Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal Form

Section 1. General administrative information

Conduct baseline habitat and population dynamics studies on lampreys in Cedar Creek

Bonneville project number, if an ongoing project 9104

Business name of agency, institution or organization requesting funding
US Fish and Wildlife Service, Columbia River Fisheries Program Office

Business acronym (if appropriate) USFWS B CRFPO

Proposal contact person or principal investigator:

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Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name
USGS-Biological Resources Division-Columbia River Research Laboratory	5501-A Cook-Underwood Rd	Cook, WA 98605	James G. Seelye

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

7.5F, 7.5F.1, and from the report proceeding from 7.5F.1: Status report of the Pacific lamprey (*Lampetra tridentata*) in the Columbia River basin (BPA Project Number 94-026), Section III - Recommended Research, Subsections A, B, and C (abundance studies, current distribution, and other habitat limiting factors, respectively).

NMFS Biological Opinion Number(s) which this project addresses.
Other planning document references.

Subbasin.
Cedar Creek (of the Lewis River) subbasin.

Short description.
With emphasis on Pacific lampreys, identify and quantitatively evaluate populations of *Lampetra* and their habitats in a stream below Bonneville.

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	+	Population dynamics
	Oceans/estuaries	X	Research	X	Ecosystems
	Climate	+	Monitoring/eval.		Flow/survival
	Other	+	Resource mgmt		Fish disease
			Planning/admin.		Supplementation
			Enforcement		Wildlife habitat en-
			Acquisitions		enhancement/restoration

Other keywords.
Pacific lampreys, life history, population dynamics, ecological interactions, identification of larval lampreys, habitat characteristics

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
9402600	Pacific lamprey research and restoration projects	Our proposed work will complement work being done under this contract. Identification of larval lampreys, and population and habitat assessment techniques will be used in any future field studies on lampreys.

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Estimate abundance, measure biological characteristics, determine migration timing of mature Pacific lampreys.	a	Trap adult anadromous (Pacific and river) lampreys through the entire spawning run and measure their biological characteristics (length, weight, sex, and maturity).
		b	Mark captured Pacific lampreys, release them downstream of the trap location, and estimate spawning run abundance from proportion of marked animals recaptured.

		d	Capture and estimate abundance of adult resident (brook) lampreys by multi-pass depletion electrofishing
2	Determine larval lamprey distribution, habitat use, and biological characteristics.	a	Capture larval lampreys by electrofishing and measure their length, weight, and sex.
		b	Evaluate habitat characteristics at ammocoete capture sites.
3	Determine outmigration timing and estimate abundance recently metamorphosed lampreys.	a	Capture outmigrant lampreys by floating screw trap, mark and release these animals upstream of the trap site, and estimate abundance from the proportion of marked lampreys in subsequent samples.
4	Determine diagnostic characteristics of larval lampreys, evaluate thermal tolerances of larval lampreys by species, and evaluate effects of internal tag placement in young adult lampreys in the laboratory.	a	Spawn adult Pacific, river, and brook lampreys in the laboratory, examine a time series of resulting progeny, and conduct morpho-metric analysis on these animals to determine characteristics that will facilitate identification; evaluate temperature effects on survival and early development on each species of lamprey.
		b	Collect large ammocoetes and recently metamorphosed Pacific lampreys and evaluate effects and success of PIT tag placement in controlled experiments in the laboratory.
5	Evaluate spawning habitat requirements of adult lampreys.	a	Conduct weekly surveys during potential spawning

			periods to identify lamprey spawning locations and redds.
		b	Measure physical characteristics of redds, including redd size, depth in the water column, water velocity, substrate, habitat type, and presence of cover and shading.
		c	Sample redds to evaluate the occurrence of unused redds.
		d	Cap redds to determine developmental timing and survival of lamprey

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	10/1998	09/2002	15%
2	10/1998	09/2002	15%
3	10/1998	09/2002	10%
4	10/1998	09/2002	35%
5	10/1998	09/2002	25%

Schedule constraints.

Completion date.
Fiscal year 2002

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel	25%time supervisor, 100%time team leader, two-100% time technicians	$89K
Fringe benefits	32% for permanent and 10% for temporaries	$19K
Supplies, materials, non-expendable property	Nets, traps, sample bottles, and misc. field gear	$3K
Operations & maintenance	Vehicle and equipment operation	$10K
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	none	00
PIT tags	# of tags: 50 for lab studies	$145 dollars
Travel	Travel to meetings and occasional overnight field work	$3K
Indirect costs	21% of total	$26K
Subcontracts	Objective 4 is subcontracted to the USGS, Columbia River Research Laboratory--amount includes 38% indirect costs	$82K
		00

Other		
TOTAL		$232K

Outyear costs

Outyear costs	**FY2000**	**FY01**	**FY02**	**FY03**
Total budget	$240K	$250K	$260K	
O&M as % of total	6.25%	6.0%	6.0%	

Section 6. Abstract

Pacific lampreys (*Lampetra tridentata*) in the Columbia River Basin (CRB) have declined to a remnant of their pre-1940s populations. The ecological, economic, and cultural significance of this species is underestimated by most casual observers. NPPC-FWP sections 7.5F and 7.5F.1 noted this decline and requested a status report identifying research needs. Among identified needs were abundance, current distribution and habitat limitation studies. Studies of the biology, population dynamics, ecology, identification, and relationships of Pacific lamprey with the two other species of lampreys *(L. ayresi*, and *L. richardsoni*) coexisting in the CRB will assist in rehabilitating the Pacific lamprey populations. Quantitative baseline data including lamprey population dynamics, length-frequency relationships, abundance estimates of spawning-phase adults, and habitat requirements will be collected from a Pacific lamprey population that has open access to the ocean. Habitat for reproduction and for rearing larval lampreys will be quantatively described. Temperature effects on lamprey embryos will be evaluated because habitats where reproduction can be successful would be easily identifiable if temperature is a major factor regulating development as it is in sea lampreys (*Petromyzon marinus).* Characteristics of the three species of larval *Lampetra* found in the CRB will be examined to develop a precise key for the identification of these fish. Methods will be taken from the literature developed from 40 years of studying sea lampreys. Specific products of this study will include: year two, an identification key for larval *Lampreta* in the CRB and a manuscript describing the importance of specific temperatures in the embryonic development of Pacific lampreys; and years three and four, manuscripts describing species-specific age, growth and fecundity, migration timing of anadromous lampreys, and ecological and inter-specific interactions of larval lampreys, including habitat selection and limiting factors. The quality of the work will be judged by the peer review of the written and verbal infomation presented.

Section 7. Project description

a. Technical and/or scientific background.

Three lamprey species (*Lampetra tridentata, L. ayresi,* and *L. richardsoni*) include the Columbia River Basin within their geographic ranges (Kan 1975). Pacific lampreys (*Lampetra tridentata*) in the Columbia River Basin (CRB) have declined to only a remnant of their pre-1940s populations (Close et al. 1995). The ecological, economic, and cultural significance of this species is grossly underestimated by most casual observers (Kan 1975, NPPC 1995, Close et al. 1995). Actions are currently being considered for its recovery of the Pacific lamprey populations in the CRB (Close et al. 1995). The status of *Lampetra ayresi* and *L. richardsoni* is unknown. Whereas some biological and ecological information for these species is available from studies conducted outside the CRB in Canada (e.g. Pletcher 1963, Beamish 1980, Richards 1980, Beamish and Levings 1991), they have been poorly studied within the CRB (Kan 1975, Hammonds 1979).

Identifying which biological and ecological factors limit lampreys in the CRB is critical for their recovery. In particular, understanding factors influencing reproduction and survival of early life history stages is important since this period may be critical to the determination of recruitment to the population (Houde 1987). Larval lamprey (ammocoete) abundance may be determined by water temperatures during early larval development or by other physical habitat characteristics (Potter et al. 1986, Young et al. 1990, Youson et al. 1993). For sea lamprey ammocoetes, the range of optimal temperatures is narrow, 17.8 to 21.8 C (Holmes and Lin 1994). Other fundamental biological questions remain unanswered. For example, sea lamprey do not exhibit a homing instinct to natal streams (Bergstedt and Seelye 1995) but instead appear to respond to the bile salts released by conspecific larval lamprey (Li et al. 1995). No information exists on homing of Pacific lampreys. The success of any rehabilitation effort of Pacific lampreys could depend our knowing whether stocks of Pacific lampreys exist in the CRB. Passive Integrated Transponder (PIT) tag studies with large numbers of recently metamorphosed Pacific lampreys and a well established upstream migrant population assessment program are required to answer this question. In preparation for a large scale homing study, this proposed study will evaluate our ability to PIT tag recently metamorphosed Pacific lampreys and will also provide the first quantitative estimate of a run of upstream migrating Pacific lampreys using a standard population estimation technique.

The lack of knowledge of CRB lamprey species extends to the identification of the larval phase. Identificaion larval lampreys of these species is not well resolved (Richards et al. 1982, Bond 1994). Current distribution of lampreys in the CRB will most likely be done by electroshocking ammocoetes. Since larval lampreys are readily collected from rearing areas in the wild by this method, the ability to identify this lifestage is a necessity to determine distribution and abundance of lampreys in the CRB.

This project represents a baseline study to provide important data on the population dynamics and habitat use of lampreys in the CRB. We will produce abundance estimation for several life stages of lampreys, evaluate movement patterns of larval lampreys, develop an inter-specific larval lamprey identification key through morphometric analysis, and measure habitat quality. Furthermore, this study will use these techniques to determine

factors limiting populations of Pacific lampreys. This infomation is necessary for the successful restoration of Pacific lampreys in the CRB. Thus, results of this study will have broad utility for studies and restoration monitoring in the CRB and other areas in the Northwest.

Initially, the techniques which will be evaluated for CRB lamprey species will be those which have been successfully used in study and management of sea lampreys in the Great Lakes (e.g. Volk 1986, Bergstedt et al. 1993, Pajos and Weise 1994, Berstedt and Genovese 1994). These techniques will be modified as necessary to meet the requirements of the CRB environment.

This study will be conducted in Cedar Creek, a third-order tributary to the Lewis River at Lewis River mile 15.7. The Lewis River enters the Columbia River at Columbia River mile 87. The Cedar Creek drainage spans 55.5 mi^2, contains five major tributaries (Chelatchie, Pup, Bitter, Rush, and John Creeks), and is inhabited by *Lampetra tridentata*, *L. richardsoni*, and probably *L. ayresi* (D. Rawding, Washington Department of Fish and Wildlife, pers. comm.). Because this site is downstream of Bonneville Dam, the first dam on the mainstem Columbia River, the effects of hydropower development should not directly influence this study. Data gathered from this study would therefore, offer a valuable baseline against which similar studies conducted above Bonneville could be compared in any efforts to understand what direct influence hydropower facilities may have on lamprey populations.

Key project personnel are uniquely qualified for working with lampreys. Dr. James.G. Seelye directed a research program on sea lampreys (*Petromyzon marinus*) in the Great Lakes for 13 years, studying biology, ecology, and associated research topics as they relate to lampreys (Seelye et al. 1987, Bergstedt and Seelye 1995, Bergstedt et al. 1993, Youson et al. 1993, Holmes et al. 1994). Scott A. Barndt and Travis C. Coley are currently monitoring lamprey species composition, spawning habitat characteristics, young adult outmigration abundance and timing, and adult spawning run sizes in conjunction with salmonid monitoring, habitat evaluation, and habitat restoration projects (USFWS, unpublished data). Jennifer M. Bayer is an experienced researcher in the CRB and most recently has used morphometric analysis to develop identification keys for larval cyprinid fishes.

b. Proposal objectives.

1. Estimate abundance, determine migration timing, and measure biological characteristics of mature lampreys in Cedar Creek.

Hypotheses tested (H_o):

1. Populations migrating up Cedar Creek are consistent from year to year.
2. Migration takes place throughout the year.
3. Biological characteristics are uniform throughout the spawning migration of lampreys in Cedar Creek.
4. Sex ratios are equal (1:1) within specific spawning populations of lampreys.
5. Biological characteristics are equivalent inter-sexually.

2. Determine biological characteristics, habitat use, and distribution of larval lampreys in Cedar Creek.

Hypotheses tested (H_o):

1. Larval lamprey distribution and habitat use is uniform longitudinally and temporally in Cedar Creek.

2. Larval lamprey distribution and habitat use is uniform throughout all habitat types in Cedar Creek.

3. Larval lamprey distribution and habitat use is uniform inter-specifically in Cedar Creek.

4. Larval lamprey distribution and habitat use is uniform among differing size classes of larval lampreys in Cedar Creek, both inter- and intra-specifically.

3. Determine outmigration timing and estimate abundance of young adult anadromous lampreys.

4. Determine diagnostic morphometric characteristics for larvae of each species, evaluate temperature effects on survival and early development of each species, and evaluate effects of internal tag placement in ammocoete and young adult lampreys in the laboratory.

Hypotheses tested (H_o):

1. Larval lampreys of different species are uniform morphologically and meristically.

20 Larval lampreys have unlimited thermal tolerance and show no preference or improved growth and survival at certain temperatures.

3. Tagged and untagged lampreys survive equally.

4. Lamprey survival and tag retention are equal regardless of tag placement.

5. Evaluate spawning habitat requirements of adult lampreys.

Hypotheses tested (H_o):

1. Redd sites are uniformly distributed longitudinally and across habitat types in Cedar Creek.

2. All redds contain developing embryos.

3. Lamprey survival is 100% within individual redds.

Results from this study will be published in peer-reviewed journals and annual reports. Specific products of this study will include: identification keys for larval lampreys; syntheses of life history-specific marking and trapping techniques; species-specific age, growth and fecundity; migration timing of anadromous lampreys; and ecological and inter-specific interactions of larval lampreys, including habitat selection and limiting factors.

c. Rationale and significance to Regional Programs.

Sections 7.5F and 7.5F.1 of the NPPC Fish and Wildlife Program (1994) noted the apparent decline of the Pacific lamprey in the CRB and requested a status report to identify

research needs. Section three of the resulting report (Close et al. 1995) outlines these research needs (in part): section III.A, abundance studies; section III.B, current distribution; and, section III.D, determine habitat limiting factors. This project will (1) develop techniques to collect these types of information, and (2) provide baseline data in all three of these areas from a stream not influenced by mainstem hydropower development. Close et al. (1995) also list the Aidentification of potential applications of transplantation≅ and AΨartificial production≅ (section III.E and section III.F) as research needs. Both technological and biological results of this study will allow informed decisions on the efficacy of these needs. Furthermore, this study will develop larval identification keys, which will allow differentiation of CRB lamprey ammocoetes. This information will greatly facilitate all lamprey studies conducted in the CRB.

No other studies of this type are known to be occurring at this time in the CRB. Workers at Oregon State University (OSU) and the University of Idaho (UI) are studying lamprey stress physiology and lamprey movements in the Columbia River by radiotelemetry, respectively (Carl Schreck, OSU Fisheries Cooperative Research Unit, pers. comm.). We have no knowledge of current attempts to evaluate the physical habitat requirements and limitations, to determine larval, juvenile, or adult abundance, biology or ecology, or to develop techniques for these objectives in the manner we propose.

d. Project history

This is a new, proposed project.

e. Methods.

Tasks associated with Objective 1:

Adult anadromous lampreys will be trapped at the falls about 3.2 km above the confluence of Cedar Creek with the Lewis River. Lampreys will be trapped in lighted box traps (Purvis et.al. 1985) set along the base of the falls. Captured animals will be anesthetized with MS-222 (Summerfeldt and Smith 1990), biological data (length, weight, sex) gathered, physically marked, and released downstream of the trap location. A number of combinations of V-shaped notches (Manion et.al. 1988) in the dorsal fin will be used weekly to create unique marks in weekly lots of fish. Spawning population abundance will be estimated from the proportion of marked adult lampreys among subsequent lots of captured lampreys (Sheaffer et al. 1990). This method assumes that marked individuals will mix uniformly with unmarked fish, that the population is closed during the time of estimation, and that marked and unmarked lampreys have equal probabilities of capture. These assumptions could be violated if marked lampreys behave differently than unmarked fish, if marked fish do not try to re-ascend the falls, or if marked lampreys experience higher mortality than unmarked fish.

Adult brook lampreys will be captured by electrofishing in Cedar Creek. Population abundance will be estimated by using removal methods (Zippin 1956). After the last removal pass, adult lampreys will be anesthetized, biological data gathered, marked with a pig ear punch, and released. Initially, abundance will be estimated in thirty 30 m sections of Cedar Creek and in ten 30 m sections in each major tributary stream. If channel types are highly variable within a creek, strata will be developed by channel type,

and at least 10 samples chosen from each strata. If variance is high within a creek or stratum, sample sizes will be increased as much as reasonable sampling effort allows (Schaeffer et al. 1990, Sokal and Rolff 1995). Relationships within collected data will be analyzed by ANOVA (Sokal and Rolff 1995) and other methods as necessary.

Tasks associated with Objective 2:

The longitudinal distribution of larval lamprey will be determined randomly selecting 30 m reaches from Cedar Creek and its major tributaries to sample for larval lampreys. These reaches will be chosen in the same manner as for Objective 1. Habitat types will be characterized (Hawkins et al. 1988). Ammocoetes will be captured by electrofishing (Pajos and Weise 1994). Each larval lamprey will be identified to species and its length (mm) and weight (g) measured. Habitat used by these ammocoetes will be described by measuring water velocity, depth, conductivity, temperature, gradient, habitat type, substrate size, and canopy density (Platts et al. 1983). Measuring substrate size and canopy density (Platts et al. 1983); water velocity, depth, conductivity, and temperature; gradient; and habitat type at the locations where these ammocoetes are collected will determine the habitat used by these ammocoetes. Relationships within collected data will be analyzed by ANOVA (Sokal and Rolff 1995) and other methods as necessary.

Tasks associated with Objective 3:

Outmigrant young adult lampreys will be captured by a floating rotary screw trap (constructed by E.G. Solutions, Inc., Corvallis, OR) with an eight-foot diameter cone placed in the pool downstream of Grist Mill falls in Cedar Creek. This trap will be placed in the stream in November of each year and will be left in place until the outmigration of anadromous young adult lamprey concludes. This trapping schedule will be modified as necessary in subsequent trapping years. Each captured lamprey will be identified to species, length (mm) and weight (g) recorded, marked with a V-notch punch in its dorsal fin, transported 400 m upstream of the trap, and released. Outmigrant abundance will be estimated from the proportion of marked lampreys in subsequent lots of lampreys captured (Roper and Scarnecchia 1996). Accuracy of this method depends on marked and unmarked lampreys having equal capture efficiency.

Tasks associated with Objective 4:

Adult Pacific, river, and western brook lampreys will be collected from the wild and spawned in the laboratory. Morphometrics and meristics of a time series of resulting progeny will be analyzed using principal components analysis to determine diagnostic characteristics for each species (Bookstein 1985, Smith et al. 1968). Additional eggs and larvae will be incubated at four different temperatures (10, 14, 18, and 22EC) to evaluate the survival and timing to developmental events at these temperatures (Piavis 1961). Large ammocoetes and recently metamorphosed parasitic-phase lampreys will be brought into the laboratory where different placements of PIT tags (Prentice et al. 1990) will be tested in controlled experiments. Initial evaluation of placement locations will determine final experimental design. Data from survival and tag experiments will be analyzed with ANOVA (Sokal and Rohlf 1995). Success of this objective is dependent on the ability to capture adults of each species.

Tasks associated with Objective 5:

Lamprey redds will be identified by weekly foot surveys during the spawning period. Physical characteristics of redds will be measured, including: redd dimensions, depth in the water column, water velocity, habitat type (Hawkins et al. 1993), and substrate and the amount of cover or shading at the redd location (Platts et al. 1983). Five redds of each species will be covered with Aredd caps≅, modified from Porter (1973), and five additional redds of each species will be excavated to evaluate false nesting, embryo development time and survival under ambient conditions.

All statistical tests will be computed by the program SAS (SAS 1989).

f. Facilities and equipment.

Existing facilities at USFWS, Columbia River Fisheries Program Office and USGS BBRD, Columbia River Research Laboratory are adequate for the purposes of this study.

-Both sites have adequate office space, microcomputers, and statistical software suitable for data entry, statistical analysis, manuscript and report preparation.

-Both stations maintain a fleet of GSA motor vehicles; these vehicles are generally replaced every 60,000 miles, and therefore remain in reasonable working order.

-The USGS B BRD station has adequate rearing and laboratory facilities for lamprey egg, larvae, and young adult experiments.

-USFWS B CRFPO has suitable backpack electrofishers, dipnets, balances, redd caps, McNeil substrate samplers, Marsh-McBirney water velocity meters, conductivity meters and measuring boards in good working order for capturing larval lamprey and collecting ammocoete and adult biological and physical habitat information.

-USFWS B CRFPO maintains six floating screw traps in five- and eight-foot sizes for capturing outmigrating fish in lotic environments.

Adult lamprey traps will be constructed for this project, and materials for these will be purchased with project funds. Tagging and marking materials will also need to be purchased with project funds, including PIT tags, coded wire tags, pig ear punches, and so forth.

g. References.

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Section 8. Relationships to other projects

To our knowledge, this project does not directly relate to any current or planned study, but instead seeks to fill a vacant niche in the knowledge of these CRB lamprey species. Necessary trapping and fish collection permits will be secured from Washington Department of Fish and Wildlife; USFWS B CRFPO and USGS-CRRL already maintains valid fish collection and trapping permits in the State of Washington.

Section 9. Key personnel

T.C. Coley, Habitat and Natural Production Team Leader, Columbia River Fisheries

Program Office, Vancouver, WA 98665.

Mr. Coley will oversee the experimental design, collection of ammocoete and adult lamprey, and the determination of their distributions, habitat use, and biological information (Objectives 1, 2, 3, and 5). He will oversee data analysis and preparation of manuscripts and reports generated from these data.

S.A. Barndt, Fish Biologist, Habitat and Natural Production Team, Columbia River Fisheries Program Office, Vancouver, WA 98665.

Mr. Barndt will collect ammocoete and adult lamprey, and determine their distributions, habitat use, and biological information (Objectives 1, 2, 3, and 5). He will compile, conduct statistical analysis, and prepare manuscripts and reports from these data.

J.G. Seelye, Laboratory Director, Columbia River Research Laboratory, Western Fisheries Research Center, USGS Biological Resources Division, Cook, WA 98605.

Dr. Seelye will be over-all project lead and will assist in experimental design and manuscript preparation.

J. M. Bayer, Fishery Biologist, Columbia River Research Laboratory, Western Fisheries Research Center, USGS Biological Resources Division, Cook, WA 98605.

Ms. Bayer will spawn and rear Pacific, river, and brook lamprey in the laboratory, conduct time series morphometric and meristic analyses on these lampreys, and produce keys for larval lamprey identification. She will also determine the laboratory development and survival of lamprey eggs and larvae under different temperature regimes and assist with tagging (PIT) laboratory experiments (Objective 4). She will compile, conduct statistical analysis, and prepare manuscripts and reports from these data.

Section 10. Information/technology transfer

Results will be published in pertinent, peer-reviewed literature and will be immediately incorporated into USFWS management procedures.

Jennifer M. Bayer

Current Position: Cooperative Education Agreement Student (Fishery Biologist)
US Geological Survey/Biological Resources Division
Columbia River Research Laboratory, Cook, WA 98605
(509) 538-2299 ext 273 Jennifer_Bayer@usgs.gov

Education: Portland State University M.S. Biology, in progress.
Oregon State University B.S. Fisheries Science,1993.

Experience:

1997-Present Cooperative Education Agreement Student, Columbia River Research Lab, Cook, WA & Portland State University, Portland, OR.
1994-1997 Fishery Biologist, USGS BRD Columbia River Research Laboratory.
1992-1994 Student Research Assistant, Stream Team, OSU, Corvallis, OR.
1991 Biological Technician, Northern Squawfish Predator Control Project, Dept. of Agricultural & Resource Economics, OSU, Corvallis, OR.
1990-1991 Work-study student, Oregon Cooperative Fishery Research Unit, OSU.
1989 Technician II, Normandeau Associates, Inc., Peekskill, NY.
1987-1988 Technician II, Prince William Sound Aquaculture Corporation, Cordova, AK.

Current Research Assignments: I am currently working on the morphometric investigation early life history stages of native Columbia River cyprinids for a Master=s in Science degree from Portland State University. For this project, I am conducting laboratory spawning and rearing of native cyprinids. Products of this work will be taxonomic descriptions of native cyprinid species and an identification key for early life history stages of Columbia River Basin cyprinids. I am also developing a methodology for the use of video and digital image processing for description and identification of cyprinid larvae.

Publications, reports, manuscripts, etc.:

Bayer, J.M. Morphometric investigation of early life history stages of Columbia River cyprinids. (Master=s thesis in progress.)

Bayer, J.M. 1997. Use of image analysis for morphometric investigation of chiselmouth and northern squawfish larvae. Presentation to the American Fisheries Society, 21st Annual Larval Fish Conference, Seattle, WA. (chapter in thesis.)

Bayer, J.M. and T.D. Counihan. 1997. Length changes in white sturgeon (*Acipenser transmontanus*) larvae: Effects of ethanol and formalin. Presentation to the American Fisheries Society, 21st Annual Larval Fish Conference, Seattle, WA. (manuscript in preparation.)

PERSONAL:

Scott Alan Barndt

EDUCATION:

Bachelor of Science, Biology
Fish and Wildlife Management Option
Montana State University
Bozeman, Montana 59717
June, 1994.

Master of Science, Biology
Montana State University
Bozeman, Montana 59717
December, 1996

EXPLOYMENT:

September 1996 – Present: Fishery Biologist
U.S. Fish and Wildlife Service
Columbia River Fisheries Program Office, 9317 Hwy 99, Suite I
Vancouver, Washington 98665
Phone: (360) 696-7605

Current primary responsibility is the Gibbons Creek habitat and fish stock evaluation, restoration, and monitoring project. Review and summarize literature in preparation for, and design, organize, and carry out, biological and physical habitat studies in Washington and Oregon streams, rivers, and lakes in coordination with state and federal biologists. Collect, compile, and analyze physical habitat and biological data from these studies, and use these data to plan and conduct habitat restoration projects in coordination with, and to make management recommendations to, public and private entities. Species worked with include chum, chinook, and coho salmon; steelhead and cutthroat trout; Pacific, river, and brook lamprey; American shad; and a wide variety of other fish, including introduced species.

May 1994 – July 1996: Graduate Research Assistant
Montana State University, Bozeman, Montana 59717

Conducted field and laboratory research project examining limiting factors of Arctic grayling and seven other species.

PUBLICATIONS:

Barndt, S.A. 1996. The biology and status of the Arctic grayling in Sunnyslope Canal, Montana. M.S. thesis. Montana State University, Bozeman, MT.

Barndt, S.A. and C.M. Kaya. Reproduction, growth, and winter habitat of Arctic grayling in an irrigation canal which flows only during spring and summer. *In preparation.*

Name: Travis C. Coley

Present Position: U.S. Fish and Wildlife Service
Columbia River Fisheries Program Office
9317 N. E. Highway 99, Suite I
Vancouver, WA 98665

Education and Training:

Degree	Date	School
B.S. Fisheries Management	1976	Mississippi State University
M.S. Fisheries Resources	1979	University of Idaho

Experience:

1991-present Team leader, Habitat and Natural Production Team, Columbia River Fisheries Program Office
Supervises a staff of 12 biologists and technicians working primarily on habitat assessment, habitat restoration, and fish population assessment and monitoring.

1986-1991 Assistant Project Leader of the Idaho Fisheries Resources Office, U. S. Fish and Wildlife Service, Ahsahka, Idaho.

1978-1986 Northwest and Alaska Fisheries Center, National Marine Fisheries Service, Hammond, OR

Pertinent Reports and Publications:

Durkin, J.T., T.C. Coley, K.J. Verner, and R.L. Emmett. 1981. An evaluation of aquatic life found at four hydraulic scour sites in the Columbia River estuary elected for potential sediment disposition. Proceedings of the National Symposium of Freshwater Inflow to Estuaries, USFWS, San Antonio, Texas. Vol. I: 436-452.

McCabe, G.T., Jr., T.C. Coley, R.L. Emmett, and J.T. Durkin. 1981. The effects of Mt. St. Helens on the fishes in the Columbia River estuary (abstract). Estuaries 4(3):247

McCabe, G.T., Jr., R.L. Emmett, W.D. Muir, T.C. Coley, and R.J. McConnell. 1983. Salinity indicator fish species in the Columbia River estuary. Final Report to U.S. Army Corps of Engineers, Portland, Oregon.

Muir, W.D., J.T. Durkin, T.C. Coley, and G.T. McCabe, Jr. 1985. Escapement of Dungeness crab, *Cancer magister*, from crab pots in an estuarine habitat. North American Journal of Fisheries Management 4:552-555.

Coley, T.C., G.T. McCabe, Jr., R.L. Emmett, and R.J. McConnell. 1986. Juvenile lingcod outer harbor field survey, Grays Harbor navigation improvement project. NOAA, NMFS, Northwest and Alaska Fisheries Center, Seattle, Washington. 43p.

McCabe, G.T., Jr., R.L. Emmett, T.C. Coley, and R.J. McConnell. 1987. Effect of a river dominated estuary on the prevalence of *Crinonemertes errans*, an egg predator of the Dungeness crab, *Cancer magister*. Fishery Bulletin 85:140-142.

Emmett, R.L., T.C. Coley, G.T. McCabe, Jr., and R.J. McConnell. 1987. Demersal fishes and benthic invertebrates at four interim dredge disposal sites off the Oregon Coast. NOAA, NMFS, Northwest and Alaska Fisheries Center, Seattle, Washington. 68p.

McCabe, G.T., Jr., R.L. Emmett, T.C. Coley, and R.J. McConnell. 1988. Distribution, density, and size class structure of Dungeness crab in the river-dominated Columbia River estuary. Northwest Science 62(5):254-262.

Giorgi, A.E., G.A. Swan, W.S. Zaugg, T.C. Coley, and T.Y. Barila. 1988. Susceptibility of chinook salmon smolts to bypass systems at hydroelectric dams. North American Journal of Fisheries Management 8:25-29.

Muir, W.D., A.E. Giorgi, and T.C. Coley. 1994. Behavioral and physiological changes in yearling chinook salmon during hatchery residence and downstream migration. Aquaculture 127(69-82).

Muir, W.D. and T.C. Coley. 1996. Diet of yearling chinook salmon and feeding success during

downstream migration in the Snake and Columbia Rivers. Northwest Science 70(298-305).

VITAE

Name: James G. SeelyeG. Seelye

Present Position: Supervisory Fishery Biologist, GS-14
Laboratory Director
Columbia River Research Laboratory
Cook-Underwood Road
Cook, Washington 98605

Education and Training:

Degree		Date	School
B.S.	Biological Science	1969	Lake Superior State College
M.S.	Limnology	1971	Michigan State University
Ph.D.	Limnology	1975	Michigan State University

Experience:

Research Limnologist, Project Manager, USACE, Waterways Experiment Station, 1975-1976

Supervisory Fishery Biologist (Research), Project Leader, FWS, Contaminant Dynamics, Great Lakes Fishery Laboratory, 1976-1982

Supervisory Fishery Biologist (Research), Station Chief, FWS, Hammond Bay Biological Station, 1982-present

Supervisory Fishery Biologist, Director, NBS, Columbia River Research Laboratory

Research Specialties: Chemical Limnology, aquatic toxicology, lamprey biology

Selected Publications:

Seelye, J. G., L. L. Marking, E. L. King, Jr., L. H. Hanson, and T. D. Bills. 1987. Toxicity of TFM lampricide to early life stages of walleye. North American Journal of Fisheries Management 7:598-601.

Seelye, J. G., D. A. Johnson, J. G. Weise, and E. L. King, Jr. 1988. Guide for determining application rates of lampricides for control of sea lamprey ammocetes. Great Lakes Fishery Commission, Technical Report 52. 23 pp.

Seelye, J. G., and R. J. Scholefield. 1990. Effects of changes in dissolved oxygen on the toxicity of 3-trifluoromethyl-4-nitrophenol (TFM) to sea lamprey and rainbow trout. Great Lakes Fishery Commission Technical Report No. 56. 8 pp.

Bergstedt, R. A., W. D. Swink, and J. G. Seelye. 1993. Evaluation of two locations for coded wire tags in larval and small parasitic-phase sea lampreys. North American Journal of Fisheries Management 13:609-6120.

Bergstedt, R. A., W. D. Swink, and J. G. Seelye. 1993. Evaluation of two locations for coded wire tags in larval and small parasitic-phase sea lampreys. North American Journal of Fisheries Management 13:609-612.

Scholefield, R.J., K.T. Fredricks, and J.G. Seelye. In press. Effects of the lampricide TFM on net oxygen production and respiration by algae. North American Journal of Fisheries Management.

Youson, Y. H., J. A. Holmes, J. A. Guchardi, J. G. Seelye, R. E. Beaver, J. E. Gersmehl, S. A. Sower, and F. W. H. Beamish. 1993. Importance of condition factor and the influence of water temperature and photoperiod on metamorphosis of sea lamprey, Petromyzon marinus. Canadian Journal of Fisheries and Aquatic Sciences 50:2448-2456.

Mallatt, J., R. D. McCall, J. F. Bailey, and J. G. Seelye. 1994. Effects of lampricides on the gill structure of larval sea lampreys and rainbow trout fry. Canadian Journal of Zoology 72:1653-1664.

Scholefield, R. J., J. G. Seelye, and K. S. Slaght. 1995. Comparison of 3-trifluoromethyl-4-nitrophenol (TFM) toxicities to sea lampreys, rainbow trout, and mayfly nymphs in continuous and interrupted 9-h exposures. Great Lakes Fishery Commission Technical Report 61:9-31.

Bergstedt, R. A., and J. G. Seelye. 1995. Evidence for lack of homing by sea lampreys. Transactions of the American Fisheries Society 124:235-239.

Fredricks, Kim T. and James G. Seelye. 1995. Flowing-recirculated water system for inducing

spawning phase sea lampreys to spawn in the laboratory. Progressive Fish Culturist 57:297-301.