PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Evaluate Sediment Transport In Spawning Habitat, Kootenai R., Idaho

BPA project number: 20049
Contract renewal date (mm/yyyy): ☐ **Multiple actions?**

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

Business acronym (if appropriate) USGS

Proposal contact person or principal investigator:

Name	Gary J. Barton
Mailing Address	1201 Pacific Ave., Suite 600
City, ST Zip	Tacoma, WA 98402
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NPPC Program Measure Number(s) which this project addresses
10.4B; .3, .4; .5 and 10.6C.1

FWS/NMFS Biological Opinion Number(s) which this project addresses
ND-USFWS BO Incidental take

Other planning document references
Kootenai River White Sturgeon Recovery Plan, USFWS, Snake River Basin Office, 4696 Overland Road, Rm 576, Boise, Idaho 83705

Short description
Enhance understanding of pre- and post-Libby Dam substrate habitat conditions in the Kootenai River, Idaho. Provide base-line substrate data for habitat enhancement evaluations performed by other agencies. Study area to include sturgeon spawning area.

Target species
Kootenai River white sturgeon (ESA) population and other native fish.

Section 2. Sorting and evaluation

Subbasin
Kootenai River

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
8806500	Kootenai River fisheries investigations	USGS a subcontractor for project during FY1997 and FY1998. USGS measured spatial distribution of river velocities using a highly accurate Acoustic Doppler Current Profiler and collected seismic profiles of the substrate in the white sturgeon spawing area.
8346700	Libby Reservoir levels and impact on resident fish	Project 8346700 objectives include calibrating simulations of hydraulic conditions and surveying river habitat. These efforts will incorporate USGS flow and substrate data collected during FY1997 and

		FY1998 and data collected by this proposed new study.
9404900	Kootenai River ecosystem improvement study	USGS contributes to project 9404900 by making available streamflow and baseline geomorphological substrate data that project 9404900 can use to develop, evaluate, and test and analyze solutions to ecosystem problems.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1997	Measured spatial distribution of stream velocities for the Kootenai River in the white sturgeon recruitment area during spawning. Results provided in U.S. Geological Survey Open-File Report 97-830.	
1998	Conducted a reconnaissance-level seismic survey and generated profiles of the substrate/subbottom in the recruitment area during spawning.	Survey defined the spawning substrate as sandy. Sandy substrate not condusive to larval survival.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Enhance understanding of pre- and post-Libby Dam substrate and geomorphological conditions in Kootenai River, relative to native fish spawning habitat. Collect data in and upgradient of sturgeon spawning area, include other reaches.	a	Conduct low- and high-frequency marine seismic subbottom surveys and generate profiles of substrate. Surveys conducted in and upgradient of white sturgeon spawning area, include other reaches.
		b	Collect 5 to 15 cores of substrate along seismic-subbottom profiles using USGS vibracoring system. Max-

			imum core depth is 15 feet below the river bottom. Describe lithology and conduct grain-size analysis on core samples.
		c	Evaluate bathymetry at USGS Kootenai River gaging stations for changes in erosion and deposition for pre- and post Libby Dam construction. Identify any discernable trends in suspended-sediment concentrations.
		d	Conduct an integrated analysis of seismic subbottom profiles and vibra-core data, and historical suspended-sediment and bathymetry data. CALIBRATE & CORROBORATE seismic subbottom profile interpretations using core data.
		e	Report results in an USGS Water-Resources Investiga-tions Report

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999	9/2000	Charactize Kootenai River substrate for changes in lithology and geomorphology for pre- and post Libby Dam construction periods and effect on white sturgeon and other native fish spawning habitat.	X	80.00%
	10/1999	9/2000	Calculate changes in the Kootenai River's suspended-sediment budget for the pre- and post Libby Dam periods. Chacaterize these changes in terms of the impact on white sturgeon and other native fish spawning habitat.	X	10.00%
	7/1999	3/2001	Prepare interpretive		10.00%

			report.		
				Total	100.00%

Schedule constraints
None foreseen.

Completion date
2001

Section 5. Budget

FY99 project budget (BPA obligated):

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel		%19	18,100
Fringe benefits		%3	3,200
Supplies, materials, non-expendable property		%4	3,700
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		%3	2,900
Indirect costs		%43	41,650
Subcontractor	USGS-Texas District Marine Coring Unit	%28	27,000
Other		%0	
TOTAL BPA FY2000 BUDGET REQUEST			$96,550

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
		%0	
		%0	
		%0	

		%0	
		Total project cost (including BPA portion)	$96,550

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$19,000			

Section 6. References

Watershed?	Reference
☐	Barton, G.J., 1998, Subbottom seismic-reflection profiling on the Kootenai River near Bonners Ferry, Idaho: abstr. in proceed. of Ninth Annual Nonpoint Source Water Quality Monitoring Results Workshop, 1 p.
☐	Edsall, T.A., Behrendt, T.E., Cholwek, Gary, Frey, J.W., Kennedy, G.W., and Smith, S.B., 1997, Use of remote-sensing techniques to survey the physical habitat of large rivers: U.S. Geological Survey Contribution number 983, 20 p.
☐	Haeni, F.P., 1992, Use of ground-penetrating radar and continuous seismic-reflection profiling on surface-water bodies in environmental and engineering studies: in proc. of Symp. on Application of Geophysics to Engineering, Oakbrook, Ill., p. 145-162.
☐	
☐	Idaho Fish and Game, 1998, Kootenai River Fisheries Investigations: Bonneville Power Administration Fish and Wildlife Program FY99 Proposal, 19 p.
☐	Lipscomb, S.W., Berenbrock, C., and Doyle, J.D., 1997, Spatial distribution of stream velociites for the Kootenai River nera Bonners Ferry, Idaho, June 1997: U.S. Geological Survey Open-File Report 97-830, 174 p.
☐	Marotz, B.L., Hansen, B., and Tralles, S., 1988, Instream flows needed for successful migration, spawning and rearing of rainbow and westslope cutthoart trout in selected tributaries of the Kootenai River: MO Dept. of Fish, Wildlife and Parks, PN 85-6.

PART II - NARRATIVE

Section 7. Abstract

The Kootenai River has undergone many changes due to construction of dikes and the Libby Dam. The operation of this dam has altered and disrupted the river ecosystem, resulting in many resident fish populations declining dramatically. In 1994, the Kootenai River white sturgeon was listed as an Endangered Species, and fishing was prohibited. Operations at the dam have muted flow extremes and reversed the hydrograph. The

muting of high spring flows reduces the amount of natural flushing of fine sediments from cobble-gravel areas, and increases development/deposition of barriers at the confluence of critical spawning tributaries to the Kootenai River.

The overall objectives of this project are to (1) characterize/describe/map the type of sediments comprising the Kootenai River substrate/subbottom/habitat, and (2) an integrated analysis of how the makeup of the substrate sediments in various reaches, suspended-sediment load, and river bottom elevations have changed since Libby Dam became operational.

Many resident species were listed as species of special interest in the 1994 Columbia Basin Fish & Wildlife Program. The main goal of this project is to provide monitoring and data that support efforts to restore the ecosystem and these important fisheries. Also, this project complements the Kootenai River Fisheries Investigations and the IDFG Regional Five Year Plan (IDFG, 1998) to recover the endangered Kootenai River white sturgeon and burbot. Substrate/geomorphological data collected by this project is important to developing, evaluating, and testing and analyzing solutions to ecosystem problems on the Kootenai River. The data collected by this project will represent monitoring baseline conditions for a significant habitat element prior to habitat restoration.

Section 8. Project description

a. Technical and/or scientific background

The Kootenai River has undergone many changes due to construction of dikes and the Libby Dam. Libby Dam interrupted the second-largest tributary to the Columbia River. Sediment transport within the basin has been dramatically altered and may have negatively impacted the spawning success of select resident fish species. Many resident fish populations have declined dramatically. In 1994, the Kootenai River white sturgeon was listed as an Endangered Species, and fishing was prohibited. The white sturgeon population decline reflects fewer juvenile sturgeons and an overall decline in spawning success. Below is a summary of hydrologic and geomorphologic changes in the Kootenai River due to construction and operation of the Libby Dam.

Operations at the dam have muted flow extremes and reversed the hydrograph. Before dam construction, the natural spring flows averaged about 60,000 cubic feet/sec (cfs), but afterwards, flows declined to about 5,000 cfs. The elimination of high spring flow events prevents flushing of fine sediments from cobble-gravel areas. Siltation of spawning beds may adversely affect the survival of white sturgeon eggs and larval. After construction of the Libby Dam, barriers have been deposited in critical spawning tributaries to the Kootenai River through the annual deposition of bedload material (sands, gravels, and boulders) at the river's confluence (Marotz and others, 1988). The pre-impoundment Kootenai River contained sufficient energy to annually remove these deltas, whereas this is not the case for post-impoundment Kootenai River. High winter flows have resulted in

warmer water and ice-free reaches. Sand may have buried gravel-cobble-spawning bed since construction of the Libby Dam.

During FY1998, the USGS and IDF&G began a program to characterize the composition of the Kootenai River bottom sediments in the white sturgeon spawning area. The seismic subbottom profiling method provided valuable information about the substrate. The results of this preliminary investigation are summarized by Barton (1998). However, cores of the substrate need to be collected in order to calibrate and corroborate the interpretation of the seismic subbottom profiles. Bottom sediment cores collected along marine seismic profile lines would significantly improve the level of detail and information about the substrate that can be interpreted from the subbottom profiles. In addition, seismic subbottom surveys need to be conducted in other reaches of the river that have unique native fish habitat. For example, upgradient of the white sturgeon spawning area the substrate grades to coarser sediments, which has potential past or future habitat implications. More importantly, the USGS-Branch of Geophysical Application and Support has procured a new state-of-the-art low-frequency/high frequency seismic system with robust seismic-signal processing software.

Analysis of water-surface elevation and channel elevation, and suspended-sediment load at gaging stations below Libby Dam will aid in characterizing transient changes in surface-water levels, channel elevation, and the suspended-sediment budget during pre- and post Libby Dam impoundment. Analysis of these important historical data may help characterize how the riverbed has changed since 1972.

b. Rationale and significance to Regional Programs

This project complements the Kootenai River Fisheries Investigations and the IDFG Regional Five Year Plan (IDFG, 1998) to recover the endangered Kootenai River white sturgeon and burbot. The rationale for this plan is based on development of sound data bases and testable hypothesis. This project will provide much needed data about the Kootenai River habitat/substrate for pre- and post Libby Dam impoundment.

These project objectives address the Fish and Wildlife Plan (Northwest Power Planning Council, 1994, as amended in 1995, section 10.8b.22) objectives because they are directed toward evaluating the Kootenai River aquatic ecosystem. The Kootenai Tribe of Idaho can integrate results from this study into their Kootenai River ecosystem status determination and improvement study.

As pointed out by IDFG (IDFG, 1998), the primary threaten and endangered species are all transboundary and any research findings and recommendation are also important to our Canadian colleagues.

c. Relationships to other projects

This proposed project can produce data important for at least three other ongoing projects in the basin. During FY 1997 and 1998, the USGS was a subcontractor on the Kootenai River Fisheries Investigations project (project 8806500). USGS measured the spatial distribution of river velocities using an Acoustic Doppler Current Profiler and collected seismic profiles of the substrate in the white sturgeon spawning reach near Bonners Ferry. The Libby Reservoir Levels and Impact on Resident Fish project (project 8346700) objectives includes calibrating simulations of hydraulic conditions and surveying the river habitat. USGS data collected during FY1997 and FY1998 and the data collection proposed herein support these project objectives. The Kootenai River Ecosystem Improvement project (project 9404900) overall objective is to identify best-management options to enhance the aquatic ecosystem. The USGS has made available to this project stream flow and baseline geomorphological substrate data that is necessary to develop, evaluate, and test and analyze solutions to ecosystem problems. The study proposed herein will continue to provide data to support the efforts of project 9404900.

This proposed project will report on the efficacy of the methods used to characterize the habitat stubstrate. The methods, particularly the new USGS seismic subbottom profiling system, employed by the proposed project will very likely demonstrate great transferability to other fish and wildlife investigations in the Columbia Basin.

d. Project history (for ongoing projects)

USGS-Idaho District has not previously responded to BPA Fish and Wildlife Program request for proposal, thus there is no previous history. See section 8c for description of services performed by USGS for IDFW project 8806500.

e. Proposal objectives

The overall objectives of this project is to (1) characterize/describe/map the type of sediments comprising the Kootenai River substrate/subbottom, and (2) characterize how the makeup of these sediments and how river bottom elevations have changed since Libby Dam became operational. The information/data produced by this project will represent monitoring of baseline conditions for a significant element of habitat prior to habitat restoration. The substrate/geomorphological data collected by this project is important to other workers developing, evaluating, and testing and analyzing solutions to ecosystem problems on the Kootenai River.

These objectives will be accomplished (see section 4, Objectives and Tasks) through the following work tasks: (a) conduct a detailed survey using state-of-the-art low- and high-frequency marine seismic subbottom profiling systems; (b) core the upper 10 to 15 feet of substrate/sediments; (c) analyze pre-and post dam water-surface elevation and channel elevation, and suspended sediment data; (d) integrate analysis of the seismic subbottom profiles, vibra core data and suspended-sediment/gage bathymetry data; and, (e) report results in an USGS Water Resources-Investigations Report. Also, the USGS is committed

to collecting and analyzing data that supports the Adaptive Ecosystem Assessment process.

f. Methods

Objective 1, Task A: Seismic surveys, methodology described in (Edsall and others, 1997; Haeni, 1992), will be conducted to obtain seismic subbottom profiles in the white sturgeon spawning area, survival near Bonners Ferry, Idaho, areas upgradient from this spawning area, some which tend to have a gravelly substrate considered more favorable for larval survival, Idaho, and other areas will be considered. Low- and high-frequency seismic subbottom profiles will be collected using a newly USGS purchased state-of-the-art marine-seismic-profiling system (see section g). The unprocessed seismic data will be digitally recorded to allow for post-data-acquisition processing. This seismic system has sophisticated digital signal processing software to remove geologic and other spurious noise from the data and capabilities to enhance seismic reflections. A global positioning system will be used to record all survey positions along subbottom profiles

The seismic/acoustic signals (commonly referred to as subsurface reflectors) displayed on subbottom profiles show the interface between different layers of sediments below the river bottom. The resolution between layers using the high-frequency acoustic source should be on the order of inches, and resolution using the low-frequency acoustic source should be about 1 or greater. Depth of geophysical exploration with the high-frequency system should be about 10 ft and possibly greater and can be limited by some natural subsurface conditions. Depth of geophysical exploration with the low-frequency is system should exceed 30 ft. Seismic reflectors on subbottom profiles are not always indicative of a specific type of sediment layer and may only indicate the boundary between two adjacent layers of sediments. Thus, cores of river bottom sediments or other 'ground truth' is required to correctly interpret the lithology of seismic reflectors displayed on subbottom profiles. Core data allows the interpretations of seismic reflectors displayed on subbottom profiles to be calibrated and corroborated and provides a level of QA/QC. Coring is an important and challenging task and is described below.

The new state-of –the-art USGS/US Navy bottom sediment classification system is currently being built under special licensing by the US Navy to the USGS and may be demonstrated.

Objective 1, Task B: The USGS will obtain `geologic control' along subbottom profiles by conducting vibra-coring from the USGS-sediment coring boat operated by the Reconstructed Trends study unit in the Texas District. The coring boat is a specially equipped 24-foot pontoon boat with a wide range of safety devices and is equipped with a wide range of coring equipment and a heavy winch. Divers certified in SCUBA accompany the coring boat. The vibra-core has a 3 inch inner diameter core barrel and should be capable of recovering cores of clay, silt, sand, and gravel.

Objective 1, Task C: Analysis of the water-surface elevation and channel elevation, and suspended-sediment load (USGS collected and computed daily suspended-sediment concentrations from 1966 to 1991) at USGS gaging stations below Libby Dam. This analysis will characterize transient changes in surface-water levels, channel elevation, and the suspended-sediment budgets during pre- and post-Libby Dam impoundment. This inexpensive analysis of import historical data will help characterize how the riverbed has changed since 1972 and will complement and augment finding from the seismic subbottom profiling and sediment coring. A very preliminary analysis of riverbed elevations shows a dramatic change in bed elevation variability between the pre and post-1972 periods, clearly, a more detailed analysis is needed.

Objective 1, Task D: Conduct an integrated analysis of seismic subbottom profiles and vibra core data, and historical suspended-sediment and bathymetry data.

g. Facilities and equipment

Most office work is conducted out of the USGS Washington District office, Tacoma, WA. The Sandpoint Idaho field office is the closest USGS office to the study area and contains office space and computer equipment sufficient for project personnel. Federal vehicles and workboats are available for project use.

The low-frequency and high-frequency seismic subbottom profiling system is housed at the USGS-Branch of Geophysical Applications and Support (BGAS), University of Connecticut, Storrs, CT. Additional information about BGAS can be found at http://wwwrvar.er.usgs.gov/ogw/bgas/. The high-frequency seismic system is an EdgeTech model SB-216S system that utilizes a transmission of swept FM waveforms that operates at 2 to 16 kHz, and 500 Hz. A tow vehicle or "fish" is pulled in the water, weighs approximately 150 pounds, and transmits and receives the FM signal. The unprocessed data will be digitally recorded to allow for post data acquisition processing. A satellite global positioning system will be used during the seismic survey in order to record positioning along subbottom profiles and during coring operations.

The USGS-Texas District coring boat is a specially equipped 24-foot pontoon boat with a wide range of safety devices, equipped with a wide range of coring equipment, and equipped a heavy winch. This coring boat is used by the USGS thorough the lower 48 states.

h. Budget

This project will be conducted over a 1.5-year period beginning October 1, 2000 and ending by March 1, 2001. The fieldwork will be conducted during the summer of 2000. Results from this project will be provided in oral presentations as well as in a USGS Water-Resources Investigations Report. A senior-level hydrologist specializing in geophysics and water resources will be the project chief. The project chief will be

supported by Idaho District staff and experts from other U.S. Geological Survey regional and headquarters offices as needed. USGS indirect costs include computer cost and District and Headquarters discipline specialist support.

PLEASE NOTE, a more expensive drilling/coring method was considered, cost about $53,000 more, but was not incorporated in order to keep the budget low as possible. The BOR-Pacific Northwest Region Headquarters, Boise, Idaho, typically operate 3 to 4 drill crews throughout the year. BOR proposed to use a large drilling barge, install a temporary riser from the barge to the river bottom, and use rotary drilling technology to drill and capture cuttings and collect cores. This method is more reliable in penetrating gravels and cobbles.

Section 9. Key personnel

Personnel	Title	FTE	Project Duties
Gary J. Barton	Hydrologist/Geophysicist	0.25	Project Chief/Geophysics/Report
Peter Van Metre	Hydrologist	0.1	Sediment Core Analyst/Advisor
Mike Dorsey	Supervisory Hydrologic Technician	0.1	Directs coring field operations
Peter Haeni	Geophysics Branch Chief	0.05	Geophysics Advisor

GARY BARTON-PROJECT CHIEF

U.S. Geological Survey-Water Resources Division
1201 Pacific Ave. Suite 600, Tacoma, WA 98402
253-428-3600 x2663 gbarton@usgs.gov

Gary has a M.S. in Geophysics/Geology from Western Michigan University and has worked for the USGS since 1984, has prior experience as a consultant in oil and gas exploration and environmental studies, and is a registered professional geologist. Gary has conducted many geophysical and drilling programs on water and on land including the Susquehanna River, Delaware River, and Atlantic Ocean. Prior to his recent move to the northwest, Gary was the USGS-Western Great Lakes Geophysical Advisor. He has given talks on geophysical applications at numerous technical conferences.

Barton, G.J., 1998, Subbottom seismic-reflection profiling on the Kootenai River near Bonners Ferry, Idaho: abstr. in proceed. of Ninth Annual Nonpoint Source Water Quality Monitoring Results Workshop, 1 p.

Barton, G., Woods, P, Horowitz, A., Kuwabara, J., Balisteria, J., and Box, S., 1998, Quality assurance project plan for U.S. Geological Survey studies in support of the EPA-Region 10 Spokane River Basin RI/FS: U.S. Geological Survey letter report, variously paginated.

Barton, G.J. and laCombe, P., 1995, Seismic-refraction surveys to determine depth of landfills in relations to ground-water levels and ground-penetration radar surveys, F.E. Warren AFB, Cheyenne, Wyoming: U.S. Geological Survey Administrative Report, 41 p.

Barton, G.J., 1996, Seismic refraction for determining depth of landfills: poster, abstr. in Annual Meeting of the U.S. Geological Survey/Department of Defense Environmental Conservation (DODEC) Hydrology Program, Orlando, FL.

Hainly, R.A., Reed, L.A., Flippo, H.N., and Barton, G.J., 1995, Deposition and simulation of sediment transport in the Lower Susquehanna River reservoir system: U.S. Geological Survey Water-Resources Investigations Report 95-4122, 39 p.

F. PETER HAENI – GEOPHYSICAL ADVISOR

U.S. Geological Survey, University of Connecticut, 11 Sherman Place, U-5015, Storrs Mansfield, CT 06269 (860) 487-7402/fax (860) 487-8802/e-mail phaeni@usgs.gov

Master of Science in Geology/Geophysics: Wesleyan University, June 1971
Bachelor of Science: U.S. Naval Academy, June 1963

PROFESSIONAL EXPERIENCE

Chief, USGS Branch of Geophysical Applications and Support, Office of Ground Water1993 to present. Responsible for advising and teaching Water Resources Division personnel (WRD) how to use geophysical methods in hydrologic studies; conducting research on new or modified geophysical methods that have the potential to be used in USGS operational programs; advising the Chief Hydrologist of the WRD on policy and operational matters concerning geophysical methods; and representing the WRD in meetings with other Federal agencies and private organizations.

Adjunct Assistant Professor, University of Connecticut 1997 to present Graduate School, Department of Geology and Geophysics. Teach field methods for geophysics classes.

OTHER PROFESSIONAL ASSIGNMENTS

Associate Editor, SEG, Geophysics, 1995-97; Secretary, Near-Surface Geophysics Section SEG, 1994-95; Associate Editor, AGU, Reviews of Geophysics, 1987-89

SPECIAL ASSIGNMENTS AND COMMITTEES

NCHRP Panel 21-5, Determination of Unknown Bridge Foundations; Member of Surface-Geophysics Standards Committee, American Society of Testing Materials; Member of delegation to Peoples Republic of China; Member of USGS review team to United Arab Emirates; International program committee on Application of Geophysics to Water Prospecting in Arid and Semi-Arid Areas; Technical program co-chairman for SAGEEP ‘94 Conference

Haeni, F.P., 1996, Use of ground-penetrating radar and continuous seismic-reflection profiling on surface-water bodies in environmental and engineering studies, in Carpenter, Phil, ed., Groundwater Geophysics Special Issue: Journal of Environmental and Engineering Geophysics, v. 1, no. 1, p. 27-35.

STEVE LIPSCOMB – SUPERVISORY HYDROLOGIST FOR SURFACE-WATER PROGRAM

Steve Lipscomb has a B.S. in Civil Engineering from California State University at Sacramento and has worked for the USGS since 1979. Steve is currently in charge of hydrologic data collection for the Water Resources Division in Idaho. Steve has been involved in several studies evaluating sediment and bedload transport including the study of the effects of draw down at the Lower Granite Reservoir on suspended sediment and bedload transport in the Snake River; a study of sediment transport in the Susitna River in Alaska; and studies of suspended and bedload transport in streams in Idaho, Wyoming, and Nevada in cooperation with the U.S. Forest Service and the Bureau of Reclamation. Recently, Steve developed QA/QC protocol for stream velocity measurements using an Acoustic Doppler Current Profiler coupled with a Global Positioning System.

Lipscomb, S.W., in press, Hydrologic classification and estimation of basin and hydrologic characteristics of subbasins in central Idaho: U.S. Geological Survey Professional Paper 1604, 49 p.

Lipscomb, Stephen W., Berenbrock, Charles, Doyle, Jack D., Spatial Distribution of Stream Velocities for the Kootenai River near Bonners Ferry, Idaho, June 1997: U.S. Geological Survey Open-File Report 97-830, 174 p.

Harper, R.W., Lipscomb, S.W., Experimental Drawdown Study, Lower Granite Reservoir, North-Central Idaho, March 1992: U.S. Geological Survey Open-File Report 94-109, 622 p.

Lipscomb, S.W., 1989, BRANCH flow model of the Knik and Matanuska Rivers, Alaska: National Space Technology Laboratory, Bay St. Louis, Mississippi, Proceedings of the Advanced Seminar on One-Dimensional, Open-Channel Flow and Transport Modeling, June 1987, p 62-64.

Lipscomb, S.W., Flow and hydraulic characteristics of the Knik-Matanuska River estuary, Cook Inlet, South-central Alaska: U.S. Geological Survey Water-Resources Investigations Report 89-4064, 52 p.

Lipscomb, S.W., 1987, Calibration and verification of a one-dimensional flow model to the Knik and Matanuska Rivers, south-central ALASKA: Fairbanks, Alaska, Proceedings of the Amer. Water Res. Assn., Alaska Section, Oct. 1987, p. 41-54.

Peter Van Metre, Specialist in Analyzing Sediment Cores

Peter has an MS in Hydrology from the University of Arizona and has worked for the USGS since 1980. His experiences include studies of remote sensing and Geographic Information Systems (GIS), ground-water contamination, surface-water ground-water interactions, surface-water quality, and reservoir sediment chemistry. He is currently the project chief the USGS National Water-Quality Assessment (NAWQA) Program's Reconstructed Trends study. The study is using age-dated sediment cores from lakes and reservoirs nationwide to describe historical trends in contaminants. Peter is also a member of the NAWQA Trace-Element National Synthesis team.

Van Metre, P.C., Callender, E., and Fuller, C.C., 1997: Historical trends in organochlorine compounds in river basins identified using sediment cores from reservoirs: Environmental Science and Technology, 31 (8) 2339-2344.

Callender, E., and Van Metre, P.C., 1997: Reservoir sediment cores show U.S. lead declines Environmental Science and Technology, 31 (9) p. 424A-428A.

Van Metre, P.C., and Callender, E., 1997: Identifying water-quality trends from 191294 using dated sediment cores from White Rock Lake Reservoir, Dallas, Texas: Journal of Paleolimnology 17: 239-249.

Van Metre, P.C., and Callender, E., 1996, Identifying water-quality trends in the Trinity River, Texas, USA, 1969-1992, using sediment cores from Lake Livingston: Environmental Geology 28 (4) 190-200.

Mike Dorsey-Supervisory Hydrologic Technician

Dorsey has been with the USGS since 1974 and is currently in charge of the Austin Field Unit for the Texas District and handles sampling and logistics for the NAWQA Reconstructed Trends sediment coring study. He participated in sediment coring studies in the Gulf of Mexico with the Geologic Division during the 1970's. He is a certified boat operator and trainer of boat operators and designed the USGS sediment coring boat being used by the Reconstructed Trends study.

STEPHEN P. ANSLEY HYDROLOGIC TECHNICIAN

Stephen P. Ansley is certified in SCUBA (NAUI, PADI, YMCA) and numerous surface supplied (hard hat) commercial diving systems. He began diving in 1972. His commercial diving career spanned 1973 through 1978. He is an underwater welder and has worked with explosives down to a depth of 60'. Steve has diving experience in both freshwater and saltwater and has worked in all environmental conditions.

Section 10. Information/technology transfer

The approach and methods used in this study will be an example using innovative technologies to characterizes sediments some of which form spawning grounds, including there history of deposition and erosion, that comprise the substrate of rivers throughout the Columbia Basin. The information to be assembled from this hydrogeologic investigation will provide important insight on the habitat (Edsall and others, 1992) of white sturgeon spawning areas and other native fish habitat. Investigations such as this support the efforts of the international team charged with the overseeing the recovery of the white sturgeon.

Congratulations!