Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal

Section 1. General administrative information

Evaluate The Status Of Columbia River Sea-Run Cutthroat Trout

Bonneville project number, if an ongoing project 9145

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

Business acronym (if appropriate) ODFW

Proposal contact person or principal investigator:

Name Mark Zimmerman/David Ward
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Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name
U.S.G.S. Biological Resources Division	Columbia River Research Laboratory 5501A Cook-Underwood Road	Cook, WA 98605	Pat Connolly
Washington Dept. of Fish and Wildlife	Kalama Research Station, 804 Allen St., Ste. 3	Kelso, WA 98626-4406	Cameron Sharpe

NPPC Program Measure Number(s) which this project addresses.
7.5E, 7.1C, 2.2A

NMFS Biological Opinion Number(s) which this project addresses.

Other planning document references.

Subbasin.
Subbasins include Eagle, Herman, Hood, Rock, Wind, White Salmon, and Klickitat above Bonneville Dam, and selected subbasins downstream from Bonneville Dam.

Short description.
Survey Columbia River tributaries above and below Bonneville Dam to determine status of sea-run cutthroat trout and identify limiting factors and anthropogenic impacts.

Section 2. Key words

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

Other keywords.
cutthroat trout, population status, distribution, DNA, stock identification, life history

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Document existing data on	a	Review existing biological data,

	historical and current distribution and describe management practices that affect sea-run cutthroat trout in the Columbia River basin.		subbasin plans, land management regulations, and current production and harvest management practices (FY 1999-2000).
2	Determine status of naturally reproducing populations of sea-run cutthroat trout above and below Bonneville Dam.	a	Survey streams above Bonneville Dam and selected reference streams below Bonneville Dam to determine presence-absence, relative abundance, and collect samples to determine life history pattern of cutthroat trout (FY 1999-2001).
		b	Conduct intensive surveys at index sites to estimate density and biomass of cutthroat trout, and identify limiting factors associated with habitat and species interactions (FY 1999-2001).
		c	Analyze scale, otolith, and fin tissue samples to describe age and growth, life history patterns (anadromous/resident), and genetic characteristics of populations of lower Columbia River cutthroat trout (2000-2001).

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	2/1999	12/2000	15.20%
2	4/1999	12/2001	84.80%
			TOTAL 100.00%

Schedule constraints.

Completion date.

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel	PEM-D @ 2months, NRS-3 @ 8 months, EBA @ 12 months	$53,040
Fringe benefits	@ 41%	$21,746
Supplies, materials, non-expendable property	backpack shockers, computer, snorkeling equipment, cell phone, field supplies	$19,700
Operations & maintenance		$1,440
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		$ 0
PIT tags	# of tags:	$ 0
Travel	12 months rent @ $230, and 20,000 miles @ $0.16	$5,960
Indirect costs	Administrative overhead at 22.9%	$20,538
Subcontracts	USGS BRD = $131,679, WDFW = $10,861	$142,540
Other		
TOTAL		$264,964

Outyear costs

Outyear costs	FY2000	FY01	FY02	FY03
Total budget	$311,888	$274,024		
O&M as % of total	1.50%	1.40%		

Section 6. Abstract

Region-wide concern for declining stocks of Columbia River sea-run cutthroat trout is documented in section 7.5E of the 1994 Columbia Basin Fish and Wildlife Program. The goal of the proposed study is to provide vital information on the current status of cutthroat trout populations in the lower Columbia Basin as a necessary prerequisite to future recovery efforts. Study objectives are to (1) summarize existing data and management practices related to Columbia River sea-run cutthroat trout, and (2) determine the status of populations above and below Bonneville Dam. Objective 1 will be conducted from 1999-2000 using a combination of questionaires and a review of existing biological data and land-use, production, and harvest management practices. Objective 2 will be conducted from 1999-2001 by conducting fish and habitat surveys.

Surveys will be used to estimate density and biomass of cutthroat trout at selected index sites. Analysis of scale, otholith, and tissue samples will be used to describe population characteristics including age and growth, life history patterns, and genetic characteristics of cutthroat trout in the lower Columbia Basin.

Section 7. Project description

a. Technical and/or scientific background.

Anadromous coastal cutthroat trout (*Oncorhynchus clarki clarki*) historically occurred in all lower Columbia River tributaries east to Hood River in Oregon and the Klickitat River in Washington (Hall et al. 1997). Sea-run cutthroat trout supported robust recreational fisheries in the lower Columbia River as recently as 1985; however, sport angler catch and effort has since dramatically declined (Melcher in press). Some populations may be extinct and many are considered depressed (Hooten 1997; Leider 1997). The status of populations in Oregon were recently classified as "sensitive" (Marshall et al. 1996), and the Northwest Power Planning Council (NPPC) has identified sea-run cutthroat trout as a species of concern in its Columbia Basin Fish and Wildlife Program. Throughout their range, sea-run cutthroat trout have declined dramatically in the past 20 years (Trotter 1989), and their status may be more critical than other anadromous salmonids of the Pacific Northwest (Nehlsen et al. 1991).

Poor hatchery returns and angling success are indications that populations of sea-run cutthroat trout are declining at an alarming rate throughout the lower Columbia River Basin. Annual main-stem harvest averaged nearly 5,000 fish from 1969 to 1985; but average harvest declined to 700 fish from 1986-1990. From 1991-1995, sport anglers harvested an average of only 175 fish per year, and harvest in 1996 dropped to a record low of six fish (Melcher in press). However, relating annual harvests to cutthroat trout abundance is confounded by increasingly restrictive angling regulations.

The status of sea-run cutthroat trout populations throughout Washington is considered most serious in Columbia River tributaries from Grays River to the Cowlitz River (Leider 1997). Nehlsen et al. (1991) considered stocks from the Elochoman, Cowlitz, Toutle, Coweeman, Kalama, and Washougal rivers "of special concern". Incidental capture of sea-run cutthroat trout at several State and Federal hatcheries was once common, but very few have been observed in recent years. The hatchery on the Kalama River recorded three cutthroat trout in 1995, none in 1996, and three in 1997. Annual adult escapement past Powerdale Dam on the Hood River ranged from 40-180 fish from 1963-71 (Hooten 1997). After monitoring at Powerdale Dam was reinstated in 1992, only four adult sea-run cutthroat trout were observed that year, two were observed in 1993, and none have been observed since (Hooten 1997). Nehlsen et al. (1991) considered the Hood River stock "at high risk of extinction". All populations of sea-run cutthroat trout above Bonneville Dam have experienced passage-related losses for nearly 60 years, and populations from the Wind and Klickitat River have been extirpated (Nehlsen et al. 1991).

Considering the rate and magnitude of decline of sea-run cutthroat trout populations, immediate action is necessary to identify any remaining populations within the Columbia River Basin so resource managers can develop goals to protect and enhance these stocks. The proposed study will provide a necessary first step toward setting management and recovery goals for Columbia River sea-run cutthroat.

b. Proposal objectives.

1. Summarize existing data and current management practices related to sea-run cutthroat trout in the Columbia River Basin. Products: Report on the effects of limiting factors, land use practices, and production and harvest practices on status and recovery of sea-run cutthroat trout.

2. Identify and determine status and life history characteristics of naturally reproducing populations of sea-run cutthroat trout in streams above Bonneville Dam, and compare to status and characteristics of populations in selected reference streams below Bonneville Dam. Products: Report on the current status of Columbia River sea-run cutthroat trout.

c. Rationale and significance to Regional Programs.

Information on the current status of sea-run cutthroat trout populations in lower Columbia River tributaries is extremely limited. Oregon tributaries of the lower Columbia River were last systematically sampled for cutthroat trout in 1981 (Hess 1982), and limited data is available for Washington tributaries (Leider 1997). The NPPC and the states of Washington and Oregon have recognized the need to address declines in sea-run cutthroat trout and to develop management measures that will facilitate recovery of declining stocks. Fishery managers have recently adopted size and area regulations to reduce harvest of sea-run cutthroat trout in the Columbia River and tributaries. Additional protective measures may be needed to avoid further declines.

The NPPC's Fish and Wildlife Program Sections 7.5E.1-E.5 acknowledge the need to identify and set management and recovery goals for naturally reproducing populations of sea-run cutthroat trout in the Columbia River. The work we have proposed will compare the status of sea-run cutthroat trout populations above Bonneville Dam with reference populations below Bonneville Dam (7.5E.1), and examine the effects of limiting factors (7.5E.3), land use practices (7.5E.4), and production and harvest management practices (7.5E.5) on Columbia River sea-run cutthroat trout. The work is also consistent with NPPC goals to support native species in native habitats (Section 2.2A), and to improve management and conservation efforts by providing base-line information on status and life history of wild and naturally spawning populations (Section 7.1C).

d. Project history

Not Applicable

e. Methods.

OBJ-1. To document historical and current distribution of sea-run and resident coastal cutthroat trout in the Columbia Basin, we will use literature sources and query agencies for established databases. Hatchery stocking records will be gathered to help determine potential origin and purity of present stocks. In addition, we will develop standardized questionnaires and give them to local biologists and others with notable experience or knowledge. These questionnaires will be based on the format successfully used to document status and distribution of inland cutthroat trout (see Appendix A in Duff 1996). Information sought by use of these forms will be professional knowledge and judgement on status, genetic purity, presence of non-native species, history of fish-stocking efforts, location and age of barriers, and extent of land management activities that affect cutthroat trout production. We will also contact private individuals and groups (e.g., Washington Trout, Oregon Trout, Skamania Flyfishers) to document additional written and oral knowledge of historical and current distribution.

All information will be compiled in a single database. Detailed maps will be created to illustrate historical and current distributions. To the extent that the data will allow, we will conduct analyses to determine stability of status and relationships of status to habitat factors.

OBJ-2, Task a: We will conduct an extensive survey of streams throughout the lower Columbia Basin to determine presence and status of cutthroat trout. Because of the limited number of populations that historically occurred above Bonneville Dam, we will sample all streams accessible to sea-run cutthroat trout in this part of the basin. A variety of sampling techniques will be employed including but not limited to snorkeling, electrofishing, seining, minnow trapping, and angling. We will conduct sampling and qualitative observations at times when adult (July-February), juvenile (July-October), and smolt (February-May) life history forms are most likely present and most vulnerable to sampling. We will qualitatively estimate relative abundance when feasible. We will obtain measures of length and weight and record observations on color, external diseases, and overall health. Scales and tissues will be taken in a non-lethal manner from all or enough fish to serve as a statistical sample (see Task c for how we propose to use these samples).

OBJ-2, Task b: We will intensively sample 8-12 streams to serve as index sites of abundance. Criteria for selection will include (1) streams known to have, or have had a population of cutthroat trout, (2) stream reaches located below migration barriers such as falls and culverts, and (3) streams accessible to sampling. Index streams will be evenly distributed between sites upstream and downstream from Bonneville Dam, with half located on each of the Oregon and Washington sides of the Columbia River.

Where site characteristics are suitable, we will conduct snorkel surveys to assess density and biomass of cutthroat trout populations. We will follow the methodology of Hankin and Reeves (1988) to estimate the density of juvenile and resident cutthroat trout in selected stream reaches. Electrofishing will be used to calibrate density estimates using the ratio method detailed by Dolloff et al. (1993). Whenever possible, we will coordinate the timing of snorkeling with the time and place of electrofish sampling to minimize electrofishing effort.

In small streams that can not be snorkeled efficiently, we will electrofish within a stream reach of at least 500 m to estimate the density of juvenile and resident cutthroat trout. To estimate density, we will conduct an intensive habitat survey of each stream reach during summer low-flow conditions. Within two weeks of a habitat survey, a fish survey will be conducted within a systematic sample of habitat units stratified by type (e.g., pools, riffles, glides). Habitat units chosen for sampling will be blocked off with nets, and sampled by backpack electrofisher for a minimum of two passes using the removal-depletion method (Zippin 1956, Bohlin 1982). Population estimates will be obtained for at least two age groups (e.g. young-of-year, age 1 or older). Risks of injuring individual fish exposed to electrofishing will be minimized by using state-of-the-art electrofishers, and by using the field guides of Connolly (1996) to insure maximum conservancy in the number of habitat units sampled and the number of passes conducted, while achieving a controlled level of precision in population estimates.

As in Task a, we will obtain measures of length and weight and record observations on appearance and health of all cutthroat trout sampled. We will take scale and tissue samples for laboratory analyses described under Task c. Scale analyses will be used to describe life history characteristics including age, growth, and anadromy. During the course of sampling, we will record qualitative and quantitative data on other fish species to provide information on the role of species interactions in limiting production of cutthroat trout.

OBJ-2, Task c: Task c involves the laboratory analysis of scale, otolith, and tissue samples collected as part of Tasks a and b. Scale and tissue samples will be obtained from juvenile and adult cutthroat trout sampled by non-lethal methods. Scale samples will be placed in scale envelopes individually labeled with appropriate information (sampling location, date, sampling gear, and fish length, weight, sex if apparent). A small clip of fin tissue will be removed from the upper lobe of the caudal fin and placed in an individually labeled plastic vial containing 95% ethanol. Otoliths will be obtained from any incidental mortalities, although sampling will be conducted so that injury and mortality rates are minimized.

Scales will be examined to determine age, growth, and life history patterns including evidence for anadromy and ocean entry in adults. Scales and otoliths (from incidental mortalities) will be subjected to elemental analysis to establish evidence of anadromy for the individual and the maternal parent, and to validate evidence for anadromy generated by visual examination of scales. Caudal fin clips will be subjected to microsatellite DNA

(msDNA) analysis using a semi-automated protocol (after Olsen et al. 1996 and Wenburg et al. 1996) examining at least six highly polymorphic loci. The msDNA data will be used to establish the genetic population structure of the putative resident and anadromous cutthroat populations of the Lower Columbia Basin.

Scale, otolith, fin, and other tissue samples will be carefully archived to preserve the option of future analysis. Emerging technologies may allow us to refine our analyses and answer new questions as they arise. For example, it may become feasible to use microscopic laser ablation mass spectrometry to conduct extremely sensitive elemental analyses for the presence of environmental toxicants and precise timing of life history events such as estuarine or ocean entry. Application of new DNA technologies in fisheries research may soon make it possible to determine effective sizes of breeding populations and parentage of juveniles.
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f. Facilities and equipment.

Staff and facilities associated with the Oregon Department of Fish and Wildlife's Columbia Region Research Section (Clackamas, OR), Washington Department of Fish and Wildlife's Kalama Research station (Kelso, WA), and U.S.G.S. Columbia River Field Station (Cook, WA) collectively provide a long history of fisheries research expertise in the Columbia Basin. In combination with the personnel that will be hired and the equipment that will be purchased with the requested funds, these offices offer veteran professionals and modern office equipment and facilities to ensure that the highest quality professional research can be conducted.

Laboratory analysis of scale, otolith, and caudal fin tissue samples will be conducted by expert staff of the Washington Department of Fish and Wildlife at the Fish Aging Unit, Otolith Analysis Laboratory at the University of Washington's Electron Microprobe Laboratory, and Genetic Stock Identification Laboratory.

Special or higher cost equipment to be purchased with the requested funds include three backpack electrofishers ($4,600 each) and two computers ($3,000 each).

g. References.

Bohlin, T. 1982. The validity of the removal method for small populations -- consequences for electrofishing practice. Institute of Freshwater Research Drottningholm Report 60:15-18.

Connolly, P.J. 1996. Resident cutthroat trout in the central Coast Range of Oregon: logging effects, habitat associations, and sampling protocols. Doctoral dissertation. Oregon State University, Corvallis.

Dolloff, C.A., D.G. Hankin, and G.H. Reeves. 1993. Basinwide estimates of habitat and fish populations in streams. General Technical Report SE-83. Asheville, North Carolina: U.S. Agriculture, Forest Service, Southeastern Forest Experiment Station. 25 pp.

Hall, J.D., P.A. Bisson, and R.E. Gresswell. 1997. Sea-run cutthroat trout: biology, management, and future conservation. Oregon Chapter, American Fisheries Society, Corvallis.

Hankin, D.G., and G.H. 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.

Hess, S.S. 1982. Cutthroat trout in lower Columbia River tributaries of Oregon. Information Report Number 83-2, Oregon Department of Fish and Wildlife, Portland, Oregon.

Hooten, B. 1997. Status of coastal cutthroat trout in Oregon. Information Report 97-2. Fish Division, Oregon Department of Fish and Wildlife, Portland, Oregon.

Leider, S.A. 1997. Status of sea-run cutthroat trout in Washington. Pages 68-76 *in* J.D. Hall, P.A. Bisson, and R.E. Gresswell, editors. Sea-run cutthroat trout: biology, management, and future conservation. Oregon Chapter, American Fisheries Society, Corvallis.

Marshall, D.B., M.W. Chilcote, and H. Weeks. 1996. Species at risk: sensitive, threatened and endangered vertebrates of Oregon. Second Edition. Oregon Department of Fish and Wildlife, Portland, Oregon.

Melcher, C.E. In press. The 1996 lower Columbia River and buoy 10 recreational fisheries. Columbia River Management, Oregon Department of Fish and Wildlife, Portland, Oregon.

Nehlsen, W., J.E. Williams, and J.A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. Fisheries 16(2):4-21.

Olsen, J.B., J.K. Wenburg, and P. Bentzen. 1996. Semiautomated multilocus genotyping of Pacific salmon (*Oncorhynchus* spp.) using microsatellites. Mol. Mar. Bio. Biotech. 5(3):259-272.

Trotter, P.C. 1989. Coastal cutthroat trout: a life history compendium. Transactions of the American Fisheries Society 118:463-473.

Wenburg, J.K., J.B. Olsen, and P. Bentzen. 1996. Multiplexed systems of microsatellites for genetic analysis in coastal cutthroat trout (*Oncorhynchus clarki clarki*) and steelhead (*Oncorhynchus mykiss*). Mol. Mar. Bio. Biotech. 5(3):273-283.

Zippin, C. 1956. An evaluation of the removal method of estimating animal populations. Biometrics 12:163-189.

Section 8. Relationships to other projects

The proposed project will be a collaborative effort between the states of Oregon and Washington, as well as the U.S.G.S. Biological Resourses Division. Wherever possible, we will coordinate with existing projects and facilities to supplement our sampling efforts, increase project and program efficiency, and avoid duplication of effort. We will coordinate with anadromous fish projects that are proposed or in progress on the lower Columbia River, such as monitoring efforts associated with the Lower Columbia River Steelhead Conservation Initiative. We will also coordinate with hatcheries to collect available information on cutthroat trout, including numbers, measures of length and weight, migrational timing, and scale and tissue samples.

Section 9. Key personnel

Resume for Mark Zimmerman

Experience

1990-Present	Oregon Department of Fish and Wildlife, 17330 S.E. Evelyn St., Clackamas, OR. (1) Project Biologist on evaluation of Northern Squawfish Management Program (5 years, 8 months). Current responsibilities: Plan, coordinate, and implement field sampling and laboratory analyses, conduct data analyses, and prepare oral and written scientific reports. (2) Research Biologist on Process to Analyze and Test Hypotheses project, (3 months); (3) Project Leader on Smolt Monitoring Project at Little Goose Dam and the lower Grande Ronde River (6 months); (4) Project Leader on evaluation of the Northern Squawfish Management Program (4 months).
1990	U.S. Forest Service, Nez Perce National Forest, Idaho. Field Crew Leader on basinwide stream surveys to measure instream and riparian habitat, and estimate densities of all fish species by snorkeling (4 months).

Education:	School	Degree and Date Received
	Virginia Tech, Blacksburg	M.S. Fisheries Science, 1989
	Virginia Commonwealth U., Richmond	M.S. Biology, 1984

Moravian College, Bethlehem B.S. Biology, 1979

Duties as Principal Investigator on Proposed Study: Review existing biological data and land management, production, and harvest management practices affecting cutthroat trout. Hire, train, and supervise seasonal field crew. Provide field expertise on surveys to determine status of sea-run cutthroat trout. Analyze and summarize data. Write summary reports. FTE: 8 months FY 1999, 8 months in FY 2000, and 6 months in 2001.

Expertise: Designed field and laboratory sampling plans, hired and supervised seasonal personnel, analyzed wide variety of biological data, authored scientific reports. Direct experience with methods and gears associated with habitat and fish surveys in streams, rivers, lakes, and reservoirs. Authored and submitted a new project proposal to BPA for sea-run cutthroat trout research in FY 1998.

Publications and Reports

Zimmerman, M.P. August 26, 1997. Food habits and predation by northern squawfish, smallmouth bass, and walleyes in the lower Columbia and Snake rivers. Annual Meeting of the American Fisheries Society, Monterey, California.

Zimmerman, M.P., T. Hillson, and R.R. Boyce. 1996. Smolt monitoring activities at Little Goose Dam in 1993 and 1994, and smolt travel-time analysis, 1992-94. Annual progress report. Oregon Department of Fish and Wildlife, Portland, Oregon.

Zimmerman, M.P., and R.M. Parker. 1995. Relative density and distribution of smallmouth bass, channel catfish, and walleye in the lower Columbia and Snake rivers. Northwest Science 69: 19-28.

Resume for Patrick J. Connolly

Experience

1997-Present	Research Fishery Biologist, U.S.G.S. Biological Resources Division, Columbia River Research Laboratory, Cook, WA. Current responsibilities: Team leader on research project to determine survival of summer steelhead over their first winter in the Wind River, WA.
1994-1997	Consultant to Wind River Restoration Team, WA.
1990-1996	Research Assistant, Oregon State University, Corvallis.
1988-1991	Fish Biologist--Subbasin Planner, Oregon Dept. Fish & Wildlife, Corvallis.
1987-1988	Fish Biologist--Research, Oregon Dept. Fish & Wildlife, Columbia River Research, Clackamas, OR.
1985-1987	Fish Biologist, Beak Consultants Inc., Portland, OR.
1984-1985	Fishery Biologist, U.S. Fish and Wildlife Service, National Fisheries Research Center, Columbia River Field Station, Cook, WA.

Education:	School	Degree and Date Received
	Oregon State University, Corvallis	Ph.D. Fisheries Science, 1996
	University of Idaho, Moscow	M.S. Zoology, 1983
	Centre College of Kentucky, Danville	B.S. Biology, 1977

Duties as Principal Investigator on Proposed Study: Review existing biological data and land management, production, and harvest management practices affecting cutthroat trout. Hire, train, and supervise seasonal field crew. Provide field expertise on surveys to determine status of sea-run cutthroat trout. Analyze and summarize data. Write summary reports. FTE: 8 months FY 1999, 8 months in FY 2000, and 6 months in 2001.

Expertise: Areas of expertise include stream fish ecology and population dynamics. Experience on numerous studies involving anadromous resident salmonids and non-salmonids of the Pacific Northwest.

Publications and Reports

Connolly, P.J. 1997. Influence of stream characteristics and age-class interactions on populations of coastal cutthroat trout. Pages 173-174 *in* J.D. Hall, P.A. Bisson, and R.E. Gresswell, editors. Sea-run cutthroat trout: biology, management, and future conservation. Oregon Chapter, American Fisheries Society, Corvallis.

Connolly, P.J. 1996. Resident cutthroat trout in the central Coast Range of Oregon: logging effects, habitat associations, and sampling protocols. Doctoral thesis, Oregon State University, Corvallis.

Connolly, P.J. 1995. Wind River steelhead restoration project: with special emphasis on the Trout Creek Basin. Prepared for: Columbia River Research Laboratory, National Biological Service, Cook, WA.

Connolly, P.J. et al. 1992. Fish management plan for the Middle Fork Willamette

Subbasin. Oregon Department of Fish and Wildlife, Portland.

Resume for Cameron S. Sharpe

Experience

1995-Present Fish Research Biologist II. Washington Department of Fish and Wildlife, Kalama Research Team. Kelso, WA. Current responsibilities: Design and conduct experiments to evaluate genetic interactions between hatchery and wild salmonids and examine temporal and spatial variation among steelhead populations. Create and maintain long term (20 yr) genetic and life history relational database. Prepare reports, professional presentations, journal articles.

1992-1995 Faculty Research Assistant, Oregon State University, Corvallis.

1988-1992 Graduate Research Assistant, Oregon State University, Corvallis.

1985-1988 Research Assistant, Oregon State University, Corvallis.

1983-1985 Undergraduate Research/Teaching Assistant, University of Oregon, Eugene.

Education:	School	Degree and Date Received
	Oregon State University, Corvallis	M.S. Fisheries Science, 1992
	University of Oregon, Eugene	B.S. Biology, 1985

Duties as Project Biologist on Proposed Study: Review existing biological data and land management, production, and harvest management practices affecting cutthroat trout. Manage laboratory of scale, otolith, and genetic samples collected directly by the proposed project and samples collected during monitoring and evaluation work directed at lower Columbia Basin steelhead and status. Review and edit project summary reports. FTE: 2 months in FY 1999, 3 months each in FY 2000 and 2001.

Expertise: Fish population genetics, genetic effects of hatchery fish on wild populations, stress physiology, behavior and physiology of wild salmonid juveniles, and life history variation in hatchery and wild steelhead.

Publications and Reports

Sharpe, C.S., D.A. Thompson, H.L. Blankenship, and C.B. Schreck. In press. Effects of routine handling and tagging procedures on physiological stress responses in juvenile chinook salmon. Prog. Fish-Cult.

Hulett, P.L., C. W. Wagemann, C.S. Sharpe, and S.L. Leider. 1995. Studies of hatchery and wild steelhead in the lower Columbia Basin. Annual Report to WDFW, RAD 95-03. 44 pp.

Sharpe, C.S., C.B. Schreck, and W.W. Dickhoff. 1994. Smoltification strategies in wild spring chinook salmon: implications for aquaculture. Proceedings of the International High Performance Fish Symposium. Vancouver, B.C. pp 68-70.

Sharpe, C.S., and C.B. Schreck. 1987. Lake Creek cutthroat trout taxonomic analysis. Completion Report to the Bureau of Land Management. 26pp.

Resume for David Ward

Experience

1984-Present Oregon Department of Fish and Wildlife, 17330 S.E. Evelyn St., Clackamas, OR. (1) Program Leader for Columbia Region Research Program (6 months). Current responsibilities: Coordinate activities of ongoing departmental and interagency projects, identify needs for and develop future projects, provide technical oversight to project leaders, and supervise project leaders and other program staff. (2) Project Leader on evaluation of the Northern Squawfish Management Program (7 years); (3) Project Leader on Portland Harbor Study (3 years); (4) Project Biologist and Technician on various studies (3 years).

Education:	School	Degree and Date Received
	Humboldt State U., Arcata	M.S. Fisheries, 1985
	Humboldt State U., Arcata	B.A. Zoology, 1978

Duties as Project Manager on Proposed Study: Coordinate and integrate activities of cooperating agencies, supervise principal investigator, review and edit project summary reports, and provide technical oversight for data analysis and report preparation. FTE: 2 months each in FY 1999, 2000, and 2001.

Expertise: Coordinated and integrated activities of cooperating agencies, hired and supervised staff of project leaders, project biologists, and seasonal workers, designed field and laboratory sampling plans, analyzed wide variety of biological data, authored, edited, and reviewed scientific reports and peer-review articles. Organized personnel from cooperating agencies to give symposia at fisheries conferences. Developed and submitted proposals for numerous research projects to various funding sources. Direct experience with methods and gears associated with habitat and fish surveys in streams, rivers, lakes, and reservoirs.

Publications and Reports

Ward, D.L., R.R. Boyce, F.R. Young, and F.E. Olney. 1997. A review and assessment of transportation studies for juvenile chinook salmon in the Snake River. North American Journal of Fisheries Management 17:652-662.

Beamesderfer, R.C., D.L. Ward, and A.A. Nigro. 1996. Evaluation of the biological basis for a predator control program on northern squawfish in the Columbia and Snake rivers. Canadian Journal of Fisheries and Aquatic Sciences 53:2898-2908.

Ward, D.L., J.H. Petersen, and J.J. Loch. 1995. Index of predation on juvenile salmonids by northern squawfish in the lower and middle Columbia River and in the lower Snake River. Transactions of the American Fisheries Society 124:321-334.

Ward, D.L. 1995. Distribution of fish and crayfish, and measurement of available habitat in the Tualatin River basin. Final Report by the Oregon Department of Fish and Wildlife to the Unified Sewerage Agency, Hillsboro, Oregon.

Section 10. Information/technology transfer

All technical information obtained from this project will be maintained on a relational database. We will coordinate with parties interested in cutthroat trout resourses in the lower Columbia Basin so that our database will be compatible with existing formats. We are particularly interested in compatibility with existing data compilation and management efforts associated with the Columbia River Basin Fish and Wildlife Program, namely the StreamNet Project. Distribution of project information will also include a minimum of two annual reports, a final research report, and a contributed paper at a scientific meeting.