional index of recovery target abundance through the general parr monitoring database(Cramer and Neeley 1993). 3) General parr monitoring data provides an index of population trend for resident fish populations. 4) General parr monitoring data is readily available through Streamnet. 5) Accurate age structure information will provide the ability to

conduct population viability analysis and to partition adult returns to the proper brood year for spawner-based recruit to parent ratios. 6) Accurate age information will provide a means of monitoring change in populations through time. 7) Determining the best method of supplementing could result in swifter recovery and significant cost savings.

f. Methods

Objective 1.

Produce chinook salmon smolts per female consistent with the Snake R. basin average (220 smolts/female) in all major watersheds of the Salmon River and Clearwater River basins. The first step in achieving this objective is to identify watersheds which are not meeting the standard. This will be accomplished by synthesizing all available fish production and habitat information on a watershed basis. The resulting report will be completed by the end of the FY 2000 contract period or June 2001. The most detailed information regarding salmon and steelhead production will likely be from study watersheds of the salmon and steelhead supplementation studies. The extent of habitat information for all watersheds of interest is unknown and is a factor which could limit results. It is anticipated that some watersheds will be identified as containing factors limiting production. For these systems, existing information may be sufficient to recommend remedial actions, but in others additional research may be recommended. Fish density, smolts per female (or redd), spawning distribution and other indices of fish abundance and productivity will be compared to basin wide averages and pertinent values in the literature as a means of identifying streams where productivity may be limited. Habitat information will be incorporated with current fish production data to determine factors likely limiting production. A population viability analysis for chinook salmon populations will be conducted to evaluate spring and summer chinook population status in the Salmon River basin. Following completion of this report, work will be recommended to alleviate identified limiting factors or further define them.

Task 1.a. Synthesize information regarding population productivity, total smolt production, parr densities, and lifestage survival rates of spring and summer chinook in the Salmon and Clearwater River basins with information regarding habitat parameters obtained from appropriate agencies (e.g. BPA, USFS, BLM, DEQ, etc.).

Objective 2.

Achieve 2-6% smolt-to-adult survival for chinook salmon and 3-7 % for steelhead in the Snake River basin. One of the routes of primary interest is that of the never-collected smolts which represent a true control group (transported fish are the treatment). The estimate of the never-collected group is based on Jolly-Seber mark-recapture theory with boot-strapping. These estimations and the details of this analysis are being conducted in coordination with the University of Idaho's statistical department. Results can be limited due to low survival resulting in a low number of adults detected. In an effort to mitigate for the low survival and produce more adult detections, additional wild juvenile steelhead are being PIT tagged. It is anticipated that survival will be higher for smolts that use some migration routes relative to others.

Snake R. basin spring and summer chinook smolts per female is important for determining smolt-to-adult survival needed for recovery. Smolts per female is estimated based on adult escapement over Lower Granite dam (considering prespawning mortality, harvest, and hatchery take) relative to the number of smolts counted at Lower Granite dam considering fish collected and fish guidance efficiency.

Task 2.a. Continue estimating smolt-to-adult survival of Snake River spring and summer chinook salmon (as an aggregate) and steelhead by migration route (transported, bypassed, never collected) and overall survival.

Task 2.b. PIT tag wild steelhead juveniles to increase the number of adult returns for the analysis in Task 2.a.

Task 2.c. Continue estimating smolts/female for aggregate Snake River basin spring and summer chinook salmon to identify smolt-to-adult survival needed to achieve recovery.

Task 2.d. Continue reporting weekly smolt detection information for the entire Snake River basin during the spring outmigration to IDFG managers for recommending actions regarding hydrosystem operation to improve survival.

Objective 3.

Manage and collect long-term monitoring data on spring and summer chinook and steelhead population abundance and characteristics to document status and trend.

Parr densities have been monitored in Idaho since 1985. Fish densities for the general parr monitoring database are derived from observations from mask and snorkel conducted according to Petrosky and Holubetz (1986) at index sites. General parr monitoring index sites are identified with written descriptions and GPS coordinates. Percent carrying capacity was calculated using density information and stream capacities estimated by the NPPC subbasin planning model (NPPC 1986). Data are entered into a spreadsheet, verified, and incorporated into Streamnet. The number and location of general parr monitoring sites were reevaluated in 1999 in an attempt to improve correlation coefficients between counts at Lower Granite dam and rearing densities for all species, races, and origins. A power analysis was also conducted in 1999 (Gerrodette 1987; Link & Hatfield 1990).

Task 3.a . Continue managing the general parr monitoring database which includes information on densities of spring and summer chinook salmon juveniles, steelhead juveniles, resident fish juveniles, and habitat parameters throughout the Salmon and Clearwater River basins.

Task 3.b. Investigate the need to expand general parr monitoring sites to integrate parr monitoring with escapement index areas.

Chinook escapement has been monitored in Idaho through redd counts since the 1950s (Elms-Cockrum 1997) and is a commonly used technique for monitoring population status and health of chinook and steelhead (Baker et al. 1996). Chinook redd counts are the best measure of spawner numbers to a basin (Cramer and Neeley 1993). In 1999, historic information and topographical maps will be used to identify potential index areas in streams identified in NMFS (1997). In 2000, aerial flights and ground inspection will be used to define index areas and begin enumerating escapement in additional areas.

Delisting of Snake River basin spring and summer chinook salmon will be based on an absolute number of adults escaping to the spawning grounds for each metapopulation, but there is no methodology available to make such estimates. The relationship of trend areas to total escapement will be evaluated for metapopulations using fish passed over weirs where available, and by conducting additional counts in areas chosen by stratified random sampling in streams containing escapement trend areas (Slalski 1990, Cramer and Neeley 1993). Adult returns in 1999 and 2000 will be the lowest returns on record which will impair establishing the relationship between index areas and basin escapement. Work in 1999 and 2000 will focus on identifying and establishing index areas and methodology in preparation for larger runsizes in 2001.

Task 3.c. Expand spring and summer chinook escapement monitoring to include all metapopulations identified in the NMFS recovery plan.

Task 3.d. Determine the relationship between redds in index areas relative to redds in the entire drainage for key populations.

Task 3.e. Continue indexing steelhead escapement in the Salmon and Clearwater River basins by conducting aerial redd counts.

As salmon reach maturity most scales are resorbed and total age cannot be accurately estimated (Chilton and Bilton 1986). Due to the long migration of Snake River chinook this effect may be exacerbated (personal communications, Lisa Borgeson, ODFW aging lab and Shayne MacLellan, supervisor fish aging lab, Fisheries and Oceans, Canada). Scales, otoliths, and fin rays have all been used to age chinook (Chilton and Bilton 1986) and other salmonids (Barber and McFarlane 1987; Hall 1991). The best method to age Idaho spring and summer chinook salmon will be determined in 1999. This method will be implemented in FY 2000 and in the future.

Task 3.f. Confirm age estimates of spring and summer chinook salmon from previous years if possible.

Task 3.g. Utilize coded-wire-tagged hatchery adults from as many sites as possible and wild PIT tagged adults to develop an archive of aging structures as a means of validating age estimates.

Chinook salmon and steelhead production and productivity will be measured in three streams of the South Fork Clearwater River basin. Adult chinook and steelhead will be enumerated with weir and redd counts (Baker et al. 1996). Smolt production will be estimated using rotary screw traps (Thedinga et al. 1994) and PIT tag detections. This information will be used to calculate chinook smolts/female and spawner:recruit relationships (Kiefer and Forster 1991, 1992; Kiefer and Lockhart 1994, 1997).

Task 3.h. Continue enumerating chinook and steelhead escapement over weirs and conducting redd counts.

Task 3.i. PIT tag a minimum of 700 emigrating chinook parr during the summer and fall, and 500 emigrating smolts during the spring, annually. PIT tag all steelhead juveniles of sufficient size.

Task 3.j. Continue monitoring chinook and steelhead parr densities in trend areas.

g. Facilities and equipment

All structural facilities are in place and are sufficient to carry out the project. A suburban, necessary to transport the tagging crew will be purchased to replace the 1986 model currently being used (we can no longer rely on leasing suburbans due to buyer demand). Computers and software may have to be upgraded or purchased to utilize new technologies. Capital items to age samples from chinook salmon carcasses may have to be purchased.

h. Budget

The increase in budget from FY 1999 is due primarily to expansion of chinook escapement monitoring. The number of streams and their inaccessibility require an increase in helicopter flight time ($420/hour) and temporary personnel time.

Section 9. Key personnel

Doug Nemeth, Principal Investigator, 1 FTE

Education:

Post-Grad, Marine, Estuarine, and Environmental Science, University of Maryland, Cambridge, Maryland 1985-1988
M.S. Biology, Ball State University, Muncie, Indiana, 1985
B.S. Fishery Science, Oregon State University, Corvallis, Oregon, 1983.

Work Experience:

Idaho Natural Production Monitoring and Evaluation Program (INPMEP)
Principal Research Biologist. Principal Investigator
Idaho Department of Fish and Game, Nampa, Idaho. 1997-Present
Project: Determination of the status and factors limiting Idaho’s wild/natural spring and summer chinook salmon and steelhead populations

- Determine program objectives and direction
- Coordinate program implementation
- Analyze data and reported findings

Sr. Fisheries Research Biologist, Project Leader
Idaho Department of Fish and Game, Nampa, Idaho 1994-1997
Project: Determination of the effectiveness of hatchery supplementation at establishing and rehabilitating chinook salmon populations.

- -Coordinated project implementation with state, federal, and tribal personnel
- -Oversaw data collection and methods
- -Analyzed data and reported findings

Assistant District Fishery Biologist
Oregon Department of Fish and Wildlife, Gold Beach, Oregon. 1990-1994.
Project: The management of the fish and human resources of the South Coast.

- - Monitored fish populations and habitat parameters
- -Protected habitat from land use activities
- -Authored South Coast Basin Plan

Sub-basin Planner
Oregon Department of Fish and Wildlife, Corvallis, Oregon. 1988-1990.
Project: The development of fishery management plans for the Molalla/Pudding subbasin, Coast Range subbasin, Willamette subbasin, and Willamette mainstem.

- -Compiled and analyzed data regarding fish populations and habitat
- -Contributed to the development of management objectives and strategies
- -Wrote basin management plans

Publications: BPA reports for 1991-1998.

Jody K. Brostrom, Regional Fishery Biologist, 1 FTE

Education:

M.S. Fisheries and Wildlife Management: Life History of Rainbow Trout and Brown Trout in Two Tributaries in the Henry's Fork Snake River, Idaho, Montana State University, Bozeman, Montana 1984-1987
B.S. Fisheries Resources and BS Wildlife Resources, University of Idaho, Moscow, Idaho 1976-1981

Work Experience:

Regional Fishery Biologist.
Idaho Department of Fish and Game, Lewiston, Idaho. 1993-present Natural Production Monitoring and Idaho Supplementation Studies.

- -Monitor anadromous and resident fish populations
- -Monitor anadromous juvenile outmigration
- -Monitor anadromous adult returns and complete redd surveys in Clearwater and Salmon subbasins
- -Compile data for Streamnet database
- -Analyze data and write annual reports
- -Evaluate and comment on land use impacts to fisheries and habitat
- -Participate in technical teams
- -Develop and implement $130,000 budget
- -Supervise four person field crew

Senior Fishery Research Biologist
Idaho Department of Fish and Game, Idaho Falls, Idaho 1990-1993
Teton River Enhancement Project

-Work with private landowners to restore and enhance riparian habitats for native cutthroat
-Develop and implement cooperative grazing plans, riparian fencing, conservation easements, angler access, and stream restoration
-Coordinate projects and provide comments to other agencies
-Evaluate and monitor salmonid fish populations and history
-Collect and analyze data and write annual reports
-Develop and implement $400,000 budget
-Supervise one permanent technician and temporary field crew

Fishery Technician
Idaho Department of Fish and Game, Idaho Falls, Idaho 1987-1990
Teton River Enhancement Project

-Develop, coordinates, supervise and participate in data collection
-Sample fish populations
-Design and implement basinwide ground and aerial creel census
-Develop angler access and easements
-Evaluate and monitor salmonid fish populations and life history
-Collect and analyze data and write annual reports
-Supervise temporary field crew

Membership: American Fisheries Society 1984-present

Judy A. Hall-Griswold, Fishery Research Biologist, .67 FTE

Education:

M.S. Biology, Eastern Washington University, Cheney, WA 1983-1985
B.S. Biology, Eastern Washington University, Cheney, WA 1978-1982

Work Experience:

Idaho Department of Fish and Game
Fishery Research Biologist, 1990, 1994-present
Senior Fishery Technician, 1992-1993
Fishery and Wildlife Technician, 1985-1987

U.S. Fish and Wildlife Service
Fishery Biologist (GS 7/9) 1982-1983, 1989-1990
Biological Aide- Fisheries 1981

U.S. Army corps of Engineers
Fishery Biologist (GS-7) 1986

Eastern Washington University
Graduate Student, Limnology 1984-1985
Research Assistant- Fishery/Limnology 1980-1981

Public Utility District
Fishery Technician 1978, 1980

Affiliations/ Certification:

American Fisheries Society

USFWS Certificate of Competence- Electrofishing
Sawtooth Wildlife Council Member

Publications:

Transactions of the American Fisheries Society, 1992. 121:680-685
Idaho Department of Fish and Game, 10 annual reports, 1986-1989, 1995-1997
U.S. Fish and Wildlife Service, 2 annual reports, 1982, 1989

Russell B. Kiefer, Senior Fisheries Research Biologist, 1 FTE

Education:

M.S. Aquatic biology, southwest Texas State University, San Marcos, Texas 1980-1984
B.S. Zoology, Texas Tech University Lubbock, Texas 1973-1978

Experience:

Senior Fisheries Research Biologist
Idaho Department of Fish and Game, Nampa, Idaho 1986-present
Research project leader estimating chinook salmon and steelhead trout natural productivity and survival in the Snake River basin.

Fish and Wildlife Technician III
Texas Parks and Wildlife Department, Sheldon Texas 1985-1986
Participated in fisheries field surveys and population analysis. Represented department at public meetings.

Fish and Wildlife Technician II
Texas Parks and Wildlife Department, Corpus Cristi, Texas 1985
Maintained marine fish brood stock in a closed recirculating system.

Assistant Fisheries Biologist
Johnson's Lake Management Service, San Marcos, Texas 1985
Fish management of private lakes and ponds.

Foreign Fishery Observer
National Marine Fisheries Service, National Marine Fisheries Service, Seattle, Washington 1984
Identified species and collected biological data onboard foreign fishing vessels in U.S. territorial waters.

Aquatic Biologist
The Nature Conservancy 1982
Completed Aquatic Survey of a 35 mile stretch of the Niobrara River and forty tributary streams.

Publications:

Annual BPA reports 1988-1995

June L. Johnson, Senior Fishery Technician, 1 FTE

Education:

B.S. Fisheries and Wildlife Biology, Iowa State University, Ames, Iowa 1983-1987

Experience:

Sr. Fishery Technician
Idaho Department of Fish and Game, Nampa, Idaho 1996-present
Analyze PIT-tag data, develop and manage fin samples, scales, and otolith samples. Manage associated databases. Determine age of adult chinook. Collect data, do redd counts, PIT-tag, snorkel, and assist with trapping as needed to monitor juvenile chinook and steelhead.

Sr. Fishery Technician
Idaho Department of Fish and Game, Idaho Falls, Idaho 1992-1996
Enhance riparian areas in the Teton drainage through cooperative agreements with landowners. Oversee fencing program of the Teton River Enhancement project. Monitor resident salmonid populations in the Teton River basin, assist with creel census. Coordinate with other agencies.

Fishery Technician
Idaho Department of Fish and Game, Lewiston, Idaho 1990-1992
Managed database of coded-wire tagged hatchery smolt releases and adult returns for Idaho's anadromous hatcheries. Aged steelhead scales. Assisted with PIT-tagging.

Fishery/Hydrology Technician
U.S. Forest Service, Sawtooth National Forest, Twin Falls, Idaho 1989, 1990
Collected streamflow and substrate measurements to determine minimum flows necessary to maintain the fishery and stream integrity. Completed mapwork, surveying, photography, constructed instream structures to enhance fishery habitat, macroinvertebrate sampling, stream inventory and data entry.

Rail Feeder
Clear Springs Trout Hatchery, Crystal Springs facility, Wendell, Idaho 1987-1989
Involved in rainbow trout production, primarily feeding and disease treatment.

Conservation Aide
Iowa Department of Natural Resources, Rathbun, Iowa, 1987
Sampled lake populations, performed water chemistry measurements, general maintenance and assisted with catfish production.

Section 10. Information/technology transfer

Information will be made available on Streamnet, in annual reports, in peer-reviewed publications, the IDFG website, and oral presentations at public and professional meetings.

Congratulations!