Kootenai Tribe of Idaho

P.O. Box 1269
Bonners Ferry, ID 83805
Ph# (208) 267-3519
Fax (208) 267-2960

April 4, 2008

W. Bill Booth, Chairman
Northwest Power and Conservation Council
851 SW Sixth Ave., Suite 1100
Portland, OR 97204

Dear Chairman Booth:

The Kootenai Tribe of Idaho thanks the Northwest Power and Conservation Council ("NPCC") for the opportunity to recommend amendments for adoption into the Columbia River Basin Fish and Wildlife Program.

The Kootenai Tribe offers three sets of amendments for inclusion in the Program: (1) Kootenai Tribe of Idaho Amendments; (2) Upper Columbia United Tribes Amendments; and (3) Columbia Basin Fish and Wildlife Authority Amendments. You will find attached Resolutions of the Kootenai Tribal Council approving these amendments.

The Kootenai Tribe believes that restoration of the resources in the Columbia Basin takes a tremendous commitment from Bonneville Power Administration and the Northwest Power and Conservation Council to approve and fund necessary projects. The resources of the entire Basin, from fish and wildlife to berries to sacred sites, are important to the life and culture of the Kootenai Tribe. To ensure long term survival of the Kootenai Tribe and to honor the Creator-Spirit's Covenant to guard and keep the land forever, restoration of the natural resources is critical. We are optimistic that the NPCC will honor this commitment by adopting the recommendations provided.

We are committed to working with the NPCC throughout the entire process as we move toward the full implementation of restoration efforts for fish and wildlife populations that have been affected by the development of the federal hydropower system. We are encouraged that the NPCC is committed to working with the Kootenai Tribe to further develop and refine the recommendations through further comments, consultations and hearings.

Sincerely,
/s/ Jennifer Porter
Jennifer Porter, Tribal Chairperson

Enclosures
cc: Sue Ireland, Director, Kootenai Fish and Wildlife Department
Scott Soults, Wildlife Department Manager
Billy Barquin, Tribal Attorney

RECOMMENDATIONS OF THE KOOTENAI TRIBE OF IDAHO FOR AMENDMENTS TO THE NORTHWEST POWER AND CONSERVATION COUNCIL COLUMBIA RIVER BASIN FISH AND WILDLIFE PROGRAM
April 4, 2008

Recommending Entity:
Kootenai Tribe of Idaho

Policy Contact:
Jennifer Porter, Chairperson
Kootenai Tribe of Idaho
P.O. Box 1269
Bonners Ferry, ID 83805
Phone: (208) 267-3519
Fax: (208) 267-2960

Department Contacts:
Susan Ireland
Scott Soults
Kootenai Fish and Wildlife Department
P.O. Box 1269
Bonners Ferry, ID 83805
Phone: (208) 267-3620
Fax: (208) 267-1131
e-mail: ireland@kootenai.org

Legal Contact:
Billy Barquin, Tribal Attorney
101 SW Main Street, Ste. 1800
Portland, OR 97204
Phone: (503) 225-0777
Fax: (503) 225-1257
e-mail: wbarquin@hk-law.com

KTOI 2008 NPCC Amendment Outline

---

1. Introduction

1.1 NPCC Amendment Process

Under the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act), Congress charged the Northwest Power and Conservation Council (Council) with developing and periodically amending a fish and wildlife program for the Columbia River Basin to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities, while providing the Pacific Northwest an adequate, efficient, economical, and reliable power supply.

The Northwest Power Act also requires the Council to call for recommendations to amend the Fish and Wildlife Program at least every five years, prior to the five-year

review of the Council's Power Plan. The Act requires the Northwest Power and Conservation Council to adopt the recommendations of federal and state fish and wildlife agencies and appropriate Tribes as part of the Fish and Wildlife Program, unless the Council explains in writing that the recommendations are inconsistent with the Act or less effective than the adopted recommendations. This document was prepared by the Kootenai Tribe of Idaho ("Kootenai Tribe" or "KTOI") in response to this opportunity to improve the Council's Fish and Wildlife Program (Program) through the amendment submission process. Further information regarding the Council's amendment process is found in Council Document No. 2007-17 (http://www.nwcouncil.org/LIBRARY/2007/2007-17.pdf).

1.2 Tribal Cultural Context of KTOI Amendment

Kootenai Tribal elders continue to pass down the history of the beginning of time, which tells that the Kootenai people were created and placed on earth by Quilxka Nupika, the supreme being to keep the Creator-Spirit's Covenant - to guard and keep the land forever. The Kootenais have never lost sight of their original purpose as guardians of the land.

The Kootenai Tribe recognizes that environmental protection needs to occur within the context of a sustainable local community and economy. Towards this end the Kootenai Tribe is committed to developing innovative and collaborative approaches to guardianship of the land. The adaptive management approach proposed in this amendment is a further example of the Kootenai Tribe's commitment to protecting, mitigating, and enhancing fish and wildlife populations in the Kootenai River Ecosystem.

In developing and implementing approaches to the restoration and conservation of aquatic and terrestrial species as well as habitat and ecosystem restoration and management, the Kootenai Tribe continues to emphasize a collaborative approach that integrates the needs, values and people of our region. The Kootenai Tribe believes that cooperation among all groups with a stake in the region's ecological health is the only way to ensure a sound and prosperous future in the Kootenai River Basin.

1.3 Purpose of KTOI Amendment

As mandated by the Power Act, this amendment focuses on protecting, mitigating, and enhancing fish and wildlife populations, communities, and required habitats and biological and ecological functions that remain affected by construction and operation of Libby Dam and the Columbia River Hydropower system.

Through this amendment the Kootenai Tribe further asserts its ongoing commitment to ecosystem- based fish and wildlife conservation and restoration and to eventual implementation of the vision articulated in the Kootenai River Subbasin Plan, which is to, "Establish and maintain a healthy ecosystem characterized by healthy, harvestable fish and wildlife populations, normative and/or natural physical and biological conditions, and sustainable human communities".

More specifically, the purposes of this amendment are to:

1) Implement, evaluate, and refine a comprehensive Kootenai River Adaptive Management Program consistent with the Council's scientific principles to meet ecological restoration and fish and wildlife enhancement objectives for the Kootenai Subbasin as presented in the Kootenai River Subbasin Plan (http://www.nwcouncil.org /fw/subbasinplanning /kootenai/plan/).

2) Recommend and acquire 10-year program funding approval periods for the Kootenai River Ecosystem Adaptive Management Program, which will include annual review and specific negotiation of individual Kootenai River Ecosystem Adaptive Management Program component projects.

3) Provide a collaborative multi-agency, multidisciplinary, and multi-jurisdictional adaptive research and management model for ecosystem-based fish and wildlife restoration for the Kootenai Subbasin, that is also relevant and applicable to other Subbasins, and is consistent with the Council's Program.

1.4 NPCC Program components addressed by KTOI Amendment

The recommendations proposed in this amendment are consistent with the Council's Program framework, vision, basin-level objectives, and eight scientific principles.

The vision presented in the Council's Program is of, "A Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem and providing the benefits from fish and wildlife valued by the people of the region". The Kootenai Tribe's Kootenai River Ecosystem Adaptive Management Program is targeted at establishing conditions that are favorable to the recovery and conservation of fish and wildlife affected by the operation of the hydrosystem, and to the recovery of species listed under the Endangered Species Act. Additionally, implementation of the Kootenai River Ecosystem Adaptive Management Program is intended to reestablish Tribal trust and reserved right harvest as well as non-tribal harvest opportunities.

The Council's biological objectives describe physical and biological changes needed to achieve the Council's Program vision. Biological objectives have two components: 1) biological performance, describing responses of populations to habitat conditions, described in terms of capacity, abundance, productivity and life history diversity, and 2) environmental characteristics, which describe the environmental conditions or changes sought to achieve the desired population characteristics.

The Kootenai River Subbasin Plan provides a comprehensive and detailed array of biological and ecological (habitat) objectives for fish and wildlife populations and habitats, and describes how the various projects address limiting factors under these

objectives to improve the Kootenai river ecosystem. Updated recommendations in this amendment further develop Subbasin Plan actions by adaptively developing, refining, implementing, and evaluating biological and habitat objectives consistent with the Council's basin level objectives, vision, and scientific principles.

2. KTOI Amendment components

The following information is found in this amendment:

- Section 2.1 describes the effects of hydropower development on fish and wildlife populations and supporting habitats and habitat functions in the Kootenai Subbasin.
- Section 2.2 describes the principles of adaptive management.
- Section 2.3 describes the Kootenai River Ecosystem Adaptive Management Program, describes the five core project components, and shows how those projects and associated work elements are intended to address and resolve specific hydro impacts.
- Section 2.4 briefly describes related complementary regional programs or projects that have been incorporated into the Kootenai Tribe's Kootenai River Ecosystem Adaptive Management Program.
- Section 2.5 describes the rationale for developing 10-year funding periods for the Kootenai River Ecosystem Adaptive Management Program.
- Section 2.6 describes recommendations for Fish Passage Center
- Section 2.7 describes recommendations for the operation of Libby and Hungry Horse Dams
- Section 2.8 provides a list of citation references used in this amendment.

Amend the Program by including the following language:

2.1 Alterations to Kootenai River, including hydropower impacts.

The Kootenai River Basin has experienced an array of natural and anthropogenic disturbances during the past century. Anthropogenic disturbances within the Kootenai Subbasin include loss and degradation of aquatic, riparian, and terrestrial habitats and habitat functions due to levee construction, wetland drainage, resource extraction (mining, logging), agricultural and municipal development, and construction and operation of the hydropower system (Figure 1). These changes and the successive and compounded affects of the changes are discussed in more detail in the Kootenai River Subbasin Plan (http://www.nwcouncil.org/fw/subbasinplanning/kootenai/plan/).

Construction and operation of Libby Dam continues to dramatically alter the quality, quantity, and timing of downstream river flow and hydraulic regime. These changes affect all aspects of aquatic, riparian, and associated upland (terrestrial) habitats,

biological communities, physical habitat conditions, and ecological processes to various degrees relative to pre-dam conditions (Figure 1). In direct response to these changes, BPA shall provide a mechanism to ensure coordinated, efficient, science-based protection, mitigation, and enhancement of fish and wildlife resources in the Kootenai River Subbasin; for the Kootenai Tribe this mechanism is the Kootenai River Ecosystem Adaptive Management Program.

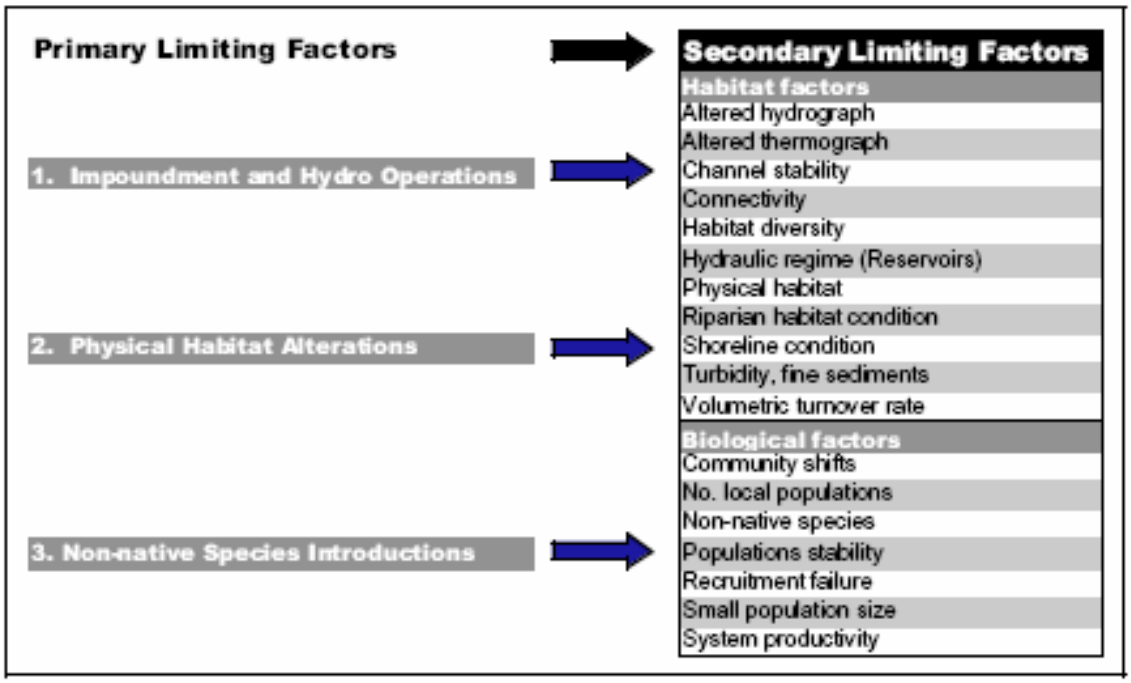

Figure 1. Primary and secondary aquatic limiting factor linkage in the Kootenai River Subbasin (source: Kootenai River Subbasin Plan).

2.2 The Adaptive Management Process

The following description of adaptive management was modified from Aldridge et al. (2004): The concept of adaptive management was developed through a series of workshops convened by Buzz Holling, Carl Walters, and Ray Hilborn over thirty years ago (Ludwig and Walters 2002). Adaptive management was initially aimed at building models to understand uncertainties associated with natural resources, and involved managers, policy-makers, and scientists in a collaborative process (Holling 1978; Walters 1986; Ludwig and Walters 2002). Walters and Hilborn (1976) later introduced the idea of adaptive resource management during the mid-1970s. They pointed out that experimentation was the most reliable means of understanding uncertainties in resource systems, and that comparing alternative models should form the basis of management, experimental design, and monitoring of resource systems (Holling 1978).

Adaptive management is the incorporation of the scientific method (experiments) into a management framework (policy decisions). This differentiates adaptive management

from traditional trial-and-error or learn-as-you-go management (Hilborn 1992, Halbert 1993). Managers and stakeholders involved in conservation planning processes often disregard this fact and think of adaptive management simply as sound management or as management with a willingness to change (Wilhere 2002). The two key components of adaptive management are that: 1) management is effectively set out as an experiment with a sound a priori experimental design, not a haphazard trial and error sequence; and 2) a direct feedback loop exists between science and management to guide the iterative process of reducing uncertainty (Figure 2) (Halbert 1993).

Adaptive management sequentially defines and assesses a problem, designs one or more possible solutions, determines the most likely solution, then implements and evaluates it in the context of rigorously characterized uncertainty (Figure 2). This adaptive management model provides the foundation for integrating the fish, wildlife, habitat, and ecosystem protection and improvement projects implemented by the Kootenai Tribe in conjunction with other complementary projects among regional collaborating state, federal, tribal, First Nations and provincial agencies in the Kootenay/i River Subbasin.

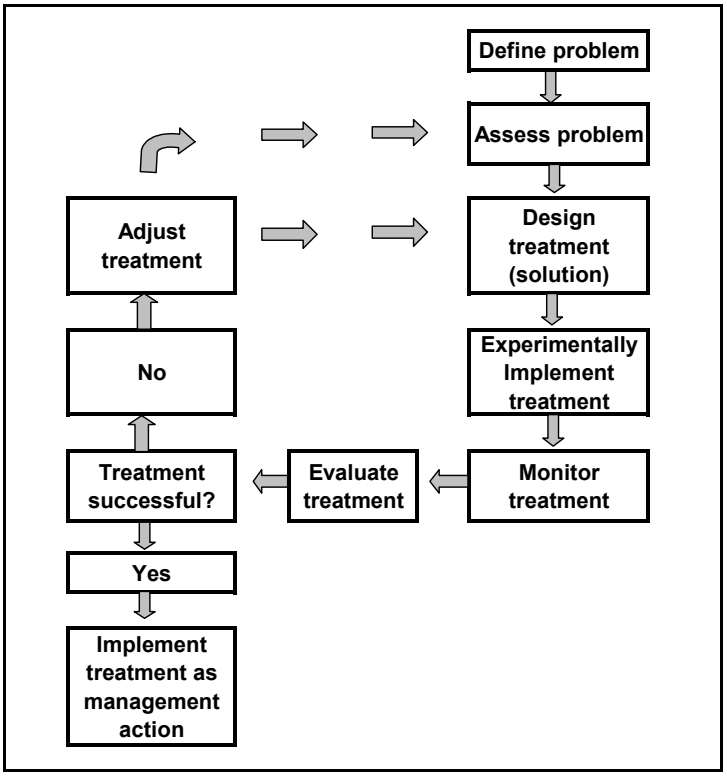

Figure 2. A schematic diagram of the Kootenai River Adaptive Management Program framework used for integrating population, community, habitat, and ecosystem protection and restoration projects (From Korman et al. 2008).

2.3 Kootenai River Ecosystem Adaptive Management Program

The Kootenai River Ecosystem Adaptive Management Program, which is administered by the Kootenai Tribe, consists of a complementary set of fish, wildlife, habitat, and ecological restoration projects in Idaho, Montana, and British Columbia. All of the projects that are included in the Adaptive Management Program incorporate the following: 1) habitat and biological components; 2) ecosystem restoration principles; 3) complementary, collaborative, and additive approaches and actions; and 4) actions consistent with the Kootenai Subbasin Plan and relevant Biological Opinions, and regional recovery and conservation plans.

Six projects comprise the core of the Kootenai River Ecosystem Adaptive Management Program. Those projects include:

- Project 198806400: Kootenai River Native Fish Restoration and Conservation Aquaculture
- Project 199404900: Kootenai River Ecosystem Improvements Project
- Project 200200200: Restore Natural Recruitment of Kootenai River White Sturgeon
- Project 200200800: Reconnect Kootenai River with the historic floodplain
- Project 200201100: Kootenai Floodplain Operational Loss Assessment, Protection, Mitigation and Rehabilitation
- Proposal 199206100: Albeni Falls Wildlife Mitigation

Collectively, the component projects of the Kootenai River Ecosystem Adaptive Management Program provide a series of remedial actions across a wide range of habitat and biological restoration activities and functions. Figure 3 identifies the primary and secondary limiting factors, and project-specific restorative hydropower fish and wildlife mitigation activities that are addressed through the Kootenai River Ecosystem Adaptive Management Program.

Sections 2.3.1 through 2.3.6 present abbreviated descriptions of the six core projects that comprise the Kootenai Tribe's Kootenai River Ecosystem Adaptive Management Program. The full project proposals are available on the web along with the criteria for selection at: http://www.nwcouncil.org/fw/budget/2007/Default.asp.

Primary Limiting Factors	Secondary Limiting Factors	Actions (Metrics/Objectives)	198806400	200200200	199404900	200201100	200200800	199206100
	Habitat factors		X	X	X	X	X	X
	Altered hydrograph	Restore normative mainstem thermograph	X	X	X	X		
	Altered thermograph	Restore normative mainstem hydrograph	X	X	X	X		
1. Impoundment and Hydro Operations →	Channel stability	Improve channel stability to reference levels		X		X		
		Restore riparian habitat to reference condition		X	X	X	X	X
	Connectivity	Improve habitat connectivity; Restore riparian habitat to reference condition		X	X	X	X	X
	Habitat diversity	Restore habitats to reference conditions;		X	X	X	X	X
	Physical habitat	Improve channel stability; Reduced fine sediment input;		X			X	
	Riparian habitat condition	Protect and revegetate riparian areas;		X		X	X	X
		Restore riparian habitat to reference condition		X	X	X	X	X
2. Physical Habitat Alterations →	Shoreline condition	Improve channel stability; Protect and revegetate shoreline and riparian areas;		X		X	X	X
	Turbidity, fine sediments	Improve channel stability; Reduced fine sediment input; restore turbidity loads to reference levels		X			X	X
	Biological factors		X	X	X	X	X	X
	Community shifts	Rehabilitate native community composition; Restore normative mainstem thermograph and hydrograph	X	X	X	X	X	X
	No. local populations	Increase number of local populations	X			X	X	X
	Non-native species	Contain, remove non-native species				X		X
3. Non-native Species Introductions →	Populations stability	Restore/maintain population stability; Restore/maintain population size required for	X		X	X	X	X
	Recruitment failure	Restore natural recruitment		X		X	X	
		Restore habitat conditions for recruitment	X	X		X	X	X
		Reduced fine sediment input		X				
	Small population size	Restore/maintain population size required for populations to persist; Restore recruitment	X	X		X		X
	System productivity	Restore productivity rates and nutrient		X	X	X	X	
		Restore natural recruitment; Restore riparian habitat to reference condition		X	X	X	X	X

Figure 3. Primary and secondary limiting factors, and project-specific restorative hydropower fish and wildlife mitigation activities within the Kootenai River Ecosystem Adaptive Management Program.

2.3.1 Project 198806400: Kootenai River Native Fish Restoration and Conservation Aquaculture

Project status: Ongoing

Project sponsor: Kootenai Tribe of Idaho

Short description: Prevent extinction and begin rebuilding healthy age class structure of sturgeon and burbot using conservation aquaculture techniques with wild broodstock. Reintroduce kokanee into west side tributaries.

Abstract: Fish and wildlife resources in the Kootenai drainage were historically abundant and were traditionally used by the Kootenai Tribe for cultural and subsistence purposes. Over the past decades, native fish and wildlife populations have declined significantly due to large-scale habitat and ecosystem changes, many resulting from development of the federal hydropower system. These declines have resulted in the Kootenai Tribe's inability to fully exercise its reserved rights to hunt and fish within its aboriginal territory. Native kokanee from the South Arm of Kootenay Lake are considered "functionally extinct", burbot from the lower Kootenai River are on the verge of extinction, and the white sturgeon population in the Kootenai River was listed as endangered by the U.S. Fish and Wildlife Service in 1994. The Kootenai River White Sturgeon Study and Conservation Aquaculture Project was initiated by the Kootenai Tribe of Idaho as a stopgap measure in 1989 to produce fish from wild Kootenai River adults until effective habitat restoration measures could be identified and implemented. Only the long life span of the sturgeon has forestalled extinction to date. Natural recruitment has been absent or limited for decades and the current population of large old fish is steadily dwindling (current population abundance halving time is estimated at 7.4 years). Continued failure of natural recruitment means that the next generation of Kootenai white sturgeon may come entirely from the hatchery program.

The Kootenai Tribe, in cooperation with many agencies and stakeholders, is implementing this native fish restoration program in the Lower Kootenai River for sturgeon and burbot using conservation aquaculture techniques with wild broodstock. Kokanee reintroductions are also successfully ongoing for the Westside tributaries to the Kootenai River, with the largest spawner returns resulting in 2007 than during any previous year since the 1980s when 25 fish per hour catch rates (Partridge et al. 1983) along with possible recruitment failure were reported to have caused collapse and function extinction of South Arm kokanee stocks that historically spawned in Idaho tributaries of the Kootenai River (Ashley et al. 1994).

2.3.2 Project 199404900: Kootenai River Ecosystem Improvements Project

Project status: Ongoing

Project sponsor: Kootenai Tribe of Idaho

Short description: The Kootenai River Ecosystem Improvements Project is designed to monitor key ecological functions of the Kootenai River ecosystem and to mitigate for nutrients lost to hydro operations at Libby Dam. Habitat complexity evaluation is also proposed.

Abstract: The overarching goal of this project is to recover a productive, healthy and biologically diverse Kootenai River ecosystem, with emphasis on restoring nutrient availability and habitat quality to support native fish species rehabilitation. The project is designed to aid the recovery of important fish stocks (e.g., white sturgeon, burbot, bull trout, kokanee and other salmonids important to the Kootenai Tribe of Idaho and regional sport-fisheries) by increasing ecological productivity from the bottom up through experimental nutrient addition and monitoring.

The major objective of the project has been to address factors limiting key fish species within an ecosystem perspective. Major components completed include: establishment of a comprehensive and thorough biomonitoring program, investigation of ecosystem-level productivity, testing the feasibility of a large-scale Kootenai River nutrient addition experiment, evaluation and rehabilitation of key Kootenai River tributaries important to the health of the Kootenai River ecosystem, provision of funding for Canadian implementation of nutrient addition and monitoring in the Kootenai River ecosystem from lost productivities created by construction and operation of Libby Dam, mitigating costs of monitoring nutrient additions in downstream Canadian waters of the Kootenay system affected by Libby Dam construction and operation, providing written summaries of all research activities, and an annual international workshop with other agencies and scientists to discuss management, research, and monitoring strategies related to this project and providing a forum to coordinate and disseminate data with other projects involved in the Kootenai River basin.

The proposed biological objectives include: continuation of a system-scale multi trophic-level biomonitoring and water quality program sensitive to changes in biological productivity, continued evaluation and rehabilitation of key Kootenai River tributaries important to the health of the Kootenai River ecosystem, provision of funding for Canadian implementation of nutrient addition and monitoring in the Kootenai River ecosystem (South Arm Kootenay Lake), holding an annual meeting to convene with other agencies and institutions to discuss management, research, and monitoring strategies for this project and disseminate information, and providing written summaries of all research activities related to the project.

2.3.3 Project 200200200: Restore Natural Recruitment of Kootenai River White Sturgeon

Project status: Ongoing

Project sponsor: Kootenai Tribe of Idaho

Short description: Refine physical and hydraulic models to characterize sturgeon recruitment requirements, design, and evaluate habitat improvement and creation actions, implement actions to restore recruitment and ecosystem resiliency, and monitor responses

Abstract: Following decades of natural recruitment failure, the Kootenai River white sturgeon population was listed as endangered in 1994. First reported during the early 1980s, recruitment failure was initially thought to be caused by failed natural spawning. However, annual sampling since the early 1990s produced viable naturally produced embryos nearly every year. Since 1990, the Kootenai Hatchery produced numerous successful white sturgeon year classes with good post-release survival rates further confirming gamete viability. Following years of viable embryo collections from the Kootenai River and consistent lack of natural recruitment, the focus of research and recovery efforts shifted to the identification, understanding, and resolution of factors limiting natural recruitment. Such factors include downstream physical habitat changes and reduced population abundance following Libby Dam construction and operation.

This project was proposed as collaborative interagency effort that uses innovative technologies to: 1) evaluate enhancement of white sturgeon spawning substrate habitat in the Kootenai River, and 2) implement habitat restoration measures to restore natural recruitment and the underlying physical habitat conditions and ecological processes required for successful natural recruitment, as well as to restore and enhance Kootenai River ecosystem resilience (e.g. increase habitat complexity and diversity, improve channel and floodplain interaction, and create normative river conditions that are stable and self-sustaining). Project actions include 1) assessment of potential spawning and rearing habitat enhancements, 2) preliminary design, peer review, final design and construction of habitat restoration measures, and 3) monitoring and evaluation of effectiveness of project actions. This project is a collaborative effort lead by the Tribe and includes collaboration among multiple federal agencies, state agencies, and other stakeholders.

2.3.4 Project 200200800: Reconnect Kootenai River with the historic floodplain

Project status: Ongoing

Project sponsor: Kootenai Tribe of Idaho

Short description: Investigate and implement actions to reconnect the Kootenai River with its historic floodplain.

Abstract: Floodplains of large river systems are increasingly being considered as integral parts of the respective ecosystems. Traditional limnological study of large river ecosystems considers the lotic portion of the river and permanent lentic floodplain lakes to be aquatic environments, while seasonally flooded areas are often treated as part of the terrestrial environment. The transient nature of aquatic habitat and the dynamic changes that occur through the seasons makes distinguishing boundaries difficult; therefore the study of floodplains, particularly in relation to ecosystem function, has been relatively ignored (Junk et al. 1989). However, qualitative observation and quantitative analysis of floodplains have suggested that the impact, relative to ecosystem function and productivity, is significant (Junk et al. 1989). Historically, the Kootenai River and its floodplain constituted diverse, variable habitats that were intricately connected, particularly in the reach between Bonners Ferry, ID and Kootenay Lake, BC. This area provides critical habitat for the endangered white sturgeon as well as other native fishes, birds, and riparian and terrestrial wildlife species. Natural ecosystem conditions in the Kootenai included sloughs, wetlands, and side channels that provided deep-water habitats with a high amount of security cover, critical for juvenile fish. Additionally, off channel habitats provide refuge from higher water velocities typical of the pre-impoundment Kootenai River mainstem. These lower velocity off-channel habitats associated with the floodplain allowed for nutrient assimilation and provided optimal habitat for aquatic invertebrates. Thus, primary and secondary production is relatively high in sloughs versus the river mainstem. Productive sloughs allow primary and secondary production, invertebrates, and juvenile fish to achieve relatively high growth rates and prepare them for a successful transition to mainstem habitats.

Virtually no information exists relative to larval and juvenile sturgeon habitat utilization in the Kootenai River prior to diking and hydroelectric development. However, the Fraser River in British Columbia is physically similar to the Kootenai River's condition prior to development and has a white sturgeon population (Coutant 2004). Actions accomplished through this project are beginning to restore natural ecosystem processes in the Kootenai River Basin by creating physical habitat for native aquatic and terrestrial wildlife as well as the botanical community.

2.3.5 Project 200201100: Kootenai Floodplain Operational Loss Assessment, Protection, Mitigation and Rehabilitation

Project status: Ongoing

Project sponsor: Kootenai Tribe of Idaho

Short description: Produce an Operational Loss Assessment Tool to estimate aquatic, riparian, and associated terrestrial ecological losses due to Libby Dam operations in the Kootenai River floodplain. Ensure applicability to other post-development large river-floodplain systems, develop watershed strategies, and mitigate loss of functions and values to their highest biological potential.

Abstract: Damming of rivers represents a cataclysmic event for large river-floodplain ecosystems. By altering water, sediment, and nutrient flow dynamics, dams interrupt and alter a river's important ecological processes in aquatic, riparian, floodplain and surrounding terrestrial environments. These environments, their life-supporting ecological functions, and the persistence of floral and faunal communities are inexorably linked. Alteration of any component of such highly integrated natural systems generally results in cascading trophic effects throughout the ecosystem. Thus, major system perturbations, such as impounding large rivers, create a myriad of ecological dysfunction, reflected at all trophic levels on an ecosystem scale. The importance of nutrient and energy dynamics during natural pulses of water discharge in rivers has been extensively described in terms of river ecology (e.g., flood pulse, river continuum, nutrient spiraling, and serial discontinuity concepts). This project incorporates this knowledge by applying a structured series of ecological evaluations to a post-impoundment large river-floodplain ecosystem, the Kootenai River system, as part of a multidisciplinary, adaptive management approach to determine, quantify and mitigate floodplain ecosystem function losses due to operation of Libby Dam. Moreover, the overarching objectives of this project are to assess abiotic and biotic factors (i.e., geomorphological, hydrological, aquatic and riparian/floodplain communities) in determining a definitive composition of the Index of Ecological Integrity (IEI), producing a hydrologic predictive model and disseminate an operational loss assessment toolbox. The resulting downstream ecological dysfunction, its evaluation structure, protocols, and findings are applicable and valuable to other post-impoundment river systems in the Columbia Basin and elsewhere. Finally, this project emphasizes the need to establish a regionally accepted framework for operational loss assessments and for the fish and wildlife managers in the Columbia River sub-basin to come to agreement on operational loss methodologies unlike crediting and ledger issues that hamper regional consensus.

2.3.6 Proposal 199206100: Albeni Falls Wildlife Mitigation

Project status: Ongoing

Project sponsor: Albeni Falls Interagency Work Group

Short description: Protect, restore, enhance, and maintain wetland and wildlife habitat in Pend Oreille, Coeur d'Alene, and Kootenai Subbasins as ongoing mitigation for impacts associated with the construction and inundation of the Albeni Falls hydroelectric project.

Abstract: The Albeni Falls Wildlife Mitigation Project was developed to protect, restore, enhance, and maintain the long-term quality of wetland and riparian habitat in northern Idaho and eastern Washington as ongoing mitigation for the construction and inundation of the Albeni Falls hydroelectric project (Northwest Power Planning Council 1995 Program measures 11.2D.1, 11.2E.1, 11.3D.4, 11.3D.5). The long-term conservation potential for this project is primarily the protection of existing high quality wetland habitat and associated target species, but also includes protection of habitat with high restoration potential. This project addresses many of the fish and wildlife goals, objectives, and strategies identified in the Kootenai, Pend Oreille and Coeur d'Alene Subbasin Plans. High quality floodplain and riparian habitats, including cottonwood forests, emergent wetlands, and scrub-shrub wetlands will be perpetually protected and managed for all species that depend on these habitat types for all or a portion of their life history requirements.

The Albeni Falls Interagency Work Group (Work Group) is a coalition comprised of wildlife managers from tribal, federal and state agencies. The Work Group directs where wildlife mitigation implementation occurs in the Kootenai, Pend Oreille and Coeur d'Alene subbasins. The Work Group recommends only those projects that are: 1) the most cost effective, 2) biologically sound, 3) meet regional wildlife criteria, and 4) are located in predetermined focus areas. The Work Group is unique in the Columbia Basin. The Columbia Basin Fish and Wildlife Authority (CBFWA) wildlife managers in 1995 approved what was one of the first two project proposals to implement mitigation on a programmatic basis. The maintenance of this kind of approach through time has allowed the Work Group to implement an effective and responsive habitat protection program by reducing administrative costs associated with site-specific project proposals.

The goal of this project is to fully mitigate wildlife habitat losses associated with the construction and inundation of Albeni Falls Dam. The Work Group envisions the protection and enhancement of 57,316 Habitat Units (HUs) over the next 15-20 years with the understanding that those HUs will be maintained in perpetuity. Long-term operations and maintenance of the protected sites with ongoing monitoring and evaluation will ensure the protection of habitat quality and target species life history requirements. The Work Group will continue to document mitigation progress through annual reporting and will monitor the effectiveness of management actions by using the Habitat Evaluation Procedure (HEP) process (USFWS 1980) and other standardized, peer-reviewed monitoring and evaluation methods.

2.4 Related complementary projects

In addition to the six core collaborative BPA projects identified above, KTOI partners with other agencies to fully develop and implement the Kootenai River Ecosystem Adaptive Management Program (e.g. Idaho Department of Fish and Game, Montana Fish Wildlife and Parks, and British Columbia Ministry of Environment). All KTOI and other Kootenai River Subbasin projects are interrelated to varying degrees by design in order to address the inherent interrelatedness of ecology and ecological restoration activities. Unlike funding opportunities within separate scientific or management disciplines, ecological functions and processes are not segregated along programmatic lines. The Kootenai projects are designed and implemented as a package to bridge these programmatic gaps between disciplines by ensuring that aquatic, riparian and terrestrial issues are collectively addressed by aquatic, riparian, and terrestrial projects (Table 1), despite being funded as separate projects.

The Kootenai Tribe also engages in many other successful collaborative efforts with other entities implementing projects that fall outside the BPA-funded realm (see the Management Plan section of the Kootenai River Subbasin Plan for additional examples).

Collectively, these collaborative partnerships are essential to successfully addressing the objectives of the Kootenai River Ecosystem Adaptive Management Program.

Table 1. Relationship among projects funded by BPA in the Kootenai Subbasin and the ecosystem adaptive management program component that they address.

BPA Project(s):	199404900 198806500	199404900 199500400 198806400	198806400 198806500	200200200 198806500 198806400	198806500 199500400 200715200	200200800 200201100
Ecosystem Component:	**Kootenai River nutrient restoration**	**Transboundary nutrient restoration, kokanee introductions, tributary restoration and enhancement**	**White sturgeon and burbot conservation aquaculture**	**Habitat modification to improve sturgeon spawning and recruitment**	**Ecosystem restoration flows - winter low, spring runoff peaking, summer stable**	**Flood plain reconnection and Operational Loss Assessments**
Target Benefit	Aquatic, riparian communities, increased growth, survival, and biological. condition	Kokanee, burbot, sturgeon, trout; Aquatic, riparian communities	Addresses stock limitation, genetic conservation, demographic safety net	Increase survival of eggs, larvae. Increase in habitat complexity and resiliency	Sturgeon and burbot recruitment, salmonid recruitment, cottonwood recruitment, natural processes	Lentic, lotic, riparian and terrestrial communities, all trophic levels
Potential Negative Effects	Stimulation of non-target species.	Stimulation of non-target species.	Overstocking could limit wild production	Possible unintended hydraulic consequences	Seepage at higher flows, cooler water temperatures inhibit sturgeon spawning, reduced productivity in reservoir (not refilled)	Possible unintended hydrologic consequences
Required Time to See Effect	Periphyton - weeks Inverts-months, Fish = 2-3 yrs,	Kokanee, 1-3 years	Variable depending on life stage and objective	In-season detection of larvae, 2+ yrs to fully recruit to gill nets; 30+ years for population effect for sturgeon	In-season detection of larvae, 2+ yrs to fully recruit to gill nets, 30+years for population effect for sturgeon	Lower trophic levels-In-seasons, higher across years
Monitoring Requirements	All taxa responses in Kootenay Lake and lower Kootenai River	All taxa responses in tributaries and Kootenay Lake Stream and riparian habitat health and condition estimators and metrics	Survival, growth and condition	Recruitment magnitude and frequency. Evaluation of ecological and physical parameters in newly created habitat	Recruitment magnitude and frequency. Ecological condition and biological productivity of post-treatment communities and functions	Nutrient availability and habitat heterogeneity contributions. Ecological condition and biological productivity of post-treatment communities and functions

2.5 Develop 10-year funding period for Kootenai River Ecosystem Adaptive Management Program

Many of the core projects that are contained under the umbrella of the Kootenai River Ecosystem Adaptive Management Program have been continuously funded since they were initially proposed to the Council, some beginning as early as 1988 (e.g., BPA-KTOI 198806400). At every juncture in their individual histories, these projects have been recommended for and have received BPA funding by the NPCC, the Council's ISRP, CBFWA, and other review groups and processes. The design and implementation of these projects collectively, in the form of the Kootenai River Ecosystem Adaptive Management Program, address the interrelatedness and multi-disciplinary nature of restorative ecology and the relevance of decadal time scales associated with ecological (post-dam) changes and restoration activities.

Given the relevance of this decadal time frame, BPA shall provide 10-year block funding for the Tribe's portion of the Kootenai River Ecosystem Adaptive Management Program, with review and negotiation of individual project statements of work and budgets at logical intervals, as occurs with ongoing BPA-funded projects.

Such block funding would synchronize funding cycles and the temporal scale of Kootenai River ecosystem restoration activities and ecological processes. It would also formally recognize and acknowledge the magnitude and time requirements of restorative ecology, and would free up Council, BPA, KTOI, and other project collaborators' time and resources, thereby improving the efficiency of program implementation and ecological restoration. Additionally, reviewing the suite of projects that comprise the Kootenai River Ecosystem Adaptive Management Program as a block would facilitate the reviewers understanding of the interrelationship and mutual dependencies of the various project actions.

Based on its success to date, and on future expectations, the Kootenai River Ecosystem Adaptive Management Program could favorably serve as an empirically integrated multi-scale and multi-disciplinary model for ecosystem diagnosis and restoration in other areas of the Columbia basin under the Council's Program.

In addition to the foregoing block funding, it is important to recognize the need for long term investments on a programmatic scale. Responsible ownership of real property involves stewardship of the attendant natural resources. Accordingly, such responsible ownership requires funding for operations and maintenance. Regardless of the type of real property interest acquired, each capital investment made under the Council's Program for the purpose of habitat acquisition/protection shall include an endowment or other long term funding for the purpose of supporting the operations and maintenance activities necessary to perpetuate the attendant habitat functions and values.

The Council's Program often makes long term investments to mitigate the impacts of the hydrosystem. The Program should likewise make long term investments in the operations and maintenance of acquired real property that are an intrinsic and necessary component of the investment in mitigation. Perpetual mitigation can only be achieved if the Program

maintains habitat investments. Therefore, BPA shall fund reasonable (current market value) long term operations and maintenance activities.

2.6 Fish Passage Center

Amend current language in the Program as follows:

- Provide for supervision of the FPC manager to the entity having contracting authority from BPA (currently PSFMC) including the authority and obligation to conduct an annual performance review.

- Provide for continuing oversight of the FPC program and its functions, including the right and obligation to conduct an annual review of the program to the FPCOB.

- Direct the FPC to consult with resident fish managers who have knowledge and expertise on reservoir operations and resident fish requirements.

2.7 Implement operations for Hungry Horse and Libby Dams to provide for normative flows[1]

BPA and the action agencies shall implement the following operations at Hungry Horse and Libby Dams to provide for normative flows[1] as follows:

- Continue to implement VARQ flood control to reduce annual reservoir drawdown and reduce the frequency of refill failure (to within five feet of full pool) as compared to historic operations;
- Implement a "sliding refill date" based on water supply to target reservoir refill later in July during high water years to reduce the probability of early reservoir refill while inflows remain above turbine capacity to prevent spill and associated gas supersaturation impacts;
- Implement seasonal flow windows and flow ramping rates in the Flathead and Kootenai rivers downstream of the storage reservoirs and maintain minimum flows in the Flathead and Kootenai rivers as described by the U.S. Fish and Wildlife Service 2006 Biological Opinion and the Montana Department of Fish, Wildlife and Parks;
- Implement summer reservoir drafting limits at Hungry Horse and Libby at 10 feet from full pool by the end of September (elevations 3550 and 2449, respectively) in all years except the lowest 20th percentile water supply (drought years) when the draft may be increased to 20 feet from full pool by the end of September. This would protect fisheries resources in the reservoirs and rivers downstream, while providing flow augmentation in the lower Columbia River.
- Create a "sliding-scale" for the summer reservoir drawdown so that operations don't cause a jump instantaneously from 10 to 20 feet when water supply forecasts approach the 20th percentile (lowest water years). The summer reservoir drawdown targets at Hungry Horse and Libby shall be translated into a discharge volume (sum

of forecasted, pass-through inflows, plus storage volume above the drawdown limit) to maintain stable flows in the rivers downstream and absorb flow forecasting error in a verifiable deviation in reservoir elevation.

- Draft each storage reservoir according to elevation limitations that, when combined with projected inflows, result in stable and "flat" or very gradually declining weekly average outflows from July through September;
- Sudden short term flow reductions shall be avoided, especially during the productive warm months. Flow reductions "reset" river productivity to the lowest stage and it takes approximately a month and a half for productivity to recover when higher flows resume;
- Implement sturgeon tiered flows at Libby Dam and shape the flow to mimic a natural spring pulse, followed by a gradual decline toward stable summer flows. Water released from storage for sturgeon should not violate Montana water quality standard for dissolved gas and timed to correspond with water temperature criteria in the USFWS Biological Opinion for white sturgeon in the Kootenai River.

Burbot Flow Consideration ~ Provide low temperature in winter every year and low winter flow when feasible. The Burbot strategies and measures in the Kootenai Subbasin Plan provide a framework with which to plan burbot restoration flows.

Cottonwood and Willow Recruitment ~ Cottonwood and willow recruitment is dependent upon winter river elevations being lower than the highest spring elevation.

Temperature ~ Operate selective withdrawal system to maximize available water temperature for spring sturgeon spawning and winter conditions for normative thermograph.

[1] *"Normative" is defined as the condition where natural flood plain functions and channel maintenance can occur. This includes a reduction in the width of the varial zone (that becomes biologically unproductive), removing unseasonable flow fluctuations (natural day to day fluctuations vary by 5% during basal conditions and 10% during spring runoff), restoring a natural spring freshet (runoff occurs in late May or early June, followed by a stable, low basal flow period), periodic channel maintenance flows (a bankfull flow for at least 48 hours on a periodicity of 2.5 years, or every second or third year, or 3 out of 10), stable summertime flows that are constant or gradually reducing after spring runoff (this can include a sliding scale to respond to varying water availability). The condition allows the river to flush fine sediments into the channel margins during runoff (cleaning fines from interstitial spaces in river cobbles creating insect habitat). As flows decline from the spring peak, terrestrial vegetation can invade the margins and as flows stabilize (riparian can establish including willows, cottonwood, grasses and sedges), roots prevent fines from being swept back into the channel (preventing embeddedness and siltation). Rivers that maintain normative functions have stable banks, slow channel migrations, maintain low width/depth ratios, and high pool/length ratios. (excerpt from Kootenai River Subbasin Plan).*

2.8 References

Aldridge, C. L., M. S. Boyce, and R. K. Baydack. 2004. Adaptive management of prairie grouse: how do we get there? Wildlife Society Bulletin 2004, 32(1):92–103

Ashley, K. L., L. C. Thompson, L. Haywood-Farmer, R. Rae, F. R. Pick, P. B. Hamilton, D. L. Lasenby, K. E. Smokorowski, and L. McEachen. 1994. Kootenay Lake fertilization experiment-Year 2 (1993/1994) Report. Fisheries Project Report No. RD 41. Province of British Columbia, Ministry of Environment, Lands, and Parks, Fisheries Branch.

Coutant, C.C. 2004. A riparian habitat hypothesis for successful reproduction of white sturgeon. Reviews in Fisheries Science 12:23-73.

Halburt, C. L. 1993. How adaptive is adaptive management? Implementing adaptive management in Washington Sate and British Columbia. Reviews in Fisheries Science 1:261–283.

Hilborn, R. 1992. Can fisheries agencies learn from experience. Fisheries 17:6–14.

Holling, C. S. 1978. Adaptive environmental assessment and management. John Wiley and Sons, New York, New York, USA.

Korman, J., C. Walters, P. Anders, C. Holderman, and S. Ireland. 2008. Draft Kootenai River Adaptive Management Plan. Report prepared for the Kootenai Tribe of Idaho. 13 pp.

Junk, W. J., P. B. Bayley, and R. E. Sparks. 1989. The flood pulse concept in river floodplain systems. Canadian Special Publication of Fisheries and Aquatic Sciences 106:110-127.

Ludwig, D., and C. J. Walters 2002. Fitting population viability analysis into adaptive management. Pages 511–520 *in* S. R. Bessinger, and D. R. McCullough, editors. Population viability analysis. University of Chicago Press, Chicago, Illinois, USA.

Partridge, F. 1983. River and stream investigations. Idaho Department of Fish and Game, Federal aid to fish and wildlife restoration, Project F-73-R-5, Subproject IV, Study IV: Kootenai River Fisheries Investigations.

Walters C. J., and R. Hilborn. 1976. Adaptive control of fishing systems. Journal of the Fisheries Research Board of Canada 33:145–159.

Walters, C. J. 1986. Adaptive management of renewable resources. McMillan, New York, New York, USA

Walters, C. 1997. Challenges in adaptive management of riparian and coastal ecosystems. Conservation Ecology [online]1(2):1 http://www.consecol.org/vol1/iss2/art1

Wilhere, G.F. 2002. Adaptive management in habitat conservation plans. Conservation Biology 16:20–29.

APPENDIX A - Kootenai River Ecosystem Adaptive Management Program - Kootenai Tribe of Idaho Draft Budget for 10 Year Period (in millions)

HABITAT - AQUATIC/TERRESTRIAL	FY08	FY09	FY10	FY11	FY12	FY13-17	TOTAL
Habitat protection, mitigation (capital) & enhancement, incl O&M	$1.70	$1.70	$3.20	$3.60	$4.20	$22.50	$36.90
Aquatic ecosystem improvements, incl. O&M	$1.00	$1.00	$1.00	$1.25	$1.25	$7.50	$13.00
Transboundary nutrient program	$0.70	$0.70	$0.75	$0.75	$0.75	$3.75	$7.40
Riparian & floodplain ecosystem rehabilitation, incl O&M	$0.50	$0.50	$0.50	$0.40	$0.40	$2.00	$4.30
White sturgeon habitat enhancement, incl. O&M, planning, data collection	$2.50	$3.00	TBD*	TBD*	TBD*	TBD*	$5.50
SUBTOTAL HABITAT AQUATIC/TERRESTRIAL	**$6.40**	**$6.90**	**$5.45**	**$6.00**	**$6.60**	**$35.75**	**$67.10**
KR ECOSYSTEM R M&E + COLLABORATION							
KR Eco. Adaptive Mgmt - Aquatic emphasis	$0.30	$0.30	$0.30	$0.30	$0.30	$1.50	$3.00
KR Eco. Adaptive Mgmt - Terrestrial emphasis	$0.70	$0.70	$0.55	$0.40	$0.40	$2.00	$4.75
Kootenai sturgeon and burbot research (critical uncertainties)	$0.80	$0.80	$0.60	$0.60	$0.50	$2.50	$5.80
Regional and community collaboration and outreach	$0.05	$0.08	$0.10	$0.10	$0.10	$0.50	$0.93
SUBTOTAL KR ECOSYSTEM R M&E	**$1.85**	**$1.88**	**$1.55**	**$1.40**	**$1.30**	**$6.50**	**$14.48**
ARTIFICIAL PRODUCTION							
Sturgeon and burbot (incl new production and hatchery M&E)	$2.00	$2.40	$3.00	$3.10	$3.10	$16.00	$29.60
Construction (capital)	$0.00	$0.00	$10.00	$5.00	$0.00	$0.00	$15.00
SUBTOTAL ARTIFICIAL PRODUCTION	**$2.00**	**$2.40**	**$13.00**	**$8.10**	**$3.10**	**$16.00**	**$44.60**
TOTAL ALL CATEGORIES	**$10.25**	**$11.18**	**$20.00**	**$15.50**	**$11.00**	**$58.25**	**$126.18**

	FY08	FY09	FY10	FY11	FY12	FY13-17	TOTAL
SUMMARY - Kootenai River Subbasin - Kootenai Tribe of Idaho							
HABITAT - AQUATIC/TERRESTRIAL	$6.40	$6.90	$5.45	$6.00	$6.60	$35.75	$67.10
KR ECOSYSTEM R M&E + COLLABORATION	$1.85	$1.88	$1.55	$1.40	$1.30	$6.50	$14.48
ARTIFICIAL PRODUCTION	$2.00	$2.40	$13.00	$8.10	$3.10	$16.00	$44.60
TOTAL ALL CATEGORIES	**$10.25**	**$11.18**	**$20.00**	**$15.50**	**$11.00**	**$58.25**	**$126.18**

Budget amounts are estimates and will be further refined during 10 year block funding negotiations

TBD - Sturgeon habitat enhancement budget amount to be determined during feasibility and design phase analysis of options - ESA obligation