PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Flathead Lake Monitoring And Habitat Enhancement

BPA project number: 9101901
Contract renewal date (mm/yyyy): 10/1999 ☒ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Confederated Salish and Kootenai Tribes

Business acronym (if appropriate) CSKT

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses
10.3

FWS/NMFS Biological Opinion Number(s) which this project addresses
Bull Trout ESA Listing (63 FR 31647)
Westslope Cutthroat Trout (Petitioned for ESA Listing)(63 FR 31691)

Other planning document references
Hungry Horse Dam Fisheries Mitigation Plan (Approved by NPPC)(1991)
Hungry Horse Dam Fisheries Implementation Plan (Approved by NPPC)(1993)
Kerr Mitigation Plan/FERC Relicensing documents
Confederated Salish and Kootenai Tribes Fisheries Management Plan (1993)
Flathead River Drainage Bull Trout Status Report (Montana Bull Trout Scientific Group)(1995)

Short description
Implement and monitor fisheries improvement activities within the Flathead Indian Reservation portion of the Flathead Lake basin. Research factors limiting successful application of mitigation measures within Flathead Lake.

Target species
Westslope cutthroat trout, bull trout

Section 2. Sorting and evaluation

Subbasin
Upper Columbia

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
20554	Hungry Horse Fisheries Mitigation Umbrella
9101903	Flathead Watershed Restoration and Monitoring
9101904	Non-native Fish Removal / Hatchery Production
9410002	Flathead River Native Species Project
9502500	Flathead River Instream Flow Project

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9608701	Focus Watershed Coordination - Flathead River Watershed	Directly assists the accomplishment of project objectives by coordinating with agencies and landowners to implement mitigation measures.
9101904	Hungry Horse Dam Wildlife Mitigation	Co-sponsor of Dayton Creek restoration project and other possible conservation easements.

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
98	Implementation: Channel reconstruction in Skidoo Creek to allow passage of fish through a culvert barrier.	No, project recently implemented. This action provides increased access to spawning habitat for native species. Future monitoring will determine if a species response follows.
98	Planning: Progress Report summarizing data collected in Dayton Creek for the purpose of identifiing restoration priorities.	No, none associated with this planning activity. This work identifies actions that will carry biological objectives.
98	Planning: Coordination with MFWP in the preparation and submittal to NPPC of the Libby Mitigation Plan, Project # 9500400.	No, none associated with this planning activity. This work identifies actions that will carry biological objectives.
98	Monitoring: Completion of six months of the yearlong Flathead Lake Creel survey.	No, none associated with this monitoring activity. We will compare catch and harvest to the baseline creel survey conducted in 1992-93.
98	Monitoring: Annual summary report of monitoring of the results of the kokanee supplementation experiment.	No, none associated with this monitoring activity. We determined that the experiment did not meet biological objectives, concluded that lake trout predation was limiting the success of kokanee supplementation, and therefore terminated the experiment.
95	Implementation: Reconstruction of groundwater seepage on Polson Golf Course into a stream channel flowing into Flathead Lake.	No, adult returns are anticipated in 1999 and will serve as a preliminary measure of the succes of this project.
94	Monitoring: Lake-wide yearlong creel survey	No, none associated with this monitoring activity. This provided baseline information to judge future mitigation results.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Monitoring: Determine relative abundance of bull and cutthroat trout in Flathead Lake. This serves as the measure of success in mitigating loss of these species in Flathead Lake.	a	Annual fixed-location, timing, and intensity gillnetting during spring that has been conducted since 1981.
2	Implementation: Improve habitat conditions and biological productivity in direct tributaries of Flathead Lake to replace recruitment losses attributable to Hungry Horse Dam.	b	Comprehensive watershed restoration (all activities that improve spawning and rearing habitat and reduce pollutant discharge to Flathead Lake)
2		c	Correct stream crossing problems, pursue management changes in riparian grazing, implement water conservation measures, and correct degraded channel reaches in Dayton Creek in cooperation with MFWP
2		d	Correct remaining passage problem, and plant cutthroat eggs in Skidoo Creek.
2		e	Monitor adult cutthroat trout returns and plant cutthroat eggs in Polson Spring Creek.
3	Monitoring: Evaluate parameters of lake trout biology (fecundity, growth, age and length at maturity, cohort strength, and mortality in Flathead Lake to monitor changes in the abundance of this predator.	f	Annual, lakewide, random location, 10-mesh, gillnetting conducted in October.
4	Monitoring: Evaluate success of westslope cutthroat and rainbow trout releases in off-site reservoirs.	g	Measure growth rate, survival past first year of release, and return to creel in stocked reservoirs
5	Research: Quantify nutrient, zooplankton, and Mysis relicta dynamics in Flathead Lake as part of a comprehensive study to determine how to mitigate losses	h	Measure water temperature at two sites within each of 10 strata biweekly in Flathead Lake.

	of native species.		
5		i	Measure nutrient levels at one site within each of five strata monthly in Flathead Lake.
5		j	Sample zooplankton at three sites within 15 strata biweekly in Flathead Lake.
5		k	Sample Mysis relicta at three sites within 15 strata monthly in Flathead Lake.
5		l	Quantify stomach contents of a subsample of Mysis relicta collected from each stratum for use in bioenergetics model.
5		m	Correlate spatial and temporal abundance of zooplankton and Mysis relicta with limnological variables.
5			Note to Reviewer: Under separate funding the total fish community will be sampled within the same physical framework as used in Tasks h-k, and correlated with the lower trophic level information.

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	4/2000	5/2007	None, this is a monitoring task designed to measure the success of habitat improvements	Ongoing	10.00%
2	10/1999	9/2007	Change in redd number, in-migrant adults, or out-migrant juveniles	Ongoing	30.00%
3	10/1999	11/1999	None have been determined at this time. This is also a monitoring task that will measure the success of agency-driven objectives for lake trout reduction.	Ongoing	15%
4	10/1999	9/2000	Yes, 1) 20% or greater annual incremental	Ongoing	5%

			growth rate, 2) 10% or greater of population composed of 2nd year fish, 3) 30% or greater annual return to creel		
5	10/1999	9/2000	None, this is a research task designed to determine the food web limitations presently restricting the mitigation of losses of adfluvial trout.	This is a two year project	40%
				Total	100.00%

Schedule constraints
None

Completion date
This is an on-going program directed by NPPC. Identification and completion of habitat projects are a continuous process. Monitoring of population responses should be continued indefinitely. Research into Flathead foodweb limitations requires two years.

Section 5. Budget

FY99 project budget (BPA obligated): $ 64,854

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	0.95 FTE	%36	34,000
Fringe benefits		%6	6,000
Supplies, materials, non-expendable property		%8	8,000
Operations & maintenance		%3	2,500
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%0	0
NEPA costs	Will be conducted by Project 9608701	%0	0
Construction-related support		%0	0
PIT tags	# of tags:	%0	0
Travel		%2	2,000
Indirect costs		%17	16,000

Subcontractor	University of Montana, Flathead Lake Biological Station	%28	26,500
Other		%0	0
TOTAL BPA FY2000 BUDGET REQUEST			$95,000

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
Confederated Salish and Kootenai Tribes	Total fish community monitoring in Flathead Lake	%19	50,000
Confederated Salish and Kootenai Tribes and Utah State University	Bioenergetic analysis of food web interactions in Flathead Lake that are limiting successful mitigation of losses of adfluvial trout.	%11	30,000
Montana Fish, Wildlife and Parks	Total fish community monitoring in Flathead Lake	%19	50,000
Confederated Salish and Kootenai Tribes and Montana Fish, Wildlife and Parks	Lake trout population modelling	%4	10,000
University of Montana under contract to Confederated Salish and Kootenai Tribes	Quantification of lower trophic levels in Flathead Lake	%11	30,000
Total project cost (including BPA portion)			$265,000

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$95,000	$73,200	$75,350	$77,600

Section 6. References

Watershed?	Reference
☐	Beauchamp, D.A. 1996. Estimating predation losses under different lake trout population sizes and kokanee stocking scenarios in Flathead Lake. Report prepared for Montana Fish, Wildlife and Parks, Kalispell, Montana.
☐	Carty, D., W. Fredenberg, L. Knotek, M. Deleray, and B. Hansen. 1997. Hungry Horse Dam fisheries mitigation: Kokanee stocking and monitoring in Flathead Lake-1996. BPA Contract No. DOE/BP-60559-3, Project No.91-019-01, 91-019-03, 91-019-04. USFWS
☒	Ducharme, L., B. Hansen, and L. Knotek. 1998. Dayton Creek watershed

	progress report: May 1997-June 1998. Prepared by Confederated Salish and Kootenai Tribes and Montana Fish, Wildlife and Parks, Pablo, Montana.
☐	Deleray, M. W. Fredenberg, and B. Hansen. 1995. Kokanee stocking and monitoring, Flathead Lake - 1993 and 1994. BPA Contract No. DE-A170-87BP65903, Project No. 91-19-1. Montana Fish, Wildlife and Parks, Kalispell, Montana.
☐	Ehrhart, R.C. and P.L. Hansen. 1998. Successful strategies for grazing cattle in riparian zones. Montana BLM Riparian Technical Bulletin No. 4. Riparian and Wetland Research Program, University of Montana, Missoula, MT. 48 pp.
☐	Evarts, L., B. Hansen, and J. DosSantos. 1994. Flathead Lake angler survey. BPA Contract No. DE-B179-92BP60479, Project No. 91-19-1. Confederated Salish and Kootenai Tribes, Pablo, Montana.
☐	Hansen, B., J. Cavigli, M. Deleray, W. Fredenberg, and D. Carty. 1996. Hungry Horse Dam fisheries mitigation: kokanee stocking and monitoring in Flathead Lake - 1995. BPA Contract No. DE-A170-87BP65903, Project No. 91-19, 91-19-01, 91-19-03, 91-19-0
☐	Hansen, B. 1996. Summary of Work to Develop Polson Golf Course Spring Creek to Benefit the Flathead Lake Fishery, Report to Hungry Horse Interagency Group, Confederated Salish and Kootenai Tribes, Pablo, Montana.
☒	Montana Bull Trout Scientific Group. 1995. Flathead River drainage bull trout status report. Prepared for the Montana Bull Trout Restoration Team. 46 pp.
☒	Montana Fish, Wildlife and Parks; Confederated Salish and Kootenai Tribes. 1991. Fisheries mitigation plan for losses attributable to the construction and operation of Hungry Horse Dam. MFWP and CSKT, Kalispell.
☐	Montana Fish, Wildlife and Parks; Confederated Salish and Kootenai Tribes. 1993. Hungry Horse Dam fisheries mitigation implementation plan. MFWP and CSKT, Kalispell.
☐	McIntyre, J. 1998. An assessment of bull trout and lake trout interactions in Flathead Lake, Montana. A report to the Montana bull trout restoration team; Montana Fish, Wildlife and Parks; and Confederated Salish and Kootenai Tribes. Polson, Montana.
☐	Proper functioning condition work group. 1993. Riparian area management, Process for assessing proper functioning condition. Technical Reference 1737-9. U.S. Dept. of Interior, Bureau of Land Management. Denver, Colorado.
☐	Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.
☐	
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PART II - NARRATIVE

Section 7. Abstract

In March 1991, the CSKT and Montana Fish Wildlife and Parks (MFWP) defined the fisheries losses, mitigation alternatives and recommendations to protect, mitigate and enhance resident fish and aquatic habitat affected by Hungry Horse Dam in the document: "Fisheries Mitigation Plan for Losses Attributable to the Construction and Operation of Hungry Horse Dam". On November 12, 1991, the Northwest Power Planning Council (NPPC) approved the mitigation plan with minor modifications, called for a detailed implementation plan, and amended measures 903(h)(1) through (7). A long-term implementation plan was submitted in 1992 and was approved by the Council in 1993. This project is a continuation of an original contract signed on November 11, 1993.

Goals of this project are to create and restore habitat and quantitatively monitor changes in fish populations to verify the efficacy of our mitigation measures. For example, native trout monitoring in Flathead Lake is conducted annually and builds on an existing data set initiated in 1981. Monitoring of the experimental kokanee reintroduction was a primary activity of this project between 1992 and 1997. The Polson Golf Course Spring Creek project was completed in 1995 and two years of imprint planting of 20,000 cutthroat eggs annually have been completed. Adult returns are expected in 1999. Initial planning, distribution of information, scoping of landowners, and inventory of resources were initiated in the Dayton Creek drainage in 1997. Restoration work is projected to continue there for several years. Restoration work began on Skidoo Creek in 1997 and consisted of 1)identifying the problem, 2)recruiting landowner support and participation, and 3) data collection. Channel reconstruction to correct a culvert migration barrier was compled in 1998, and monitoring activities are projected for several additional years. Lake trout, whose high densities have precluded successful mitigation of losses of other species, have been sampled since 1996 for a determination of maturity and fecundity. Results of this work have utility in determining the population status of this key predator in Flathead Lake.

This proposal includes an increase in funding for research to investigate biological factors limiting the successful mitigation of losses of adfluvial trout. The dramatic increase of lake trout following the introduction of M*ysis relicta* in Flathead Lake is now considered responsible for the decline of native species that are the target of mitigation efforts (McIntyre 1998). The experiment to reintroduce kokanee into Flathead Lake failed because of high predation rates by lake trout (Deleray et al. 1995, Hansen et al. 1997). Further efforts at mitigation of adfluvial fish in Flathead Lake may also fail if we do not improve our understanding of critical food web limitations. Initial efforts to investigate the controlling factors began in 1996. Progress has continued with plans for synchronized multi-trophic level, lakewide sampling in 1999-2001. This comprehensive project requires multiple agencies and universities, each bringing the necessary jurisdiction or expertise to the project to answer complex ecological questions. We have learned that the answers to the questions are a prerequisite to successful implementation of mitigation of losses of adfluvial trout in Flathead Lake. The BPA portion of this project represents 15% of the total funding, and will accomplish the quantification of the bioenergetics of the lower trophic levels. This work will be subcontracted to the University of Montana Flathead Lake Biological Station. Additional parties to this research will be Tribal and Montana Fish, Wildlife and Parks staff and Utah State University under a separate contract funded by the Salish and Kootenai Tribes.

Section 8. Project description

a. Technical and/or scientific background

The problem this project addresses is the loss of habitat, both in quality and quantity, in the interconnected Flathead Lake and River basin resulting from the construction and operation of Hungry Horse Dam. The purpose of the project is to both implement mitigation measures and monitor the biological responses to those measures including those implemented by Project Numbers 9101903 and 9101904. Goals and objectives of the 1994 Fish and Wildlife Program addressed by this project are the rebuilding to sustainable levels weak, but recoverable, native populations injured by the hydropower system. The project mitigates loss in place and in kind. The project logically mitigates the blockage of spawning runs by Hungry Horse Dam by restoring and even creating spawning habitats within direct drainages to Flathead Lake. The project monitored the five year experiment to reintroduce kokanee into Flathead Lake which included the measurement of kokanee growth and survival rates, and lake trout predation rates on kokanee. It has documented downward trends in cutthroat and bull trout as well as changes in several other major species through standardized gillnetting surveys. It defined the baseline condition of the Flathead Lake fishery in 1992-1993 by completing a one year creel survey (Evarts et al. 1994). It has begun a second yearlong creel survey, five years after the baseline survey, and will provide a measure of changes in catch and harvest rates of four species. The project has begun restoration work in three tributaries to Flathead Lake.

The project will expand on basic research into foodweb interactions within Flathead Lake begun in 1996. We will research the competitive interactions between target mitigation

species and exotic species that are restricting the potential success of mitigation measures. This cooperative effort includes tribal and state management agencies and two universities. We have learned that this basic research is necessary to successfully mitigate losses of adfluvial trout in Flathead Lake. The research will quantify spatial-temporal consumption demand and compare it to the spatial-temporal availability of prey populations to evaluate whether predation, competition, or environmental factors control the population dynamics of species in Flathead Lake.

b. Rationale and significance to Regional Programs

This project works to achieve the goals and objectives of the Fish and Wildlife Program by implementing measures that mitigate the loss of habitat resulting from construction of Hungry Horse Dam. These measures have included direct supplementation and habitat restoration. Additionally, this project monitors the population responses to tributary restoration projects both directly and in Flathead Lake, so that the accountability of mitigation practices is upheld. Monitoring and implementation are both conducted in close cooperation with Project No. 9101903 which represents a necessary collaborative effort between the State and the Tribes who share jurisdiction and management in the basin.

c. Relationships to other projects

Hungry Horse Dam blocked migration of adfluvial trout leaving Flathead Lake. Tributaries to Flathead Lake that have the potential to provide habitat for the recovery of those native stocks of fish damaged by Hungry Horse Dam occurr both on the Flathead Indian Reservation and on lands managed by Montana Fish Wildlife and Parks. It is the State and Tribal projects that comprise the extent of efforts to mitigate the losses from Hungry Horse Dam. The benefits of the habitat improvement projects within Flathead Lake tributaries are monitored by the Tribes and State both within the tributaries and within Flathead Lake to assess the influence on adult adfluvial populations. Implementation efforts are closely coordinated with Project 9608701, Flathead Focus Watershed, to recruit landowner participation, and cost sharing with other agencies and foundations.

d. Project history (for ongoing projects)

This project was initiated in 1992 after NPPC adopted Hungry Horse Mitigation Plan (November 1991, see NPPC program:10.3A.10), and has received annual funding since that time. Adaptive management is actively being practiced, most notably in the implementation and subsequent completion of the kokanee reintroduction experiment. Additionally adaptive management is practiced in the targeting of lake trout as a species to monitor because lake trout predation bears so heavily on our ability to mitigate for the losses of species identified in the Fish and Wildlife Program. Major results achieved are:

Monitoring Results:

(1)detailed monitoring of a five year kokanee reintroduction experiment that identified and quantified the reason for the failure of the experiment.
(2)accurate and repeatable quantification of baseline angler use of the Flathead Lake fishery in 1992-3 and 1998-99.
(3)continuation of annual trend monitoring of native westslope cutthroat and bull trout in Flathead Lake to establish a 17 year period of record.

Implementation Results:

(1)creation of a small tributary to Flathead Lake from a marshy drainage area that has successfully raised outmigrating cutthroat trout.
(2)initiation of a process that includes all stakeholders in the Dayton Creek watershed to begin restoration work and reestablishment of adfluvial cutthroat populations.
(3)correction of a culvert passage barrier in Skidoo Creek by reconstructing a degraded portion of channel.

e. Proposal objectives

Objective #1: Determine relative abundance of bull and cutthroat trout.
This monitoring objective is a necessary component of mitigation which provides a feedback to the efficacy of mitigation measures employed. Measurements target the adult populaton of adfluvial bull and cutthroat trout in Flathead Lake. We expect the response of the adult segment of these populations to habitat improvements to be gradual because of generations times necessary for population changes, but consider them to be the most useful indicator of successful restoration of native stocks of fish. This monitoring was initiated in 1981, and has effectively demonstrated a wide range of changes in relative abundance of species within the Flathead Lake fish community.

Objective #2: Improve habitat conditions and biological productivity in direct tributaries to Flathead Lake.
Only a small number of direct tributaries to Flathead Lake exist on the Flathead Indian Reservation. These are all being inventoried for opportunities to enhance them to achieve replacement habitat for that lost due to the construction of Hungry Horse Dam. The tributary with the greatest potential for restoration is Dayton Creek, and secondarily Skidoo Creek. Minimum objectives for accomplishing restoration in these streams have not been identified, but contributions to the goal will be measured with the following parameters: **Habitat based:**

(a) area of riparian vegetation planted,
(b) miles of fencing installed,
(c) changes in riparian health rating expressed by the Proper Functioning Condition survey method (Proper Functioning Condition Work Group 1993),
(a) linear distance of stream channel reconstructed,
(b) cubic feet per second increase in base stream flows,
(c) reduction in percent of streambed sediments of a size less than 4.75mm in diameter,

(d) reduction in channel width/depth ratio, and,
(e) increase in average stream pool depth.

Population based:

(e) survival to emergence of planted cutthroat eggs,
(f) in-migration to tributaries of returning adult cutthroat trout,
(h) increased standing stock of trout in Dayton Creek
(i) out-migration of juvenile trout to Flathead Lake.

Objective #3: Evaluate 6 parameters of lake trout biology
This objective is the product of adaptive management. It arose from the monitoring of the kokanee experiment which indicated that greatly expanded lake trout populations had created a bottleneck in Flathead Lake which reduced survival of the species targeted for mitigation. Six parameters of lake trout biology: age at maturity, length at maturity, fecundity, growth rate, mortality rate, and year class strength were first measured in 1996. These parameters have utility as surrogates for absolute abundance estimates that are costly and technically difficult to acquire, and as components for population and bioenergetic modelling of the predation effects of lake trout.

Objective #4: Measure success of off-site plants of cutthroat and rainbow trout.
The success of the releases of hatchery raised trout into seven small reservoirs on the Flathead Indian Reservation will be measured by whether or not there is: 1) a >20% annual incremental growth rate, 2) a >10% representation within the population of >1 year post planting year classes, and 3) >30% return to creel of stocked fish.

Objective #5: Quantify lower trophic level production and population dynamics in Flathead Lake.
This objective is also a product of adaptive management and results from the need to better understand foodweb interactions in Flathead Lake. It will be addressed by the University of Montana under a subcontract. This work is one component of a larger comprehensive research project being conducted by CSKT and MFWP that is designed to better facilitate effective mitigation of losses of adfluvial trout than is possible with the current level of knowledge.

f. Methods

Objective #1, Task a: Use a standardized gillnetting method to determine catch rates of westslope cutthroat and bull trout. Gillnets consist of five mesh sizes, and measure 250 ft long and 6 ft deep. Three sinking and three floating nets are set at five fixed locations near shore. This work now constitutes a time-series of trends in native species abundance that dates back to 1981.

Objective #2, Tasks b-e: Methods employed to improve habitat conditions and biological productivity in tributaries of Flathead Lake will be a continuation of those employed since the inception of this program, which include:

Information gathering:
(a) collection of habitat and population data using standard inventory methods.
(b) consensus building among landowners living in targeted drainages to foster changes in existing management practices.

Implementation:
(a) restoration of stream channels using the natural channel design method primarily described by Rosgen (1996).
(b) use of fencing and rotational grazing to protect riparian areas using methods primarily described by Erhart (1997).
(c) enhancement of stream flows by improving irrigation efficiency and storage.
(d) correction of poorly designed or dilapidated stream crossings.

Objective #3, Task f: The lake trout population is sampled during spawning season using gillnets to acquire measures of maturity and end of season growth rates. The nets are set lakewide in a stratified random design that assigns sampling intensity within strata relative to the percent of the total represented by each stratum. There are five geographic strata and four depth strata. Gillnets consist of 10 meshes ranging in size from 0.75 in to 3.0 in bar measure, and 250 ft long and 8 ft deep. Age at maturity is determined by visual identification and scale measurements, fecundity by subsampling ovaries, year class strength by developing the length-based population structure from mesh-selectivity adjusted catches, mortality rate from the descending limb of the catch curve, and growth rate from scale and otolith analysis.

Objective #4, Task g: Growth rate and population structure of stocked fish will be determined in each of seven reservoirs on a two year cycle. Creel surveys will be conducted on each reservoir on a four year cycle. Fish will be sampled by multiple collection methods depending on reservoir morphometry. Small sample sizes (30-50 fish) are considered adequate to demonstrate growth rate and survival one year post planting. Creel surveys will be statified to the peak angling seasons: July and August and the ice fishing period.

Objective #5, Methods employed to research lower trophic level food web interactions are:

Task h, i and j: Biweekly measurement of bottom to surface temperature profiles at two sites within each of ten strata (there are four depth strata nested in five geographic strata, and only two depth strata: 0-50' and 50-100' will be sampled for this task). Monthly measurements of phosphorous and chlorophyl A at one site within five strata. Vertical tows of zooplankton biweekly between May 1 and November 1, monthly between November 1 and May 1 at three sites within each of 15 strata.

Task k: *Mysis relicata* will be sampled biweekly by vertical tows between May 1 and November 1, monthly between November 1 and May 1 at three sites within each of 15 strata.
$\mathbf{H_o}$ = The spatial and temporal distribution of *Mysis relicta* is uniform throughout Flathead Lake.

H_a = There is spatial and temporal structure to the distribution of *Mysis relicta* in Flathead Lake.

Task l: Measure stomach contents of subsamples of Mysis relicta collected in all strata.
H_o = The spatial and temporal diet of *Mysis relicta* is uniform throughout Flathead Lake.
H_a = There is spatial and temporal structure to the diet of *Mysis relicta* in Flathead Lake.

Task m: Correlate spatial and temporal abundance of zooplankton and *Mysis relicta* with limnological variables collected in Tasks g-i.
H_o = Species abundances are not correlated with limnological variables in Flathead Lake.
H_a = Species abundances are correlated with limnological variables and species distributions are predictable insofar as cycles and patterns in limnological variables can be identified in Flathead Lake.

Note to Reviewer: Separate funding has been secured for sampling the total fish community within the same physical framework as used in Tasks h-k. Population structure, relative abundance, and diets will be determined for each major species of the fish community. The Wisconsin bioenergetics model will be used to estimate the importance of predation, competition, food supply, and environmental conditions in controlling survival and growth of target species. The model will then be incorporated into decision making to determine the value of species manipulation within Flathead Lake to benefit species targetted for mitigation.

g. Facilities and equipment

The Confederated Salish and Kootenai Tribes have a 23 foot welded aluminum boat, office space, laboratory, microscopes, computers and vehicles, all of which are adequate to achieve the objectives. The subcontractor, Flathead Lake Biological Station also has boats, sampling gear, water quality measuring instruments, computers, and personnel more than adequate to achieve the research objectives.

h. Budget

This budget request has two components. The first is to fund the ongoing activities approved by the Council at the same level that has been authorized over the past four years. The second component is a new request to cost-share research that is intended to improve the effectiveness of future mitigation efforts in Flathead Lake. The research component is necessary to quantify critical foodweb interactions that we have concluded to be limiting successful mitigation of losses of adfluvial trout in Flathead Lake. The research is comprehensive and includes participation of several agencies and universities. This request for an additional $35,000 is about 25% of the quantity needed to accomplish the entire research project. The other partners to BPA that are providing the remaining 85% of the funding are CSKT, MFWP, University of Montana, and Utah State University. The research will require two years to provide adequate resolution of the

questions concerning foodweb interactions that are presently affecting the agencies' ability to effectively mitigate the losses of adfluvial trout.

Section 9. Key personnel

*Barry Hansen (0.2 FTE)
*Bachelor of Science, Tulane University, New Orleans, Louisiana, 1974
*Master of Science, University of Montana, Missoula, Montana, 1988
*Certified Fisheries Scientist (American Fisheries Society)
*Confederated Salish and Kootenai Tribes,Fisheries biologist conducting mitigation, monitoring, research, and review.
*Formerly employed by Montana Fish, Wildlife and Parks and the U.S. Forest Service
*Barry's expertise for this job results from extensive experience in conducting fisheries research and implementation projects under NPPC direction. Those projects include instream flow studies, reservoir fluctuation studies, and the current supplementation, monitoring and stream restoration projects conducted over the last five years. For each project a completion report was prepared resulting in a total of eight reports submitted to BPA.

Hansen, B., and J. DosSantos. 1997. Distribution and management of bull trout populations on the Flathead Indian Reservation, western Montana, USA. ed. Mackay, W.C. et al. Friends of the Bull Trout Conference Proceedings.

Hansen, B. 1990. Changes in the benthic community of Lake Creek, MT, resulting from mine tailings contamination. Pp. 119-127 in: Proceedings of the Clark Fork River Symposium. University of Montana, Missoula, MT.

And reports listed above as project accomplishments.

*Joe DosSantos (0.05 FTE)
*Bachelor of Science, University of Montana, Missoula, Montana, 1978
*Master of Science, Montana State University, Bozeman, Montana, 1985
*Certified Fisheries Scientist (American Fisheries Society)
*Confederated Salish and Kootenai Tribes, Fisheries Program Manager
*Formerly employed by Montana Fish, Wildlife and Parks (1977-1982)
*Joe's expertise results from his experience working with large hydropower projects since 1978, and his work with inland salmonid biology and management since 1977, and with esocids and centrarchids since 1983.

Hansen, B., and J. DosSantos. 1997. Distribution and management of bull trout populations on the Flathead Indian Reservation, western Montana, USA. ed. Mackay, W.C. et al. Friends of the Bull Trout Conference Proceedings.

Hardy, T.B. and J.M. DosSantos. 1994. Technical evaluation of impacts in Flathead lake and the lower Flathead River from Kerr Dam operations and recommendations for operational mitigation at Kerr Dam. Draft Report. Utah Water Research Laboratory, Utah State University, Logan and Confederated Salish and Kootenai Tribes, Pablo, Montana. 68 pp.

Evarts, L., B. Hansen, and J. DosSantos. 1994. Flathead Lake angler survey. BPA Contract No. DE-B179-92BP60479, Project No. 91-19-1. Confederated Salish and Kootenai Tribes, Pablo, Montana.

DosSantos, J., C. Hunter, L. Lochard, B. Marotz and J. Vashro. 1992. Hungry Horse Dam Fisheries Mitigation Implementation Plan. Report to the Northwest Power Planning Council, Montana Department of Fish, Wildlife and Parks, Kalispell, and the Confederated Salish and Kootenai Tribes, Pablo, Montana. 42 pp.

DosSantos, J.M. 1991. Ecology of a riverine pike population. Pages 1555-159 in J.L. Cooper and R.H. Hamre, coordinators. Warmwater Fisheries symposium I. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-207, Fort Collins, Colorado.

Section 10. Information/technology transfer

Annual reports have been produced by this project in each of the five years of its existence. One interagency workshop and one expert panel have been convened to date and such will continue to be the practice. Results of project monitoring determine agency direction in implementing mitigation for Hungry Horse Dam.

Congratulations!