PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Evaluate Relationship Between Land Use,Water Quality, And Fish Health

BPA project number: 20073
Contract renewal date (mm/yyyy): ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
U.G. Geological Survey

Business acronym (if appropriate) USGS

Proposal contact person or principal investigator:

Name	Mark D. Munn
Mailing Address	1201 Pacific Ave.,Suite 600
City, ST Zip	Tacoma, WA 98402
Phone	253-428-3600 x2686
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NPPC Program Measure Number(s) which this project addresses
4.1A: Salmon and Steelhead Rebuilding Principles
7.1A.4: Evaluation of Carrying Capacity
7.6B: Habitat Policies (1)-
7.6C: Coordinated Habitat Planning
7.6D: Habitat Objectives - water quality
7.7: Cooperative Private Habitat Protection and Improvement

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

Other planning document references
Okanogan Watershed Management Plan - This plan is in development under the leadership of the Okanogan Conservation District with funds from the Washington State Department of Ecology. This plan has identified contaminants from land use activities as a threat to water quality and fisheries.

Short description
Evaluate whether land use activities are elevating the concentrations of pesticides and trace elements in surface waters to levels that pose a potential threat to fish and other aquatic life.

Target species
Sculpin and Rainbow trout

Section 2. Sorting and evaluation

Subbasin
Upper Mid-Columbia, Okanogan

Evaluation Process Sort

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

Section 3. Relationships to other Bonneville projects

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

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9604200	Restore and enhance anadromous fish populations and habitat in salmon creek	Contaminants in sediment and water may be limiting to the restoration of anadromous salmon.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Determine if trace elements and/or pesticides in water, sediment, and fish tissue are above concentrations that may pose a threat to the health of fish and other aquatic life.	a	Utilize GIS to develop land use coverages for the purpose of stratifing basin.
		b	Measure the concentrations of organochlorine compounds in fish tissue.
		c	Measure the concentrations of present day pesticides in surface waters.
		d	Measure the concentrations of trace elements in bed sediment, water and fish.
	Complete Report -FY2001		Due to laboratory analysis being done at the end of FY2000, this study will require some time in FY2001 for completion of the report.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999	1/2000	Task a: GIS land use map	X	5%
1	3/2000	9/2000	Tasks b-d: Collection	x	95.00%

			and laboratory analysis		
				Total	100.00%

Schedule constraints
Tasks b, c, and d have to be completed during low-flow conditions; therefore, the exact timing of sample collection will depend upon flow conditions for 1999.

Completion date
2001

Section 5. Budget

FY99 project budget (BPA obligated):

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel		%18	47,900
Fringe benefits		%3	8,500
Supplies, materials, non-expendable property	Equipment, laboratory cost, printing	%33	86,600
Operations & maintenance		%0	
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%0	
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags:	%0	
Travel		%4	11,400
Indirect costs		%37	96,700
Subcontractor	Colville Confederated Tribes: field and technical assistance, rental of boat shocker	%4	10,000
Other		%0	
TOTAL BPA FY2000 BUDGET REQUEST			$261,100

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
		%0	
		%0	
		%0	
		%0	
Total project cost (including BPA portion)			$261,100

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$50,000			

Section 6. References

Watershed?	Reference
☐	
☐	Crawford, J.K. and S.N. Luoma. 1993. Guidelines for studies of contaminants in biological tissues for the National Water-Quality Assessment Program. Open-File Report 92-494. U.S. Geological Survey. Lemoyne, PA.
☐	Gruber, S.J. and M.D. Munn. 1998. Organophosphate and carbamate insecticides in agricultural waters and cholinesterase (ChE) inhibition in common carp (Cyprinus carpio). Archives Environmental Contaminants and Toxicology. 35:391-396.
☐	Leatherland, J. 1992. Endocrine and reproductive function in Great Lakes salmon. In. T. Colborn and C. Clement, ed., Chemically Induced Alterations in Sexual and Functional Development: The Wildlife/Human Connection. Prenceton Scientific, Princeton, NJ.
☐	
☐	
☐	Leland, H.V. and J.S. Kuwabara. 1984/. Trace Elements. In. Fundamentals of Aquatic Toxicology. G.M. Rand and S.R. Petrocelli, eds. Hemisphere Publishing, New York. pp. 374-415.
☐	
☐	Munn, M.D. and T.M. Short. 1997. Spatial heterogeneity of mercury bioaccumulation by walleye in Franklin D. Roosevelt Lake and the Upper Columbia River, Washington. Transactions of the American Fisheries Society. 126:477-487.
☐	Munn, M.D. and S.J. Gruber. 1997. The relationship between land use and organochlorine compounds in streambed sediment and fish in the Central Columbia Plateau, Washington and Idaho, USA. Environmental Toxicology and Chemistry. 16(9):1877-1887.
☐	Sheldon, L.R. 1994. Field guide for collecting and processing stream-water

	samples for the National Water-Quality Assessment Program. U.S. Geological Survey. Open-File Report 94-455.
☐	Woodward, D.F., Goldstein, J.N., Farag, A.M., and Brumbaugh, W.G. 1997. Cutthroat trout avoidance of metals and conditions characteristic of a mining waste site: Coeur d'Alene River, Idaho. Transactions of the American Fisheries Society. 126:699-706.

PART II - NARRATIVE

Section 7. Abstract

The Okanogan River is presently the upper most basin in the Columbia River with anadromous fish runs. There is a great deal of interest in the basin since the upper Columbia River Steelhead were listed as endangered in 1997 and spring chinook are presently under review. In response to this, the Colville Confederated Tribes Fish and Wildlife Department are focussing on recovery efforts within the basin. The CCT Fish and Wildlife Department and the Okanogan Watershed Council have also identified land use practices as a critical limiting factor for restoration. Land use practices determine many of the physical and chemical features of surface waters thereby influencing aquatic life. Land use practices that increase the likelihood that contaminants will reach surface waters are of particular concern to fisheries due to a wide range of potential toxicological effects on early life stages that are most affected by contaminants. Two groups of contaminants of concern to fish health in the Okanogan River Basin are agricultural pesticides and trace elements from mining activities. This study proposes identifying if contaminants from land use practices are elevated to levels that could impact fisheries resources, and what land uses are of the greatest concern.

Section 8. Project description

a. Technical and/or scientific background

Land use practices that increase the quantity of contaminants reaching surface waters are of particular concern to fisheries due to a wide range of potential toxicological effects. Two groups of contaminants that are a threat to fish health are agricultural pesticides and trace elements from mining activities. Organochlorine pesticides can bioaccumulate to high concentrations in fish (Munn and Gruber 1977), with elevated concentrations linked to reproductive function in salmonids (Leatherland 1992). Water soluble pesticides, such as organophosphates and carbamates, have been linked to a wide range of toxicological effects including reduced brain function (Gruber and Munn, 1998) and acute toxicity (Matsumura, 1985). Likewise, trace elements from mining activities are known to pose a health risk to fish in a variety of ways: trout have demonstrated avoidance behavior when exposed to mixtures of trace elements (Woodward et al. 1997); the condition factor of walleye was reduced when body burdens of mercury were elevated (Munn and Short,

1997); and trace elements can cause both chronic and acute toxicological effects (Leland and Kuwabara, 1985).

Two of the dominant land use activities in the Okanogon Basin include mining in the upper basin and agriculture in the lower basin. Both of these practices, alone or in combination, can pose a substantial threat to the health of the ecosystem overall, and particularly the resident and anadromous fish populations. This is particularly important given that the Okanogan River is the last major tributary in the upper Columbia River with anadromous fish runs. The upper Columbia River Steelhead were listed as endangered in 1997 and spring chinook are presently under review for potential listing. In response to this, the Colville Confederated Tribes Fish and Wildlife Department are focussing on recovery efforts within the basin. The CCT Fish and Wildlife Department and the Okanogan Watershed Council have identified land use practices as a critical limiting factor for restoration. Therefore, it is imperative that restoration activities in the Okanogon Basin include a solid understanding on the potential toxicity effects of contaminants to both anadromous salmons along with other components of the ecosystem which salmonids rely on.

b. Rationale and significance to Regional Programs

The 1994 Fish and Wildlife Program emphasizes the need for ecosystem level approaches for the protection and enhancement of salmon in the Columbia River. While the majority of issues center around physical habitat, the Fish and Wildlife document discusses the need to address water quality as a potential limiting factor of restoration efforts. Our study will address a variety of contaminants in the Okanogan Basin and determine whether the concentrations of both pesticides and trace elements may be of concern to both fisheries resources and the aquatic environment overall. These contaminants together, or in some combination, may be a critical limiting factor for early life stages of salmon that are presently being addressed in several recovery programs.

c. Relationships to other projects

This project directly relates to the Colville Confederated Tribes Fish and Wildlife Department program within the Okanogan Basin. This program is working on recovery of anadromous salmonids in tributaries of the Okanogan, particularly in Salmon Creek (Restore and enhance anadromous fish populations and habitat in Salmon Creek, BPA 9604200), Omak Creek (Improvement of anadromous fish habitat and passage in Omak Creek), and Aeneas Creek (Evaluate an experimental re-introduction of sockeye salmon into Skaha Lake). The majority of the recovery issues have to date focused on physical features as in sediment, instream flows, water temperature, access, and riparian systems. CCT is very concerned about land use practices that affect all of the above features of streams. Furthermore, along with physical features of streams, they are interested in how land use activities affect water quality, which may limit restoration efforts within the basin (Scott Fisher, personal communication, CCT).

Okanogan Watershed Management Plan - This plan is in development under the leadership of the Okanogan Conservation District with funds from the Washington State Department of Ecology. This plan has identified contaminants from land use activities as a threat to water quality and fisheries.

d. Project history (for ongoing projects)

e. Proposal objectives

The objective of this study is to determine if trace elements and/or pesticides in water, sediment, and fish tissue are above concentrations that may pose a threat to the health of fish and other aquatic life.

Tasks:

- Utilize GIS to determine land use practices for the purpose of stratifying basin.
- Determine the occurrence and distribution of organochlorine compounds in fish tissue.
- Determine the occurrence and distribution of present day pesticides in surface waters.
- Determine the occurrence and distribution of trace elements in bed sediment, water and fish.

f. Methods

Objective 1-Task A: Develop a land use coverage map of the Okanogan Basin. This will be done using GIS coverages of surface waters combined with land use features. The purpose of developing a land use coverage is so the basin can be stratified by land use thereby permitting sites to be distributed in a representative manner. The dominant land use categories of concern are mining and agriculture. The stratification will also permit the selection of reference sites within each land use category for the purpose of identifying background concentrations. Reference sites will be critical in the mining areas since background concentrations of trace elements can be substantially elevated; whereas in agricultural areas reference sites are slightly less critical since pesticides can only reach reference areas via atmospheric deposition.

A maximum of 20 sites will be selected in the Okanogan Basin with sites distributed among the various land uses and reference sites. The approach used for assessing contaminants will vary somewhat depending on the contaminant group and medium being used to assess that group.

Objective 1 – Task B: Organochlorine compounds (e.g. DDT) were used historically, however are still measured in the environment due to their resistance to breakdown. Because these compounds are lipophilic and tend to accumulate in the fat tissue of fish,

they will be assessed using a single composite of whole fish from each of 20 sites in the basin. Methods used in the collection, sampling processing, and analysis will follow those outlined in Crawford and Luoma (1993). Composite sampling is used in large-scale land use studies because concentrations from a composite approximate an average value for the cost of a single sample. While one can not determine variance at a particular site, this method permits a more complete assessment of the occurrence and distribution of contaminants at a large spatial scale. While the fish species will depend on availability, the two preferred species are sculpin and rainbow trout. Sculpin are commonly used in contaminant studies because they remain within a local stream reach and therefore better reflects local land use conditions. Rainbow trout of also used due to their importance as a resident game fish.

Objective 1 – Task C: The second group of pesticides are the presently used water soluble compounds including organophosphates and carbamates. This group of pesticides are best assessed in surface waters using two approaches. First, a synoptic study will be used to determine the concentrations of pesticides at 20 sites distributed among the various land uses. Samples will be collected using procedures outlined in Sheldon (1994), which involves collecting depth integrated water samples, filtering through a 0.7 mm glass-fiber filter, and then pumped through a solid-phase extraction (SPE) cartridge. The cartridges will be shipped on wet ice to the USGS National Water-Quality Laboratory for analysis of 52 herbicides, 24 insecticides, and 7 metabolites. The number of pesticides analyzed for may vary somewhat depending on information of pesticide application. The exact timing of the synoptic study will depend upon pesticide application data that will be obtained as part Task a (land use coverage). The second component of the pesticide study will involve the collection of surface water pesticide data during peak flows and/or high application periods. This is critical since it is often at these times that concentrations can rapidly reach levels that can pose a threat to aquatic resources. To address this component a total of four samples will be collected from each of five sites. Sites will be selected that best integrate pesticide runoff.

Objective 1 – Task D: Trace elements differ from pesticides in that they are commonly measured in sediment, water, and biota depending on the specific objective. All trace element data will be collected during low-flow conditions. The occurrence and distribution component will be done using surficial bed sediment following methods outlined in Sheldon and Capel (1994). Five to ten samples of surficial streambed sediment (upper 2 cm) will be collected from depositional zones along a 100-m reach at each of 20 sites and composited for analysis. The selection of a 100-m reach ensures that a composite sample consisted of depositional material from multiple microhabitats. Samples will be collected using a glass beaker with samples then homogenized in a glass bowl and passed through a 62 micron nylon mesh sieve into a 1,000 ml glass jar with. Samples will then be packed on wet ice and shipped to the USGS Water Quality Laboratory for analysis.

Fish will also be collected at 10 of the 20 sites to determine if trace elements have bioaccumulated to concentrations above concentrations known to be a health threat to fish eating wildlife, above reference sites, and above national studies. These ten sites will

be distributed from upstream of the mining areas to the mouth of the Okanogan River thereby permitting an assessment of the availability of trace elements throughout the basin. The fish used for this component will be the same species as those used in the organochlorine component. A fish sample will include a composite of five whole fish or fish livers; with a single sample from each of the ten sites. Methods for the collection and field processing will follow those outlined in Crawford and Luoma (1993). Samples will be shipped to the USGS National Water Quality Laboratory where they will be analyzed for 22 trace elements.

Surface water samples will also be collected at a subset of sites both in the vicinity of mining operations and downstream to the mouth of the Okanogan. Samples will be analyzed for total metals (unfiltered), with a subset of these also be analyzed for dissolved metals (filtered). Whole metals will permit an assessment of trace elements in water plus those associated with suspended sediment; whereas, the dissolved metals will provide some information as the speciation of some trace elements. All samples will be collected as outlined in Sheldon (1994) and shipped to the USGS National Water Quality Laboratory were they will be analyzed for 16 trace elements.

A summary of the number of samples collected are shown below:

Contaminant	Fish	Sediment	Water	Total Samples
Organochlorine pesticides	20			20
Water soluble pesticides			40	40
Trace elements	10	20	40	70

Data collected on both pesticides and trace elements will be compared to a variety of guidelines, criteria, and national studies depending on the issue. Organochlorine pesticides in fish will be compared to the New York State Department of Environmental Conservation (NYSDEC) criteria which evaluate the effects of contaminants on fish eating wildlife. Results will also be compared to the U.S. Geological National Water Quality Assessment (NAWQA) program which maintains a large national database.

The water soluble pesticides and trace elements in water will be compared to EPA water quality criteria and several toxicity databases to assess the potential toxicity of these contaminants to fish and other aquatic life.

Trace elements in sediment will be compared to the Sediment Quality Guidelines developed by the Canadian Council of Ministers of the Environment (CCME), along with guidelines presently being developed by both the EPA and Washington State Department of Ecology.

It is important to note that while all data in this study will be collected during FY99, laboratory results will not be available until the end of the fiscal year. Therefore, the analysis and report will not be completed until FY00. Once results are analyzed and contaminant issues identified, it will be important to develop the next phase of this study, which is the toxicological implications of contaminants in the watershed. However, it is not possible to design, and therefore budget, this component until results from this initial contaminant survey are complete.

g. Facilities and equipment

This project will be run out of the U.S. Geological Survey office in Tacoma, Washington. This office presently has all the major sampling equipment as in mobile water quality laboratories and sampling gear. The only equipment cost to the project will include vehicle costs along with sampling containers and sampling equipment that can only be used once due to issues of contamination. The total estimated cost for equipment is $5,000.

All laboratory analysis will be done at the U.S. Geological Survey National Water Quality Laboratory in Arvada, Colorado. This laboratory in national known for high quality analysis of organic compounds and trace elements in water, sediment and biota. It is the primary laboratory the U.S. Geological Survey National Water Quality Assessment (NAWQA) program, so it has extensive experience in producing high quality analytical results in a timely fashion.

h. Budget

One of the highest cost budget categories is the "supplies, materials, nonexpendable property", with a budget of $86,600. The majority of this cost (91%) is for laboratory analysis and is high because of the number of complex analytical procedures used for the study. The only subcontractor costs is for the Colville Confederated Tribes to assist in the collection of field samples, technical support on fish collection, and rental of fish collection equipment.

Section 9. Key personnel

Personnel	Title	FTE	Project Duties
Mark D. Munn	Research Biologist	0.3	Project Manager/PI
James Tesoriero	Research Chemist	0.3	Lead Chemist
Sarah Ryker	Geographer	0.1	Land Use/GIS
Field Technician		0.3	Collection of field data
Chris Fisher	Anadromous Fisheries Biologist	0.1	Lead Fisheries Biologist

MARK D. MUNN, Ph.D.

EDUCATION: Ph.D.(1986), Entomology, University of Idaho, Moscow, ID
M.Sc.(1982), Aquatic Biology, Central Michigan Univ, Mt.Pleasant, MI
B.A.(1978), Biology, Point Loma College, San Diego, CA

CURRENT POSITION: Research Biologist, U.S. Geological Survey, Water Resource Division, 1201 Pacific Ave., Suite 600, Tacoma, WA 98402

CURRENT RESPONSIBILITIES: Design and conduct studies to assess how land use practices affect aquatic communities in streams.

PREVIOUS EMPLOYMENT:

1988-92 E.V.S Consultants, Seattle, WA

1987-88 Environmental Services and Permitting, Gainsville, FL

1986-87 Associate research biologist (Post-Doctoral Position), Aquatic Biology Section, Illinois State Natural History Survey, Champaign, IL

EXPERTISE: Aquatic ecologist with expertise in the influence of land use practices on stream ecosystems. This includes both physical and chemical parameters and how they control biological communities and health in a stream.

SELECTED PUBLICATIONS

Gruber, S.J. and M.D. Munn. 1998. Organophosphate and carbamate insecticides in agricultural waters and cholinesterase (ChE) inhibition in common carp (Cyprinus carpio). Archives of Environmental Contamination and Toxicology. 35(3):391-396.

Munn, M.D. and S.J. Gruber. 1997. Relationship between land use and organochlorine compounds in streambed sediment and fish in the Central Columbia Plateau, Washington, and Idaho, USA. Environmental Toxicology and Chemistry. 16(9):1877-1887.

Munn, M.D. and T.M. Short. 1997. Spatial heterogeneity of mercury bioaccumulation by walleye in Lake Roosevelt and the upper Columbia River, Washington. Transactions of the American Fisheries Society. 126:477-487.

Bortleson, G.C., S.E. Cox, M.D. Munn, R.J. Schumaker, E.W. Block, L.K. Bucey, and S.B. Cornnelius. 1995. Sediment-quality assessment of Franklin D. Roosvelt Lake and the upper Columbia River, Washington, 1994. U.S. Geological Survey, Open-File Report 95-4007.e

ANTHONY J. TESORIERO, Ph.D.

EDUCATION: Ph.D., 1994, Environmental Science and Eng., Oregon Graduate Institute.
M.S., 1985, Geology, Arizona State University, Tempe.
B.A., 1982, Geological Sciences, State University of New York at Buffalo.

CURRENT POSITION: Research Geochemist, U.S. Geological Survey, Water Resources Division, 1201 Pacific Avenue, Suite 600, Tacoma, WA 98402

CURRENT RESPONSIBILITIES: Design and conduct field studies on the fate and transport of contaminants in Puget Sound Basin aquifers.

PREVIOUS EMPLOYMENT:

1989-1994 Research Assistant, Oregon Graduate Institute, Portland, OR.

1988-1989 Geochemist, IT Corporation, Pittsburgh, PA.

1986-1988 Geochemist, U.S. Nuclear Regulatory Commission, Washington, DC.

1985-1986 Hydrogeologist, New Jersey Department of Environmental Protection, Trenton, NJ

EXPERTISE: Aqueous geochemist with expertise in the knowledge of fate and transport of contaminants in aquatic systems.

SELECTED PUBLICATIONS:

Tesoriero, A.J., Inkpen, E.L., and Voss, F.D., 1998, Assessing ground water vulnerability using logistic regression: in Proceedings of the Source Water Assessment and Protection Conference, Dallas, Texas, April 28-30, 1998, p. 157-165.

Tesoriero, A.J., and Voss, F.D., 1997, Predicting the probability of elevated nitrate concentrations in the Puget Sound Basin: implications for aquifer susceptibility and vulnerability: Ground Water, v. 35, no. 6, p. 1029-1039.

Staubitz, W.W., Bortleson, G.C., Semans, S.D., Tesoriero, A.J., and Black, R.W., 1997, Water-quality assessment of the Puget Sound Basin, Washington--environmental setting and its implications for water quality and biota: Water-Resources Investigation Report 97-4013, 76 p.

Tesoriero, A.J., and Pankow, J.P., 1996, Solid solution partitioning of Sr2+, Ba2+, and Cd2+ to calcite: Geochimica et Cosmochimica Acta, v. 60, p. 1053-1063.

Christopher J. Fisher

Education: B.S., 1990, Forest Resources, School of Forest Resources, University of Georgia
M.S., 1996, Wildlife & Fisheries Science. South Dakota State University Dept. of Wildlife and Fisheries Sciences

Experience:

Job title: Anadromous Fisheries Biologist II
Employer: Colville Confederated Tribes, Nespelem, WA 99155

Duties: My duties include the management of anadromous fish stocks for population viability and subsistence for tribal members. I conduct and evaluate creel surveys, analyze catch data and develop regulations. I also participate planning and implementation for watershed restoration projects. I prepare correspondences and reports (monthly, quarterly, annually, and conditionally) needed to maintain good communications within the Tribal organization and Federal, State, and Tribal fishery agencies. I develop budget contract proposals, modifications, and reports as required by Tribal policy or established under contract agreements.

Job title: Fisher biologist
Employer: U.S. Forest Service, Okanogan National Forest (Jan 96 to Mar 97)
U.S. Forest Service, Boisen National Forest (Apr 94 to Nov 95)

Job title: Fishery technician
Employer: Idaho Department of Fish and Game, McCall (Jun 90 to Nov 91)

Job title: Research technician
Employer: School of Forest Resources, University of Georgia (Apr 88 to Sep 89)

Expertise:

By acquiring my education in the southwest and midwest and being employed by both state and federal agencies in three different regions of the country my experience in fisheries is extensive and diverse. My wide range of experience has provided me with expertise in collecting, analyzing and interpreting a variety of data and the ability to communicate the results of management activities and research to professional and civic groups via technical reports or presentations.

Section 10. Information/technology transfer

This study will be published in either a U.S. Geological Survey report and presented at one Pacific Northwest conference.

Congratulations!