PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Collect Data On White Sturgeon Above Grand Coulee Dam

BPA project number: 9502700
Contract renewal date (mm/yyyy): ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Spokane Tribe of Indians

Business acronym (if appropriate) STOI

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses
Section 10.4A including subsections 10.4A.1, 10.4A.2, 10.4A.6, 10.4A.9: Sections 2.2G, 2.2G.1

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

Other planning document references
Upper Columbia River Blocked Area Management Plan

Short description
Three year base-line assessment of white sturgeon in Lake Roosevelt from Grand Coulee Dam to the Canadian border, and the Spokane River arm. Special emphasis will be placed on defining recruitment potential and factors currently limiting recruitment.

Target species
White Sturgeon

Section 2. Sorting and evaluation

Subbasin
Upper Columbia Mainstem; Spokane

Evaluation Process Sort

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

caucus	processes, mark one or both	
☐ Anadromous fish ☒ Resident fish ☐ Wildlife	☐ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☒ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

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

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9404300	Lake Roosevelt Monitoring / Data Collection Program	Management plan to be developed under the LRMDCP will depend on findings of this project.
9700400	Joint Stock Assessment	Will rely on proposed project to supply data on white sturgeon in Lake Roosevelt as part of comprehensive data compilation and collection efforts within the upper Columbia Basin.

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	Define population characteristics of white sturgeon.	a	Collect white sturgeon above Grand Coulee Dam and obtain length, weight, age data.
		b	Define habitat characteristics (substrate type, flow velocity, temp., depth) at areas where white sturgeon are collected.
		c	Conduct mark-recapture analysis of tagging data to estimate abundance, mortality and

			recruitment of white sturgeon above Grand Coulee Dam.
2	Define potential for white sturgeon spawning between Grand Coulee Dam and the international border.	a	Define potentially suitable spawning areas for white sturgeon above Grand Coulee Dam based on review of existing data and Habitat Suitability Indices.
		b	Assess spawning use of areas defined in 2-a using artificial substrate mats to collect spawned eggs.
3	Assess biological and environmental factors affecting abundance of white sturgeon.	a	Collect stomach contents of representative fish species at and downstream of areas defined in 2-a during sturgeon spawning season to assess predation of eggs or newly hatched larvae.
		b	Monitor physical and chemical water / sediment quality parameters near known or potential spawning areas to define existence of potentially adverse conditions for egg/fry survival.
		c	Assess availability and distribution of suitable food items for various life history stages of white sturgeon in Lake Roosevelt.
4	Development a restoration and management plan for white sturgeon above Grand Coulee Dam.	a	Investigate the potential for artificial propagation of white sturgeon from area(s) above Grand Coulee Dam including need, feasibility and appropriate methodologies.
		b	Implement recommendations of management plan to restore a complete age class structure within the target population.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	1/2000	1/2002			45.0
2	1/2000	1/2002			15.0
3	1/2000	1/2002			25.0
4	1/2000	1/2001		Yes	15.0
				Total	100.0

Schedule constraints
Definition and refinement of collection methods which will be most successful within Lake Roosevelt will be necessary. Coordination with canadian interests could potentially slow progress during the planning/initialization phase(s).

Completion date
2002

Section 5. Budget

FY99 project budget (BPA obligated): $264,000

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	Project Manager, Biologist, Technician	26.3	$90,000
Fringe benefits	28% of salaries	7.4	$25,200
Supplies, materials, non-expendable property	set lines, gillnets, misc. field, office, lab	1.5	$5,000
Operations & maintenance	Insurance	0.3	$1,000
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	1 computer, boat/trailer, truck, 2 PIT tag readers	24.3	$83,000
NEPA costs			
Construction-related support			
PIT tags	# of tags: 200	0.2	$580
Travel	Coordination meetings, boat and vehicle fuel, etc…	1.5	$5,000
Indirect costs	21.3% of contract less capital	8.0	$27,306
Subcontractor		30.7	$105,000
Other			
TOTAL BPA FY2000 BUDGET REQUEST			$342,086

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
BC Ministry of the Environment	M&E of white sturgeon status above international border.	4.5	$16,250
Total project cost (including BPA portion)			$358,336

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$359,190	$377,150		

Section 6. References

Watershed?	Reference
☐	Apperson, K. and P.J. Anders. 1991. Kootenai River white sturgeon investigations. Idaho Department of Fish and Game. Prepared for Bonneville Power Administration. Annual Progress Report, Project 88-65, Portland.
☐	Auer, N.A. 1996. Response of spawning lake sturgeon to changes in hydroelectric facility operation. Transactions of the American Fisheries Society 125:66-67.
☐	Beamesderfer, R.C. and Nigro, A.A. 1993a. Status and habitat requirements of the white sturgeon populations in the Columbia River downstream from McNary Dam. Final Report, Volume I, July 1986-September 1992. DE-AI79-86BP63584, Bonneville Power Adminis
☐	Beamesderfer, R.C. and Nigro, A.A. 1993b. Status and habitat requirements of the white sturgeon populations in the Columbia River downstream from McNary Dam. Final Report,

	Volume II, July 1986-September 1992. DE-AI79-86BP63584, Bonneville Power Admini
☐	Beer, K.E. 1981. Embryonic and larval development of white sturgeon (Acipenser transmontanus). Master's Thesis. University of California, Davis.
☐	Brannon, E., and seven others. 1987. Columbia River white sturgeon (Acipenser transmontanus) population genetics and early life history study. Final Report. Project 83-316. Bonneville Power Administration, Portland.
☐	Elliott, J.C. and R.C. Beamesderfer. 1990. Comparison of efficiency and selectivity of three gears used to sample white sturgeon in a Columbia River reservoir. California Fish and Game 76(3):174-180.
☐	Klemm, D.J., P.A. Lewis, F. Fulk, and J.M. Lazorchak. 1990. Macroinvertebrate field and laboratory methods for evaluating the biological integrity of surface waters. U.S. Environmental Protection Agency, Office of Research and Development. EPA/600/4-90/0
☐	McCabe, G.T., Jr. and L.G. Beckman. 1990. Use of an artificial substrate to collect white sturgeon eggs. California Fish and Game 76(4):248-250.
☐	Nilo, P., Dumont, P., and Furtin, R. 1997. Climatic and hydrological determinants of year-class strength of St. Lawrence River lake sturgeon (Acipenser fulvescens). Canadian Journal of Aquatic Science 54:774-780.
☐	Paragamian V., G. Kruse, and V.D. Wakkinen. 1995. Kootenai River white sturgeon investigations. Annual Progress Report. Project 88-65. Bonneville Power Administration, Portland.
☐	Paragamian V., G. Kruse, and V.D. Wakkinen. 1996. Kootenai River white sturgeon investigations. Annual Progress Report. Project 88-65. Bonneville Power Administration, Portland.
☐	Paragamian V., G. Kruse, and V.D. Wakkinen. 1997. Kootenai River white sturgeon investigations. Annual Progress Report. Project 88-65. Bonneville Power Administration, Portland.
☐	Parsley, M. 1991. How water velocities may limit white sturgeon spawning. Research Information Bulletin, U.S. Department of the Interior, U.S. Fish and Wildlife Service, 91-86.
☐	Parsley, M.J. and L.G. Beckman. 1994. White sturgeon spawning and rearing habitat in the lower Columbia River. North American Journal of Fisheries Management 14:812-827.
☐	Partridge, F. 1983. Kootenai River fisheries investigations. Idaho Department of Fish and Game. Job Completion Report, Project F-73-R-5, Boise.
☐	R.L.&L. Environmental Services Ltd. 1994. Status of white sturgeon in the Columbia River, B.C. Final Report prepared for B.C. Hydro, Environmental Affairs, Vancouver, B.C. Report 377F.
☐	Simpson, J.C. and R.L. Wallace. 1982. Fishes of Idaho. University of Idaho Press, Moscow, Idaho.
☐	Stetter, A. and E. Brannon. 1992. A summary of stock identification research on white sturgeon of the Columbia River. Bonneville Power Administration, Project 89-44, Portland.
☐	Wydoski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. University of Washington Press, Seattle.

PART II - NARRATIVE

Section 7. Abstract

Research and surveys concerning sturgeon status are directly called for in the 1994 Columbia Basin Fish and Wildlife Program (Section 10.4A) as white sturgeon (*Acipenser transmontanus*) populations are declining, possibly as a result of dam construction and hydropower operation. White sturgeon surveys conducted by the Oregon Department of Fish and Wildlife and the Spokane Tribe of Indians during 1998 revealed an aged population above Grand Coulee Dam with virtually no recruitment during the past 20-25 years. The goal of the proposed project is to assess population characteristics of white sturgeon in Lake

Roosevelt and assist future management decisions. Specific objectives are to; 1) define population characteristics of white sturgeon above Grand Coulee Dam; 2) Define potential for white sturgeon spawning between Grand Coulee Dam and the international border, 3) Assess biological and environmental factors affecting abundance of white sturgeon, and 4) Develop a restoration and management plan for white sturgeon above Grand Coulee Dam. Methodologies used will be drawn from other regional sturgeon studies currently underway including those throughout the Columbia River (including Canadian reaches) and on the Kootenai River. This project is expected to be completed three years after initiation of sampling, and will provide solid baseline data regarding sturgeon in Lake Roosevelt.

Section 8. Project description

a. Technical and/or scientific background

Data collected during 1998 by the Washington and Oregon Departments of Fish and Wildlife and the Spokane Tribe of Indians revealed an aged white sturgeon population above Grand Coulee Dam, with virtually no recruitment during the past 20-25 years. No young of year sturgeon were collected in 1998 by USGS trawling surveys above Grand Coulee Dam, although these same methods are collecting YOY in other reservoirs throughout the lower Columbia and Snake Rivers. The sturgeon population above the international border are also recruitment limited (R.L. & L. Environmental Services Ltd. 1994) suggesting that further investigations are necessary to define factors limiting recruitment of white sturgeon above Grand Coulee Dam.

As described in Section 10.4A of the 1994 FWP, concern has arisen over the declining status of native sturgeon populations throughout the Columbia River Basin. White sturgeon populations above Grand Coulee Dam were closed to harvest in 1996 due to increasing concerns over the apparent declining status of the population. Mitigative and/or restorative efforts have become necessary to maintain this particular white sturgeon stock which possesses genetic traits different from other Columbia River stocks (Stetter and Brannon 1992; Brannon et al. 1987). Genetic stock differentiation was also defined for the Kootenai River white sturgeon stock which, under a similar condition of limited recruitment, was listed as endangered in 1994.

Sturgeon populations are declining, in part, due to dam construction and hydro-ops which result in hydrograph reversal (Apperson and Anders 1991; Partridge 1983). Numerous authors have noted the importance of high spring flows in sturgeon spawning and recruitment (Nilo et al. 1997; Auer 1996; Parsley 1991), and hydro-ops may be, in part, related to the lack of recruitment noted in the upper Columbia River. Other factors may also play an important role in limiting recruitment of white sturgeon above Grand Coulee Dam, including food availability, predation of juveniles by walleye and other piscivores, and water/sediment quality issues related to zinc smelting operations in Canada and mining operations in the U.S.

The proposed work will provide needed insight into factors limiting recruitment of white sturgeon in the upper Columbia River, and collect baseline data necessary to make informed management decisions.

b. Rationale and significance to Regional Programs

Sections 10.4A.1, 10.4A.2, 10.4A.6 and 10.4A.9 of the FWP specifically address the need for collection of baseline data on sturgeon populations throughout the basin. Sections 10.4A.6 describes the need to “fund a sturgeon assessment in Lake Roosevelt from Grand Coulee Dam to the international border, including the Spokane River arm on the Spokane Indian Reservation”. Section 10.4A.9 recognizes the need for “sturgeon population research in Lake Roosevelt…”.

Findings from 1998 surveys conducted by the ODFW and STOI demonstrated that the white sturgeon population above Grand Coulee Dam is similar in status to that of the Kootenai River stock, with a very aged population and virtually no recruitment over an extended period. Section 10.4B of the FWP specifically deals with the Kootenai River white sturgeon stock which was listed as endangered in 1994. Parsley and Beckman (1994) showed that white sturgeon in the Kootenai River spawn under different habitat conditions than those in the lower Columbia basin, and the proposed project will further our understanding of similarities or differences between stocks in the Kootenai and upper and lower Columbia

Rivers. Results of the proposed project will help to define the needs (if any) for further or more specific actions related to sturgeon stock(s) in and above Lake Roosevelt.

Sturgeon stock(s) found in Lake Roosevelt have the ability to migrate across the international border, making their management a transboundary issue. The information collected will enable effective coordination and management with Canadian co-managers of these upriver sturgeon stock(s) as discussed in Section 2.2G of the FWP. At a November 18, 1998 meeting, representatives of Canadian (B.C. Environment, B.C. Hydro) and U.S. (STOI, Washington Department of Fish and Wildlife, National Park Service) interests acknowledged the need for a cooperative effort to manage this transboundary sturgeon stock. Canadian interests have already conducted extensive surveys of spawning habitat and the spawning population(s) between the international border and Hugh Keenleyside Dam, and have begun work on a stabilization/recovery plan (L. Hildebrand; R.L. &L. Environmental Services Ltd., Vancouver, B.C.; Personal communication). Results of the proposed project will include a comprehensive plan addressing the transboundary nature of this particular stock, with the ability to use the Canadian plan as a model or existing framework.

This project will also provide data necessary to the development of biological and integrated rule curves for Lake Roosevelt as called for in Section 10.8B.5 of the FWP. Rule curves will be constructed as part of the Lake Roosevelt Monitoring / Data Collection Program (BPA 9404300).

c. Relationships to other projects

The proposed project is critically linked to the Lake Roosevelt Monitoring / Data Collection Program (BPA 9404300), the Joint Stock Assessment (BPA 9700400), and potentially to the proposed Ford Hatchery. The LRMDCP will require data on the white sturgeon population above Grand Coulee Dam to complete a management plan for Lake Roosevelt. With both the LRMDCP and the proposed project being conducted by the STOI, coordination of personnel, equipment, and information will be maximized. The Joint Stock Assessment is compiling existing databases on upper Columbia River fish stocks, and defining existing gaps which need to be addressed. At the current time, data concerning white sturgeon in Lake Roosevelt is a necessary but lacking portion of that database. The proposed Ford Hatchery is a potentially suitable site for rearing of white sturgeon to assess their potential for artificial propagation under this proposal.

The proposed project is similar to numerous funded projects in that hydro-operations appear to have negatively impacted the white sturgeon population above Grand Coulee Dam, similarly to others within the basin. Numerous programs are funded by BPA which address white sturgeon evaluations, mitigations, or recovery plans in other portions of the Columbia River Basin; BPA 8605000 – White sturgeon mitigation and restoration in the Columbia and Snake Rivers (ODFW), BPA 9700900 – Evaluating rebuilding the white sturgeon population in the upper Snake River (NPT), BPA 8806400 – Kootenai River white sturgeon studies and conservation aquaculture (KTOI), BPA 8806500 – Kootenai River fisheries investigations (IDFG), BPA 9084 - Assessing genetic variation among Columbia basin white sturgeon populations (UOI), and BPA 9019 – Monitor reproductive physiology of Columbia River white sturgeon (OSU).

Current work at the University of Idaho (BPA 9084) will further investigate the genetic uniqueness of the Lake Roosevelt / Upper Columbia stock of white sturgeon. Work at Oregon State University (BPA 9019) is currently assessing reproductive physiology of white sturgeon collected throughout the Columbia River (including those collected above Grand Coulee Dam during 1998), and may provide additional information on potential factors limiting recruitment in this reach.

Funded sturgeon projects on the Kootenai River have established a precedence of involving Canadian interests in transboundary sturgeon stock evaluation and management efforts funded by BPA.

d. Project history (for ongoing projects)

N.A.

e. Proposal objectives

Objectives:
1. Define population characteristics of white sturgeon.

a) Collect white sturgeon above Grand Coulee Dam and obtain length, weight, age data.
b) Define habitat characteristics (substrate, velocity, temp., depth) where white sturgeon are collected.
c) Conduct mark-recap analysis of tagging data to estimate abundance, mortality, and recruitment of white sturgeon above Grand Coulee Dam.

2. Define potential for white sturgeon spawning between Grand Coulee Dam and the international border.
   a) Define potentially suitable spawning areas for white sturgeon above Grand Coulee Dam based on review of existing data and Habitat Suitability Indices.
   b) Assess spawning use of areas defined in 2-a using artificial substrate mats to collect spawned eggs.
3. Assess biological and environmental factors affecting abundance of white sturgeon.
   a) Collect stomach contents of representative fish species at and downstream of areas defined in 2-a during sturgeon spawning season to assess predation of eggs or newly hatched larvae.
   b) Monitor physical and chemical water / sediment quality parameters near known or potential spawning areas to define existence of potentially adverse conditions for egg/fry survival.
4. Development a restoration and management plan for white sturgeon above Grand Coulee Dam.
   a) Investigate the potential for artificial propagation of white sturgeon from area(s) above Grand Coulee Dam including need, feasibility and appropriate methodologies.
   b) Implement recommendations of management plan to restore a complete age class structure within the target population.

Product(s) will include annual and completion reports to the funding agency.

f. Methods

Methodologies currently or previously utilized within the Columbia River Basin to sample white sturgeon or their spawned eggs are described in Paragamian et al. (1995, 1996, 1997), Beamesderfer and Nigro (1993a and 1993b), Stetter and Brannon (1992), Elliott and Beamesderfer (1990), and McCabe and Beckman (1990). Methods for the proposed project will draw from these defined methodologies whenever possible and efforts will be coordinated with basin-wide researchers to ensure collection of any samples valuable to other studies (i.e. genetic work at UOI, BPA 9084).

An outline of proposed methods is listed by Objective as defined in Sections 4 and 8e.

I) Objective 1, Define population characteristics of white sturgeon.

Set lines with 12/0, 14/0, and 16/0 circle hooks (R.L.&L. Environmental Services Ltd, 1994; Elliott and Beamesderfer, 1990) will be used to collect white sturgeon above Grand Coulee Dam. White sturgeon are fully recruited to this gear by approximately 90 cm fork length, and some smaller fish are captured (Elliott and Beamesderfer 1990). White sturgeon first mature at roughly 120 cm (males) and 150 cm (females; Wydoski and Whitney, 1979) in the Columbia River, making setlines a suitable gear to assess sub-adult and adult populations.

Gillnets have been used to effectively collect juvenile white sturgeon throughout the Columbia and Snake rivers (Mike Parsley, USGS, Personal Communication), and will be the primary gear utilized to do so under this project. Hoopnets with restricted openings (designed to keep adult sturgeon from entering) may be used to sample juvenile sturgeon in relatively high velocity reaches where gillnets cannot be effectively utilized. Juvenile surveys conducted under this project will focus on the riverine portions of the study area above Evans Landing. Gillnet surveys between Grand Coulee Dam and Evans Landing are currently conducted under the Lake Roosevelt Monitoring / Data Collection Program.

Sturgeon captured will be measured (fork length), weighed, and marked with externally visible numbered tags (spaghetti or floy) and a PIT tag (internal). A scute will be removed from a standard

position on each sturgeon captured to provide a permanent externally visible mark. A small portion of the pectoral fin spine will be removed from each sturgeon to establish fish age. Tagging will allow for assessment of sturgeon, growth, distribution, and movements. Information on sturgeon abundance, mortality, and recruitment rates will be estimated by analyzing mark-recapture data with appropriate software packages (i.e. MARK or POPAN-5). Observed age and length frequencies will be compared to those observed in previous studies to define temporal changes in stock status.

II) Objective 2, Define potential for white sturgeon spawning between Grand Coulee Dam and the international border.

White sturgeon above the international border utilize spawning habitats similar to those utilized elsewhere in the Columbia River basin (R.L.&L. Environmental Services Ltd, 1994), and numerous potentially suitable areas have been identified below the international border (Larry Hildebrand, R.L.&L. Environmental Services Ltd, Personal Communication). Based on existing literature and Habitat Suitability Indices for white sturgeon (Parsley and Beckman, 1994), the presence of additional sites will be investigated. Use of identified suitable spawning areas by white sturgeon will be investigated using artificial substrates designed to collect spawned sturgeon eggs (McCabe and Beckman, 1990). Physical habitat parameters (temperature, velocity, depth, predominant substrate) will be monitored throughout the spawning season at all suspected or potential spawning areas identified during this study. Artificial substrates will be deployed downstream of potential spawning areas and monitored throughout the spawning season (June – July; R.L.&L. Environmental Services Ltd, 1994). If spawned eggs are collected, they will be sacrificed and fertilization and stage will be determined according to methods described by Beer (1981). Sacrifice of eggs will be necessary to determine if successful spawning has occurred (fertilization) and the number of spawning events at each site (determined by egg stage). These methods are currently used in Kootenai River investigations (BPA 8806400 and 8806500) to establish fertilization rates and number of spawning events. Egg collection efforts will provide information on distribution and use of suitable spawning habitat, and the timing of spawning activities which can then be related to hydro operations.

III) Objective 3, Assess biological and environmental factors affecting abundance of white sturgeon.

To assess predation of white sturgeon eggs and/or larvae, stomach contents will be collected from representative fish species in the vicinity of spawning locations defined under Objective 2. Potential predators will be collected using various methods including (but not limited to) angling, electrofishing, and gillnetting. Stomach contents may be assessed in the field if time permits, or preserved in 100% ETOH for laboratory examination at a later time. If any fish eggs or larvae are observed during field observation of stomach contents, they will be preserved in 100% ETOH for laboratory identification to ensure accurate identification. All preserved stomach contents will be labeled with date, location, time, and method of collection, and collector(s).

Following identification of potential spawning areas under Objective 2, physical and chemical water and sediment quality parameters will be assessed near these areas to identify potentially adverse conditions for egg/fry survival. Sediment quality is not anticipated to vary in the short term, and will be investigated once annually near each potential spawning location. Sediment samples will be collected via ponar dredge and sent to the Spokane Tribal Laboratories for analysis of contaminants (including heavy metals, fine sediment, pesticides or other chemical contaminants). Water quality is expected to be variable through time, and will be assessed at least twice per month during the spawning season. Water quality monitoring will include assessment of turbidity, dissolved oxygen, percent dissolved oxygen, pH, conductivity, total dissolved solids, oxidation reduction potential, and total dissolved gas using a Hydrolab Surveyor IV. Water samples will be collected using a Van Dorn bottle (or similar water sampler) from near the sediment-water interface for laboratory analysis at least twice per month during the spawning season. Laboratory analysis of water samples will include metals, chemical contaminants (i.e. pesticides/herbicides, etc…) suspended solids, nutrients, hardness, alkalinity, and other parameters deemed relevant after further literature review.

Assessment of available food for white sturgeon will be investigated according to life history stage. Benthic invertebrates are important in the diet of juvenile sturgeon (Simpson and Wallace, 1982), and their density and distribution will be assessed using a combination of ponar and artificial substrate

samples (Klemm et al., 1990), and review of existing literature for Lake Roosevelt. Sub-adult and adult sturgeon rely heavily on fish, crayfish, and mussels (Wydoski and Whitney, 1979). Data on seasonal distribution of fishes in Lake Roosevelt is available through the Lake Roosevelt Monitoring / Data Collection Program (LRMDCP). Additional fisheries surveys (electrofishing and gillnetting) will be conducted under the proposed program to examine distribution and species composition in the riverine portion of the study area above Lake Roosevelt. Crayfish and mussel distribution will be assessed using systematic surveys throughout the study reach. Crayfish will be sampled using baited minnow traps. Mussel distribution will be assessed using available data and brail surveys (Klemm et al., 1990) in areas suitable for colonization by freshwater mussels. Density and distribution major food items will be plotted as an individual GIS layer on a bathymetric map of Lake Roosevelt being constructed under the LRMDCP allowing for comparison of sturgeon and food distributions throughout the study area.

IV) Objective 4, Develop a restoration and management plan for white sturgeon above Grand Coulee Dam.

Canadian interests have already conducted extensive surveys of spawning habitat and the spawning population(s) between the international border and Hugh Keenleyside Dam, and have begun work on a stabilization/recovery plan (L. Hildebrand; R.L. &L. Environmental Services Ltd., Vancouver, B.C.; Personal communication). Results of the proposed project will include a comprehensive restoration and management plan (Plan) addressing the transboundary nature of this particular stock, with the ability to use the Canadian plan as a model or existing framework. Development of the Plan will involve representatives of the STOI, Colville Confederated Tribes, WDFW, National Park Service, B.C. Hydro, B.C. Ministry of the Environment, and any other pertinent or interested parties.

Two young of year (YOY) white sturgeon were collected in standardized fishery surveys conducted by the STOI during 1998 (electrofishing and gillnetting; LRMDCP), and were the only YOY noted in similar seasonal surveys since 1988. Data collected on adult sturgeon during 1998 further substantiates the theory of a recruitment limited population above Grand Coulee Dam. The potential for artificial propagation of white sturgeon above Grand Coulee Dam must therefore be fully addressed as both a management and restorative alternative within the Plan. The Plan will be based both on currently existing data and the findings of this baseline investigation. It will define the need (if any) for artificial propagation, and address the feasibility and most appropriate methodologies to be used. Methods of artificial propagation defined within the Plan will be utilized during year two of the proposed (three year) study to determine obtainable hatching and survival rates of white sturgeon within a regional aquaculture facility.

g. Facilities and equipment

The Spokane Tribal Fisheries Department has sufficient facilities and equipment to conduct the majority of work described in this proposal. The STOI is also the primary contractor for the Lake Roosevelt Monitoring / Data Collection Program (BPA 9404300), which has been underway under various project names since 1988. Facility needs and much of the equipment for these two projects will overlap, and therefore they can be effectively shared by both programs.

Office and laboratory space utilized by the Lake Roosevelt Monitoring / Data Collection Program (LRMDCP) are located within the Spokane Tribal Natural Resources Building in Wellpinit, WA. Storage space for boats, equipment and supplies is available at two locations on the Spokane Reservation; a 36x40' metal building located adjacent to the natural resources building, and a larger storage facility located near Little Falls Dam.

Three vehicles are owned and/or utilized by the LRMDCP; a 1 ton Dodge pickup equipped with electric brakes and snow plow, a 3/4 ton Ford pickup, and a 1/2 ton Chevy pickup. The LRMDCP also utilizes a 33' Bounder motorhome to house employees during extended field efforts. The LRMDCP utilizes four boats; a 15' fiberglass Boston Whaler with a 90 hp outboard engine, a 19' Bildwel aluminum boat with 135 and 9.9 hp outboard engines, a 21' Smith Root electrofishing boat with a 200 hp outboard engine, and a 21' Smith Root electrofishing boat with an inboard engine and jet drive. Due to heavy use of existing boats and vehicles, one additional vehicle and boat/trailer combination will be purchased under the proposed program to maximize availability and sampling effectiveness. The vehicle and boat purchased will be used primarily for sturgeon work, but made available for use by other BPA programs when no sampling conflict will result. The boat to be purchased will be of a design to accommodate sturgeon sampling first, with other uses considered secondary.

Computer systems currently in use by the LRMDCP include 2 Power Macintosh systems, one Macintosh Quadra 650, and a Macintosh Powerbook, two Pentium PC's, and a network equipped PC to serve as a network hub within the LRMDCP. One additional computer will be purchased under the proposed program and will be dedicated to staff directly involved in the proposed project.

Sharing of field equipment with the LRMDCP will be maximized during this project. The LRMDCP currently has all necessary field equipment to conduct the sampling described in this proposal, with the exception of PIT tagging equipment, artificial substrate mats, and hoopnets. We anticipate the need to purchase two PIT tag readers under this program budget. Approximately 60 artificial substrate mats can be made available for use on this project by the USGS (Mike Parsley, USGS, Personal Communication) and additional mats can be fabricated as necessary. Hoopnets will be purchased only if deemed necessary during this project. Equipment which is subject to high use and wear (i.e. gillnets) are repaired when appropriate and replaced as necessary.

Canadian interests (B.C. Environment) are currently conducting sturgeon surveys between the international border and Hugh Keenleyside Dam, and are therefore anticipated to have all equipment necessary to assist with this project.

h. Budget

Personnel: Includes 3 FTE; one Program Manager ($38,000), one Biologist ($29,000), and one Technician ($23,000). Current fisheries staff within the STOI is insufficient to take on the additional work load proposed, so staff members dedicated to sturgeon efforts will be hired.

Fringe: 28% of salaries.

Supplies: Misc. field equipment including setlines, gillnets when replaced, tools needed to complete proposed tasks. Also includes general office and lab supplies.

O&M: Insurance for three FTE's, one vehicle and one boat.

Capital Acquisitions: 1) One pentium PC system and printer to be dedicated to project staff. Additional computers can be shared with LRMDCP as needed. 2) Two PIT tag readers necessary for adequate tracking of marked fish. 3) Due to existing scheduling constraints and commitments with existing vehicles and boats owned by the STOI, the proposed program will purchase a boat/trailer and vehicle to be dedicated primarily to sturgeon sampling efforts. The boat purchased will be of a design suitable for sturgeon sampling, with other sampling concerns of secondary importance. Boats currently maintained under the LRMDCP are not well suited for handling large fish when considering available space and safety of both the fish and employees.
Anticipated costs associated with each purchase: Computer system, $3,000; PIT tag readers 2 @ $4,000 each; Vehicle, $32,000; Boat and trailer designed for sturgeon sampling, $40,000.

Travel: Includes fuel for boat and vehicle used during sampling. Also includes travel expenses (personal vehicle mileage, per-diem, lodging, etc…) associated with attendance of coordination meetings required for successful completion of this program.

Indirect costs: 21.3% of contract, less capital acquisitions.

Subcontractors: Includes three anticipated subcontracts: 1) $35,000 to B.C. Ministry of Environment to assist with and expand monitoring/evaluation efforts currently underway above the international boundary, and to assist with sampling protocols within the U.S. In addition, funds will be used to attend coordination meetings to develop the comprehensive restoration and management plan. This funding will be matched with approximately $16,250 by the subcontractor.
2) $60,000 to WDFW to include the hiring of one FTE technician dedicated to this project (including fringe benefits, etc…). Also includes travel expenses associated with field sampling and coordination activities for development of the restoration and management plan.
3) $10,000 to Spokane Tribal GIS/Mapping Department to digitize abundance and distribution data related to white sturgeon, habitat characteristics, and food items above Grand Coulee Dam. A bathymetric map of Lake Roosevelt (in GIS format) is currently being constructed under the LRMDCP, and information collected under the proposed project will provide one or more additional 'layers' of information to that map.

Section 9. Key personnel

Two FTE's are currently associated with this proposal, and are listed below. Keith D. Underwood and Thomas A. Cichosz are both currently involved with the Lake Roosevelt Monitoring / Data Collection Program (BPA 9404300). Both will be involved in the initial planning of this project, including the selection of qualified applicants to fill the proposed positions.

Name	**Position**	**Primary Duties**
Keith D. Underwood	Program Manager	Overall program oversight and direction; Contractual and financial obligations, Coordination with other management entities; Sub-contract oversight; Research planning and design.
Thomas A. Cichosz	Fisheries Biologist II	Oversight of day to day program operations including office, laboratory, and field activities; Research planning and design; Data analysis and report writing.

KEITH UNDERWOOD, M.S.
Project Manager

EDUCATION

M.S. Biology, Eastern Washington University, 1996
B.S. Biology, Eastern Washington University, 1992

EXPERIENCE

Project Manager--Spokane Tribe of Indians, Wellpinit, WA., January 1994 to present.
Project Manager of the Lake Roosevelt Monitoring Program oversees administrative, planning, design, research and coordination activities. The program is collecting data and modeling the physical and biological attributes of the lake. The completed model will be used in the development of a fisheries management plan recommending a suite of hydro operations and management actions.

Project Biologist--Spokane Tribe of Indians, Wellpinit, WA. January 1994 to January 1993.
Collected and analyzed data on water bodies contained within the Spokane Tribal Reservation for fisheries management planning. Assisted the Lake Roosevelt Monitoring Program with data collection. Participate in regional forums that coordinate fisheries management actions in the Columbia River.

Research Assistant II--Eastern Washington University, Cheney, WA., April 1992 to December 1992.
Collected and analyzed population indices, diet, and microhabitat use of bull trout, chinook salmon and rainbow trout in three streams of southeast Washington to identify whether bull trout populations are negatively impacted from stocking of hatchery reared chinook salmon and rainbow trout. Also conducted spawning ground surveys by foot and migration behavior by radiotelemetry to better understand bull trout behavior.

Research Assistant I--Eastern Washington University, Cheney, WA. April 1991 to March 1992.
Conducted backpack electrofishing surveys on three southeast Washington streams to estimate fish population density and collect diet information. Enumerated macroinvertebrates from Hess samples.

PUBLICATIONS

Author of masters thesis and five professional reports; including lead author of 1993 through 1995 and co-author of 1996 and 1997 annual reports for Lake Roosevelt Monitoring Program.

PROFESSIONAL PRESENTATIONS

Two professional presentations in past year, as well as numerous informal presentations.

PROFESSIONAL SOCIETIES

American Fisheries Society since 1991.
North American Lake Management since 1995.

THOMAS A. CICHOSZ, M.S.
Fisheries Biologist II

EDUCATION

M.S. Fisheries Resources, University of Idaho-Moscow, 1996
B.S. Water Resources/Biology, University of Wisconsin-Stevens Point, 1989

EXPERIENCE

Fisheries Biologist II--Spokane Tribe of Indians, Wellpinit, Washington. January 1997 to present.
Project biologist responsible for planning, design, coordination and execution of research and management surveys on Lake Roosevelt, Washington. Surveys relate to fisheries, limnology, and zooplankton and are directed toward both current management and future modeling efforts within the Lake Roosevelt ecosystem. Other responsibilities include data analysis and report writing, oversight and assessment of work completed by subcontractors, and scheduling of personnel and equipment resources.

Data Analyst--University of Idaho-Moscow. November 1996 to January 1997.
Used multivariate analyses to assess habitat use by juvenile chinook salmon in Lower Granite Reservoir. Included extensive use of SAS and other statistical software to perform canonical correspondence and discriminant analyses. Other responsibilities included report writing and assisting graduate students with SAS programming and data analysis.

Graduate Research Assistant--University of Idaho-Moscow. August 1994 to October 1996.
Performed extensive computer modeling of northern pikeminnow population dynamics using SAS statistical software. Also participated in studies examining predation of salmonids by smallmouth bass and diet composition of fishes in Lower Granite Reservoir. Conducted fishery surveys by electrofishing, gillnetting and beachseining.

Fisheries Bio-aide--Idaho Department of Fish and Game, Coeur d'Alene, Idaho. April 1994 to August 1994.
Captured white sturgeon and burbot and assisted in implantation of radio and sonic transmitters. Performed radio and sonic telemetry in lake and riverine setting. Collected sturgeon eggs to monitor spawn timing and success. Conducted backpack electrofishing surveys of Kootenai River tributaries.

Environmental Specialist, Ecology Department--Environmental Science & Engineering, Inc., St. Louis, Missouri. May 1990 to April 1994.
Four years of professional responsibility including training and supervision of temporary employees, and project budget and timeline oversight. Collected adult and larval fish, mussels, and macroinvertebrates. Also responsible for taxonomy of adult fish and benthic macroinvertebrates, various data operations and report writing.

PUBLICATIONS

Author of masters thesis and seven professional reports; including lead author of 1996 and 1997 annual reports for Lake Roosevelt Monitoring / Data Collection Program.

PROFESSIONAL PRESENTATIONS

Seven professional presentations in past 3 years, as well as numerous informal presentations.

PROFESSIONAL SOCIETIES

American Fisheries Society since 1994.

Section 10. Information/technology transfer

Results of this program will be reported in program specific annual and completion reports to BPA. Results may also be presented in oral or poster format at public and/or professional venues.

Congratulations!