PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Evaluate Rebuilding The White Sturgeon Population In The Lower Snake Basin

BPA project number: 9700900
Contract renewal date (mm/yyyy): 1/2000 ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Nez Perce Tribe Department of Fisheries Resources Management

Business acronym (if appropriate) NPT

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses
10.4A.4

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

Other planning document references
Multi-Year Implementation Plan for Resident Fish Protection, Enhancement and Mitigation in the Columbia River Basin (CBFWA 1997) - Section 6.6.5.1.A; Wy-Kan-Ush-Mi Wa-Kush-Wit (CRITFC 1995) - Section 5B-41

Short description
Evaluate the need for and identify potential measures to protect and restore white sturgeon between Hells Canyon and Lower Granite dams to obtain a sustainable annual harvest of white sturgeon.

Target species
White Sturgeon (Acipenser transmontanus)

Section 2. Sorting and evaluation

Subbasin

Lower Snake Mainstem, Salmon, Clearwater

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
8605000	Evaluation of White Sturgeon in the Columbia River	In 1995 and 1996 - NPT White sturgeon BPA was Subcontracted under Project 8605000. Provide framework and techniques for assessment.
9093	Consumptive Sturgeon Fishery-Hells Canyon and Oxbow Reservoirs	New study in 1999 that will utilize movement and growth data collected by the 9700900 project.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1996	Completion of a Biological Risk Assessment (Carmichael et al. 1997	
1997	Completion of a Multi-year Research Plan (Hoefs 1998)	
1998	1997 Annual Report	

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Evaluate the need and identify potential actions for protecting and restoring populations to mitigate for effects of hydropower on white sturgeon productivity.	a	Conduct a biological risk assessment. Completed (Carmichael et al. 1997)
2	Determine the status and characteristics (reproductive and early life history) of the Snake River white sturgeon population between Hells Canyon and Lower Granite Dams, including the major tributaries (Clearwater and Salmon rivers).	a	Estimate abundance and determine if there has been any marked change in abundance or age structure of the population over the last 25 years.
		b	Identify spawning behavior and movements of gravid females and mature males before, during, and after spawning. Identify spawning locations.
		c	Verify spawning activities, timing, and locations.
		d	Determine distribution/movements of fish, abundance of various age classes of white sturgeon per reach throughout the system and determine life history characteristics to be used in modeling population dynamics.
3	Determine habitat used for spawning and rearing of white sturgeon in the Snake River between Lower Granite and Hells Canyon Dams, including major	a	Describe environmental conditions at locations where sub-adult and adult fish are captured in conjunction with tasks 2.a and 2.b and 2.d.

	tributaries (Clearwater and Salmon rivers).		
4	Develop an adaptative management plan.	a	Fully assess the risks associated with mitigative actions using information collected.
		b	Make recommendation for implementation of mitigation action(s).
		c	Develop an implementation, evaluation and monitoring plan.
5	Restore population to provide an annual sustainable harvest of 5 kg/ha/yr.	a	Implementation of mitigative action(s).
		b	Evaluate and monitor effectiveness of action(s) by quantifying changes in population.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measurable biological objective(s)	Milestone	FY2000 Cost %
1	10/1995	12/1996		Biological Risk Assessment	0.00%
2	6/1997	12/2001	Population Structure and Habitat Utilization	Annual Reports	85.00%
3	6/1998	12/2001	Habitat Utilization	Annual Reports	15.00%
4	1/2002	12/2002		Management Plan	0.00%
5	1/2003		Sustainable Harvest		0.00%
				Total	100.00%

Schedule constraints
Ability to capture adequate number of gravid females and potentially spawning males for tracking.

Completion date
Development of Management Plan Scheduled for completion 12/2002; Objective 4: Implementation / Monitoring and Evaluation Phase -- Projected Completion Target for 12/2017 (will depend on the type of mitigation actions identified in the Management Plan)

Section 5. Budget

FY99 project budget (BPA obligated): $400,000

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	project leader, assistant project leader, field crew supervisor, 5 aides, administrative support	%53	221,012
Fringe benefits	27% taxed 12% non-taxed	%9	39,137
Supplies, materials, non-expendable property	boat fuel and maintenance, radio and sonic tags, sampling equipment	%6	26,700
Operations & maintenance	office rent and utilities, office support	%2	7,795
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%0	0
NEPA costs		%0	0
Construction-related support		%0	0
PIT tags	# of tags: 300	%0	870
Travel	vehicles, air fights, field per diem	%8	33,850
Indirect costs	@22.9%	%18	75,430
Subcontractor	genetic analysis, helicopter flights	%4	14,700
Other		%0	0
		TOTAL BPA FY2000 BUDGET REQUEST	$419,494

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
		%0	
		%0	
		%0	
		%0	
		Total project cost (including BPA portion)	$419,494

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$410,000	$150,000	$250,000	$260,000

Section 6. References

Watershed?	Reference
☐	Apperson, K. and P.J. Anders. 1990. Kootenai River white sturgeon

	investigations and experimental culture. Annual Progress Report FY 1989. Idaho Department of Fish and Game and Bonneville Power Administration. Contract Number DE-A179-88BP93497 / Project
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☐	Beer, K.E. 1981. Embryonic and larval development of white sturgeon (Acipenser transmontanus). M.S. Thesis. University of California. Davis, CA.
☐	Carmichael, R., L. Lestelle, L. Mobrand, D. Statler, R. Carter, D. Bennett, J. Chandler, K. Lepla, T. Cochnauer, J. DeVore, T. Rien, R. McMullin, M. J. Parsley, and A. Seamans. 1997. Upper Snake River White Sturgeon Biological Risk Assessment. Prepared fo
☐	Columbia Basin Fish and Wildlife Authority. 1997. Draft Multi-year implementation plan for resident fish protection, enhancement and mitigation in the Columbia River Basin. CBFWA Tech. Planning Document. Portland, OR.
☐	Cochnauer, T.G. 1983. Abundance, distribution, growth and management of white sturgeon (Acipenser transmontanus) in the middle Snake River, Idaho. Doctoral Dissertation. University of Idaho. Moscow, ID.
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☐	Coon, J.C. and R.R. Ringe, and T.C. Bjornn. 1977. Abundance, growth and movements of white sturgeon in the mid-snake river. Research Technical Completion Report Project B-026-IDA. Idaho Water Resources Research Institute. University of Idaho. Moscow, ID.
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☐	DeVore, J.D., B.W. James, C.A. Tracy, and D.H. Hale. 1993. Dynamics and potential production of white sturgeon in Columbia River downstream from Bonneville Dam. in R.C. Beamesderfer and A.A. Nigro (editors). Status and Habitat requirements of white sturg
☐	Hoefs, N.J. 1997. NPT White Sturgeon Multi-Year Research Plan. Nez Perce Tribe Report. Lapwai, ID
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☐	Lepla, K.B. 1994. White sturgeon abundance and associated habitat in Lower Granite Reservoir, Washington. Thesis. University of Idaho. Moscow, ID.
☐	Lestelle, L.C., L.E/ Mobrand, J.A. Lichatowich, T.S. Vogel. 1996. Ecosystem diagnosis and treatment (EDT) Applied Ecosystem Analysis- A Primer. BPA Department of Fish and Wildlife. Portland, OR
☐	Lukens, J.R. 1985. Hells Canyon White Sturgeon Investigations. Idaho

	Department of Fish and Game, River and Stream investigations, Job Performance Report, Project No. F-73-R-7. Idaho Fish and Game, Boise, ID.
☐	McCabe, G.T. 1990. Use of an artificial substrate to collect white sturgeon eggs. Calif. Fish and Game 76:248-250.
☐	Nigro, A.A. 1989. Columbia River Research Programs. in Pacific States Marine Fisheries Commission 1989 White Sturgeon Workshop Proceedings. Abstract. Pacific States Marine Fisheries Commission. Portland, Oregon.
☐	Northwest Power Planning Council. 1994. Columbia River Basin Fish and Wildlife Program. Report 94-48; NPPC. Portland Oregon.
☐	Otis, D.L., K.P. Burnham, G.C. White and D.R. Anderson. 1978. Statistical inference from capture data on closed animal populations. Wildlife Monographs 62
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☐	Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin 191. Fisheries Research Board of Canada.
☐	Rieman, B.E. and R.C. Beamesderfer. 1990. White sturgeon in the lower Columbia River: is the stock overexploited? North American Journal of Fisheries Management 12:255-265.
☐	Rien, T.A., and R.C. Beamesderfer. 1993. Accuracy and precision in age estimates of white sturgeon using pectoral fin-rays. in R.C. Beamesderfer and A.A. Nigro, (eds.) Status and habitat requirements of white sturgeon populations in the Columbia River dow
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☐	Tracy, C.A. and M.F. Wall. 1993. Length at age relationships for white sturgeon in the Columbia River downstream from Bonneville Dam. in R.C. Beamesderfer and A.A. Nigro, (eds.) Status and habitat requirements of white sturgeon populations in the Columbi
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PART II - NARRATIVE

Section 7. Abstract

The goal of the Nez Perce Tribe's (NPT) White Sturgeon Program is to restore and rebuild the white sturgeon populations in the Snake River between Hells Canyon and Lower Granite dams to support a sustainable annual subsistence harvest of white sturgeon by the Nez Perce People equivalent to 5 kg/ha/yr. This Project addresses measure 10.4A.4 of the Northwest Power Planning Council Fish and Wildlife Program to "...fund an evaluation, including a biological assessment (Section 7.3B.1) of potential means of rebuilding sturgeon populations in the Snake River between Lower Granite and Hells Canyon dams." In 1996, a biological assessment of the upper Snake River white sturgeon was conducted by the Nez Perce Tribe (NPT) as part of BPA Project #86-50. The *Upper Snake River White Sturgeon Biological Assessment* was successful in identifying: 1) regional sturgeon management objectives, and 2) potential mitigation actions needed to restore and protect the population. However, the risks and uncertainties associated with their implementation could not be fully assessed because critical data concerning the status of the population and their habitat requirements are unknown. Currently, under BPA Project #9700900, NPT data on the size and structure of the white sturgeon population and how habitat is utilized by sturgeon for rearing and spawning are being collected. From these data an adaptive management plan will be developed that will 1) reassess potential mitigative actions, 2) recommend the implementation of needed mitigative action(s), and 3) present a monitoring and evaluation plan.

Section 8. Project description

a. Technical and/or scientific background

Development of the Columbia River Basin hydroelectric system has created impoundments throughout the basin that have altered habitat and the movement of white sturgeon and their principal food sources in the Lower Snake River subbasin between Hells Canyon and Lower Granite dam. As a result, it is hypothesized: 1) that natural production of white sturgeon is less than what it was before development and operation of the hydropower system, 2) that white sturgeon rearing habitat in many area is underseeded because of the reduction in spawning habitat caused by the hydropower system development and operations, 3) that white sturgeon production can be significantly enhanced by some combination of spawning and rearing habitat restoration and supplementation, and 4) that naturally spawning white sturgeon populations can be preserved and optimum rates of production can be restored while concurrently maintaining conservative tribal and recreational fishing opportunities (CBFWA 1997). In 1995, during the first phase of this project a biological risk assessment team (BRAT) was assembled to develop a risk assessment for white sturgeon in the Upper Snake River between Hells Canyon and Lower Granite dams. The BRAT concluded that the data to fully assess these hypotheses, or critical assumptions concerning the Snake River white sturgeon population between Hells Canyon and Lower Granite dams is not available (Carmichael *et al.* 1997).

Currently, the size and structure of the white sturgeon population and how habitat is utilized by sturgeon for rearing and spawning in the Snake River and it's major tributaries between Hells Canyon and Lower Granite dam are unknown. Between 1972 and 1976 the abundance, distribution, and movement of white sturgeon in the Snake River was assessed in Hells Canyon reach of the Snake River to aid in regional white sturgeon management (Coon *et al.* 1977). Between 8,200 and 12,250 white sturgeon were estimated to populate the Snake River between Lower Granite and Hells Canyon dams. From 1982-1984 a second population estimate was conducted (Lukens 1985). The total portion of the free-flowing portion of the Snake River between Hells Canyon Dam and Lewiston, ID a total population estimate of 3,955 sturgeon was calculated. Although the author found it difficult to draw any conclusions about changes in the white sturgeon population between 1972 and 1984, because of differences in the designs of these early studies, he did report a 14% increase in sturgeon between 91.5 and 182.8 cm (Lukens 1985). Although the difference was not statistically significant, the increase was attributed to the an increase of those age classes that were harvested before 1970. In 1990-91 the abundance and structure of the white sturgeon population in Lower Granite Reservoir was assessed (Lepla 1994). The population in Lower Granite Reservoir was estimated to be between 946 and 2166 sturgeon. Although the 1970's estimates done in the Hells Canyon reach of the Snake River were extrapolated for the Snake River system it is not possible, to make comparisons between this study and those done in the upper river. These studies also looked at the age/size structure of the population. In all cases, the population was found to be comprised largely of juvenile sturgeon < 91 cm (Coon *et al.* 1977, Lukens 1985, Lepla 1994).

A current estimate of the number and size/age structure of white sturgeon throughout the entire Snake River reach and its major tributaries will allow us to determine if there has been any significant change since the early 1970's. Direct comparisons between population estimates from the earlier studies and from the study we are proposing may be difficult, because of variation in study designs. We should, however, be able to assess changes in the age/size structure of the population structure between that found in 1970's and 1980's in the upper sections of the river and in early 1990's in the lower reservoir. There has been some suggestion that the white sturgeon population in the Hells Canyon Reach is slowly recovering and that ages classes that were impacted by recreational fishing before 1970 are improving. A better understanding of changes in the abundance and age/size structure of the population that have occurred over the last 30 years, and how fish are distributed throughout the study reach will allows us to begin to determine if the population is currently at equilibrium with respect to size and age structure, and possibly identify underutilized capacity. This information is critical in determining whether white sturgeon production can be significantly enhanced by some combination of mitigative actions, such as restoration of spawning and rearing habitat, supplementation, and hydropower configuration and operation, identified by the BRAT or if the no action alternative should be taken. The distribution of sturgeon, determined by comparing numbers and the population structure among the Snake River Hells

Canyon, Salmon River, and Lower Granite Reservoir reaches and direct monitoring of habitat used for spawning and rearing will allow us to assess and understand the effects of hydropower releases and impoundments on the population.

Studies in Lower Granite Reservoir and impounded areas in the Lower Columbia Basin found that less than 30 percent of the variation in sturgeon distributions were attributable to environmental factors (Lepla 1994, Parsley *et al.* 1993, Parsley and Beckman 1994). Little information concerning the effects of environment factors, however, is available in free-flowing river systems. Relationships between abundance and environmental factors, or habitat use in the free-flowing Salmon River, and comparisons with sections affected by daily water level fluctuations may give us a better understanding of habitat needs of different white sturgeon life stages and allow us to identify environmental factors limiting capacity and bottlenecks on white sturgeon productivity.

There are other factors that can affect the abundance and distribution of white sturgeon in the system. The construction of dams on the Columbia system has not only blocked the movement of white sturgeon, but also affected the influx of food resources. Lamprey and salmonids, the primary foods of large sturgeon in this areas once abundant in the Snake, Salmon and Clearwater rivers, have all but been eliminated. As a result, it has been suggested that food may be limiting and thus affecting recovery of the white sturgeon population (Carmichael *et al.* 1997) By assessing the condition and health of the fish and determining age specific growth rates we hope to determine if there is a need to assess food habitats and food availability in the system. There is little information on what large white sturgeon are feeding on and whether food availability is affecting the size, structure and/or distribution of white sturgeon in this section of the Snake River.

Various population models have been used to assess population viability of white sturgeon in the Columbia and Snake River basins (Cochnauer 1983, Lukens 1985, Rieman and Beamesderfer 1990, DeVore *et al.* 1993) and are currently being developed specifically for the Snake River (IPC 1997). Collection of basic population dynamics data on the sex ratio of potential spawners, mortality by age, age of maturity, and spawning periodicity for females within the Snake River between Hells Canyon and Lower Granite dams will allow us to refine and apply these models to conditions specific to the study area. By modeling age-specific population information, changes in the population over time can be predicted or simulated under different situations. These models will be used to help assess the probable affects of potential mitigative actions on the white sturgeon population.

A wide variety of potential mitigative actions that could be applied to restore the population was identified by the BRAT. Potential actions dealt with: 1) restoration and supplementation of sturgeon food resources, 2) alteration of flows from Hells Canyon, 3) reduction of contaminants in Lower Granite Reservoir, 4) identification and reduction of impacts of the catch-and-release fishery, 5) supplementation, and 6) reservoir drawdown.

The risks associated with the implementation of these actions, as well as a no action alternative, were analyzed using a risk assessment process (Lestelle *et al.* 1996).

However, because of the lack of basic information concerning the white sturgeon in the Snake River between Hells Canyon and Lower Granite dams, the BRAT was not able to fully assess the risks and effectiveness of individual mitigative actions in restoring the population . The BRAT indicated that basic information concerning the current health and status of the population and habitat use by white sturgeon is needed before the effectiveness of potential mitigative actions can be fully assessed. Without this information critical uncertainties exist concerning rearing and spawning habitat, how rearing and spawning habitat is affected by hydropower, whether the population is currently at equilibrium or if the system is at carrying capacity, and how population dynamics of white sturgeon have been affected by isolation. This lack of information prevents us from fully assessing the need for supplementation, alterations in hydropower operations, habitat restoration, restoration of natural food resources or whether no action is needed.

b. Rationale and significance to Regional Programs

The Nez Perce Tribe began a multi-year research effort to address measure 10.4A.4 of the Northwest Power Planning Council's Fish and Wildlife Program (NPPC 1994) to "...fund an evaluation, including a biological assessment (Section 7.3B.1) of potential means of rebuilding sturgeon populations in the Snake River between Lower Granite and Hells Canyon dams". The NPPC encouraged the identified sturgeon studies to be undertaken and completed quickly and on-the-ground projects identified and implemented as soon as possible to address the needs of this species. The NPPC also encouraged sturgeon studies be coordinated to avoid redundant work and to increase the potential for learning.

The study objectives are consistent with those of the "White Sturgeon Research Program Implementation Plan" (Plan) developed by the BPA in cooperation with state and federal agencies, tribes, universities, and the private sector, and approved by the NPPC in 1985. Specific objectives of the Plan addressed by this study are:

> "assess the current status of Columbia River Basin white sturgeon stocks";
>
> "provide the basis to evaluate the need for protection, mitigation, and enhancement of white sturgeon in the Columbia River system."

The study also addresses research priorities described in the White Sturgeon Management Framework completed by the Pacific States Marine Fisheries Commission in 1992.

In 1995, during the first phase of this project a biological risk assessment team (BRAT) was assembled to develop a risk assessment for white sturgeon in the Upper Snake River between Hells Canyon and Lower Granite dams. BRAT participants included a wide range of professionals from a variety of federal, state, and private agencies that were knowledgeable and concerned about white sturgeon ecology, the Snake River system, and regional ecological issues. The *Upper Snake River White Sturgeon Biological Assessment* (Carmichael *et al.* 1997) was successful in identifying: 1) regional white sturgeon resource objectives, and 2) potential mitigative actions that could be used to achieve regional objectives.

c. Relationships to other projects

BPA 8605000- *White Sturgeon Productivity Status and Habitat Requirements*
The 8605000 project was designed as an cooperative effort among the agencies involved in restoration and enhancement of white sturgeon populations in the Columbia and Snake River basins. Initial assessment of the Snake River white sturgeon between Hells Canyon and Lower Granite dams by NPT was conducted as part of the this project. This project has provided the framework and techniques for assessment of the health and status and identification white sturgeon habitat used for spawning and rearing. Although, NPT White Sturgeon Project is now included under the BPA Umbrella Agreement the Tribe has continued its involvement with the 8605000 Project as a member of the Columbia Basin White Sturgeon Cooperators Group.

Idaho Power Company, *Hells Canyon Relicensing Project FERC No. 1971*
Concurrent with the work being done by NPT, Idaho Power Company (IPC) is assessing the status and habitat use of white sturgeon in the Hells Canyon Reach of the Snake River (IPC 1997). Because of the similarity in the objectives and tasks being assessed, a formal agreement to share data has been established and the majority of the work proposed by NPT will be conducted on the Snake River below the mouth of the Salmon River. Randomized sampling conducted to estimate the size of the population will not include the Snake River reaches above the mouth of the Salmon River. Tracking and assessment of spawning and rearing habitat will be conducted throughout the study area, including the Snake River reach above the mouth of the Salmon River. However, coordination with IPC is ongoing to reduce duplication in defining and identifying spawning and rearing habitat throughout the Hells Canyon section of the Snake River.

d. **Project history** (for ongoing projects)

In 1995 the NPT White Sturgeon Project began as a sub-contact of BPA Project # 8605000 coordinated by Oregon Department Fish and Wildlife assessing the white sturgeon productivity, status and habitat requirements in the Snake and Columbia River basins. In 1997 the project (BPA Project # 9700900) was moved under the Nez Perce Umbrella Agreement.

Quarterly reports have been used to document monthly progress. In 1996 the annual report summarized the findings of the draft BRAT report and outlined initial data collection for 1997. The *Upper Snake River White Sturgeon Biological Risk Assessment* (Carmichael *et al.* 1997) which identified potential mitigation actions and the data needed to fully assess their effectiveness and risk, and a *NPT Multi-Year White Sturgeon Research Program* (Hoefs 1998) which outlined a plan to collect the information identified by the BRAT were completed. The second phase of the project, implementing the collection of data began in 1997. In 1997 and 1998 approximately 450 sturgeon have been captured and marked, with population and habitat data being measured from the Snake River between Lower Granite Dam and the confluence of the Salmon River, in the

Salmon River, and in the Clearwater River to begin assessment of the status and structure of the population.

BPA funding for FY95-96 approximated $246,000 (under subcontract to the BPA White Sturgeon Project # 8605000). The NPT White Sturgeon BPA # 9700900 has been funded from 1997 through 1999 for a total of $1,048,106 to complete and implement a plan for the collection of data identified by the BRAT.

e. Proposal objectives

Goal: The goal of this project is to determine the need and identify potential measures for protecting and rebuilding populations conducive to subsistence harvest and mitigating for effects of the hydropower system on productivity of white sturgeon in the Snake River between Lower Granite and Hells Canyon Dams, including the Clearwater and Salmon rivers.

Objective 1: Evaluate the need and identify potential actions for protecting and restoring populations to mitigate for effects of hydropower on white sturgeon productivity. (completed)

Hypothesis: Existing data concerning the health, status and dynamics of the Snake River sturgeon population between Hells Canyon and Lower Granite dams is adequate to identify potential measures for protection and enhancing population and mitigating for effects of hydropower system.

Products: *The Upper Snake River White Sturgeon Biological Risk Assessment* (Carmichael *et al.* 1997). Identification of critical uncertainties concerning Snake River white sturgeon population that is needed before risks of potential mitigative actions can be fully assessed. *Multi-Year White Sturgeon Research Plan* (Hoefs 1998). Multi-year research designed to collect data addressing critical uncertainties identified in the Biological Risk Assessment..

Objective 2: Determine the status and characteristics (reproductive and early life history) of the Snake River white sturgeon population between Hells Canyon and Lower Granite Dams, including the major tributaries (Clearwater and Salmon rivers).

Hypothesis: Size, structure and dynamics of the population vary spatially and temporally depending on flow conditions.

Product: Research Report summarizing the current health and status of the white sturgeon population (i.e., an estimate of abundance, distribution/ movements of various size/age classes of sturgeon throughout the system, various life history and population dynamics).

Objective 3: Determine habitat used for spawning and rearing of white sturgeon in the Snake River between Lower Granite and Hells Canyon Dams, including major tributaries (Clearwater and Salmon rivers).

Hypotheses: Habitat use for larval, YOY, juveniles, adults and spawning adults differ and is a function of flow and flow related environmental conditions.
Product: Identification and characterization habitat used for spawning and rearing used by white sturgeon between Hells Canyon and Lower Granite Dams.

Objective 4: Develop an adaptive management plan.
Hypothesis: The data collected concerning the current health, status and dynamics of the Snake River sturgeon population and habitat use between Hells Canyon and Lower Granite dams is adequate to identify potential measures for protection and enhancing population and mitigating for effects of hydropower system.
Product: Adaptive Management Plan.

Objective 5: Experimental implementation of mitigative action(s) to restore population to provide an annual sustainable harvest of 5 kg/ha/yr.
Hypothesis: Changes in populations are due to implementation of mitigative action(s).
Product: Annual assessment of population recovery and re-adaptation of management needs and plans to sustain white sturgeon harvest rates of 5 kg/ha/yr.

f. Methods

Objective 1 - Evaluate the need and identify potential actions for protecting and restoring populations to mitigate for effects of hydropower on white sturgeon productivity.
Approach (Completed) - Development of Biological Rish Assesement (Carmicheal et al. 1997).

Objective 2- Determine the status and characteristics (reproductive and early life history) of the Snake River white sturgeon population between Hells Canyon and Lower Granite Dams, including the major tributaries (Clearwater and Salmon rivers).

Approach - Initiate data collection activities using standard techniques identified in the multi-year plan and study design (Hoefs 1998) to obtain needed data to describe the life history and population dynamics of sub-adult and adult white sturgeon. Capture (diver nets, set lines, and hook and line), tag, and measure characteristics of white sturgeon throughout the study area using a random sampling design. Reproductive and early life history characteristics of white sturgeon will be determined by capturing gravid females and mature males, fitting them with radio and sonic tags, and tracking their movements. Spawning will be documented by presence of eggs collected using standard egg mats. In addition, we will attempt to describe early life history characteristic of larval and young-of-the-year fish by identifying densities of these fish in various nursery locations.

To estimate the size of the population mark-recapture estimators will be used (Ricker 1975, Otis *et al.* 1978. White *et al.* 1982). Sampling will be randomized by reach and designed so data collected can be used to test whether sturgeon are emigrating or migrating between reaches within the Snake River and or it's tributaries (the Salmon and Clearwater rivers) defining populations of interest. The program Capture (Otis *et al.* 1978) will be used to estimate the population size using a variety of capture/recapture models (including the Jolly-Seber open population model), test the assumptions of each, and determine which model is most appropriate (White *et al.* 1982). The white sturgeon population will be estimated (with 95 percent confidence intervals) throughout the study area, in individual reaches, and for various size/age class.

Sturgeon that are being captured and marked to estimate the size of the population size will also be used to collect information on movement and the age/size structure of the population throughout the study area, and collect population dynamic data. All captured fish will be measured and weighted. In addition, a proportion of the sturgeon from a variety of size classes will be aged by clipping a section of the pectoral fin and counting annual ring formations (Cuerrier 1951, Nigro 1989, Rien and Beamesderfer 1993, Tracy and Wall 1993). Sturgeon > 150 cm will be sexed by making a small incision (1.5 -2 cm) along the side of the abdomen. Gonad tissue will be removed through this incision and used to determine sex and maturity (Conte *et al.* 1988). Population age/size structure will be evaluated throughout the Snake River system and within individual reaches and habitats of interest.

Population dynamic parameters will be needed for modeling productivity and viability of the population. Sex and age structure will be used for modeling productivity. Catch curves, generated by plotting the number of fish at each age, will be used to determine instantaneous mortality rates (the regression slope of the descending limb; Ricker 1975). Growth rates will be determined from recapture data using fish marked during the duration of this study and data on fish that have been previously been marked. Recapture data collected over the next five years from a variety of age classes will allow us to determine age class specific growth rates and test growth rate estimates that have been derived in the past.

In addition, condition of sturgeon captured will determined by fitting the relationship between fork length (l) and weight (W), $W=a\ l^{b}$ and comparing it to other Snake and Columbia river populations using the standard weight equation (Ws = 2.735E-06FL3.232; Beamesderfer 1993). Condition will be compared among reaches within the study area and with other Columbia River white sturgeon populations.

At least 20 sturgeon, including 5 potential spawning females (late vitellogenic egg stage; Beer 1981) will be tagged with radio and sonic transmitters each year. Tagged sturgeon will initially be located once a week, through triangulation, using yagi antenna and/or a hydrophone with a Lotek SRX 400 receiver adapted to receive sonic signals. The frequency of locations may be increased depending on the variability and patterns of habitat use and movement. Egg mats will also be placed downstream from where spawners stage and checked periodically for eggs (McCabe 1990). Collected eggs will be preserved and developmental stage determined (Beer 1981). Developmental stage will be used estimate date of spawning and determine pre-spawning environmental conditions that may influence spawning.

Densities of larval and YOY the year fish will assessed throughout the study area. Initially suspected "nursery' areas will be targeted for larval and YOY using plankton nets and small mesh nets, respectively.

Task - Estimate white sturgeon abundance throughout entire study area reach and determine if there has been any marked change in abundance or age structure of the population over the last 25 years.

- Capture and mark (using Floy and Passive Integrated Transponders - PIT tags) and recapture fish throughout the study area using a random design.

Task - Identify spawning behavior and movements of gravid females and mature males before, during, and after spawning. Identify spawning locations.

- Capture and tag (using radio and sonic tags) gravid females and mature males in order to assess reproductive behavior. Tag a minimum of five potential spawning females throughout the study area.
- Track radio and sonic tagged fish and record spawning migrations and behaviors.

Task - Verify spawning activities, timing, and locations.

- Deployment and retrieval of standard egg mats to capture white sturgeon eggs. Process captured eggs to identify species and developmental stage.

Task - Determine distribution/movements of fish, abundance of various age classes of white sturgeon per reach throughout the system and determine life history characteristics to be used in modeling population dynamics.

- Capture and tag (using radio and sonic tags) sub-adult and adult sturgeon in order to identify habitat use. Tag up to 30 fish of various age classes.
- Track radio and sonic tagged fish and record movement and habitat use (including spawning habitat).
- Capture (larval fish nets and plankton nets either anchored, drifted, and/or towed) and identify distributions of larvae and young of the year throughout the study area.

Objective 2 - Determine habitat used for spawning and rearing of white sturgeon in the Snake River between Lower Granite and Hells Canyon Dams, including major tributaries (Clearwater and Salmon rivers).

Approach - Initiate data activities using standard techniques identified in multi-year plan and study design (Hoefs 1998) to define habitat used for spawning and rearing by white sturgeon within the study area. Spawning and rearing habitat will be identified primarily by tracking sub-adult and adult fish throughout the study area using radio and sonic tags, but will also be assessed in association with the collection of fish. Identified habitats for rearing and spawning will be characterized using water depth, water column velocity and turbulence, and temperature.

Rearing and spawning habitats will be identified either locating of areas with high densities of individuals and/or by tracking fish of various age classes. Gravid females and potentially spawning males will be tagged with radio and sonic transmitters (Apperson and Anders 1990) and spawning behavior and habitat will be monitored in the Snake River and it's major tributaries to identify rearing and spawning habitat use by white sturgeon. Similarly, movement and habitat use of juvenile and adult white sturgeon of various size classes will be monitored. The distribution of larvae and YOY throughout the area will also be determined and of high fish densities used to reflect habitat selection. Habitat use of larval fish and YOY will be estimated using multivariate models that correlate densities of fish at a location with environmental factors.

Task - Describe environmental conditions at locations where sub-adult and adult fish are captured

- Data collection on habitat associated with sub-adult and adult white sturgeon for rearing characterized by temperature, substrate, various flow variables, and categorized by marco-habitat type.

Objectives 4 and 5 – Develop an adaptive management plan restoring population to provide an annual sustainable harvest (2002).

Approach - An adaptive management plan, based on the above data will then be written and implemented. The adaptive management plan will 1) assess the risks and uncertainties associated with potential mitigative actions using a risk assessment process (Lestelle *et al.* 1996), 2) make recommendations to implement mitigative actions designed to restore and rebuild the white sturgeon population to obtain a sustainable annual tribal subsistence harvest of 5 kg/ha/yr (CBFWA 1997), and 3) present a plan to implement, evaluate and monitor of effects of the mitigation action on the population.

g. Facilities and equipment

Office and storage space is provided by the Nez Perce Tribe at the Lapwai Headquarters Office and at the NPT White Sturgeon Experimental Production Facility in Clarkston WA. Non-expendable field and office items (boats, computers, sampling gear, etc.) needed to complete the project as outlined for sampling have previously been purchased in 1996 and 1997. In addition, sampling gear and boats are available on loan from other Tribal Projects supported under the BPA Umbrella Agreement with the NPT Tribe Fisheries Department. Annual costs to operate and maintain GSA vehicles are include in each years budget projections.

h. Budget

Personnel:

The sturgeon research project for the Nez Perce Tribe requires 1 Project Leader, 1 Assistant Project Leader, 1 Field Crew Supervisor, and between 5 Department Aides.

Fringe Benefits:

The fringe benefit rate is 27% for taxed employees and 12% for non-taxed employees.

Supplies, Materials, Non-Expendable Property:

Access to and conducting of most of the research requires the use of jet boats. Boat fuel and maintenance costs are considerable and covered under this line item.

Pit Tags:

We need 300 pit tags for continuation of the marked recapture studies. These tags will not be the "new" ISO tags in order maintain compatibility of detection with fish marked in past years.

Travel:

Yearly vehicle costs are considerable because of long distances between field locations and the yearly rental fees. This project requires two 1 ton pickup trucks capable of towing research jet boats to the launch sites. Field per diem and lodging is necessary to keep personnel accommodated in remote locations.

Indirect Costs:

Indirect costs are negotiated between the funding agency and the Nez Perce Tribe and are currently at 22.9%.

Subcontractor:

Genetic samples are collected each year as part of the study tasks and must be sent to a laboratory for analysis. Helicopter flight time allows the tracking of fish through the lower Salmon River canyon during times when flow conditions prohibit access via jet boat.

Section 9. Key personnel

<u>Mike Tuell, Project Leader/Research Biologist (1 FTE):</u> Mike Tuell is the project leader for the white sturgeon research project. Mr. Tuell has 6 years experience as a fisheries research biologist and project leader with the Nez Perce Tribe. He has extensive experience with mobile radio telemetry and has co-author 3 annual research reports. Current job duties include: design, implementation, and coordination of white sturgeon research studies. Oversight, management and supervision of White Sturgeon Research Program. Senior negotiator among regional and national fisheries agencies concerning all aspects of White Sturgeon Research Program. Prepares and finalizes all scientific and technical reports and publications including the generation and submission of quarterly and annual reports. Responsible for development and design of research plans, and preparation of budgets.

Education: Bachelor of Science, 1994 University of Idaho
Major: Fisheries Resource Management

<u>Scott Everett, Assistant Project Leader/Biologist (1 FTE):</u> Mr. Everett has 3 years of professional fisheries research experience. Mr. Everett has 2 years of experience with

radio telemetry and boat operation in the Snake River. He also has experience with habitat condition and utilization. Responsible for collection and processing of scientific data. Assist in the preparation of scientific and technical reports and publications including the generation and submission of quarterly and annual reports. Supervision of Field Crew Supervisor and field operations

Education:	Bachelor of Science, 1995	University of Idaho
	Major: Fisheries Resources Management	
	Masters of Science, (May 1999)	University of Idaho
	Major: Fisheries Resources	

Paul A. Kucera, Director of Biological Services, Nez Perce Department of Fisheries Resources Management is the program leader for the sturgeon research project. Mr. Kucera has 23 years experience as a professional fisheries biologist in research, management and administration and is a Certified Fisheries Scientist with AFS. He has authored seven peer-reviewed fisheries journal publications and over 40 gray literature reports. Responsible for technical program direction and administration of the Fisheries Research Division. This position fills 0.1 FTE.

Education:	Bachelor of Science, 1975	Utah State University
	Major: Fisheries Management	
	Graduate Studies 1984-1987	University of Idaho
	Major: Fisheries Management	

Jay Hesse is the Research Coordinator, Nez Perce Department of Fisheries Resources, which supervises the project leader of the sturgeon research project. Mr. Hesse has five years professional experience as a fisheries research biologist and as the research coordinator. Responsible for technical direction and supervision of all research division projects, research coordination, and tribal fisheries research representation at federal and state meetings. This position fills 0.05 FTE.

Education:	Bachelor of Science, 1992	Michigan State University
	Major: Fisheries	
	Masters of Science, 1994	Michigan State University
	Major: Fisheries and Wildlife	

Section 10. Information/technology transfer

Information collected will be analyzed and presented in annual reports to BPA and peer-reviewed journals, and at regional and national scientific meetings, BPA reviews, and at meetings of the Columbia River Sturgeon Cooperators Group. Recommendations for restoration, plans for implementation, evaluation and monitoring will be reported in an Adaptive Management Plan.

Congratulations!