



Independent Scientific Review Panel
for the Northwest Power Planning
Council

851 SW 6th Avenue, Suite 1100
Portland, Oregon 97204
isrp@nwppc.org

April 29, 2002

MEMORANDUM

TO: Mark Fritsch, Fish Production Coordinator

FROM: ISRP

SUBJECT: Preliminary ISRP Step Review - *Kalispel Tribe Resident Fish*, Project 199500100

At the Council's request, the ISRP reviewed the Step submittal for Project 199500100, *Kalispel Tribe Resident Fish*. This step submittal initiates a combined step review that addresses the construction of two rearing ponds in association with the Kalispel Tribal Hatchery. This step review is based in part to address comments provided by the ISRP (ISRP document 2001-4) and folded into the Council's Issue Summary for the Mountain Columbia provincial review. As commonly occurs in Step reviews, the ISRP requests additional information and response from the sponsor to help clarify issues before we release our final report. ISRP comments and questions are provided after each of the Kalispel Tribe's answers to the Step technical questions in their submittal attached below (look for "Reviewer Comments" and blue text). To aid the response process, the key remaining ISRP questions and concerns are extracted from the Step submittal and provided immediately below.

Reviewers require additional specific information to be able to better assess whether the proposed pond construction will enable the project to meet its goals.

1. Stocking Strategies

- Stocking goals are not consistently stated in this document: are they 100,000 fry and 50,000 fingerlings as stated as the apparent original goals, or are they 150,000 age 1⁺ fish at 150 mm in length as stated on page 4 of the current (pond construction) proposal?
- Reviewers are extremely skeptical that fry releases are appropriate, as they would probably only feed yellow perch and other predators. Are fry releases still planned? If so, please provide additional justification. The three other options appear to be (a) pond rearing through the first summer of life with fish released in autumn at about 120 mm, (b) continued pond rearing through the winter with fish released in spring at

about 150 mm, and (c) some combination of (a) and (b). Is that correct, and are those the correct expected sizes in autumn and spring?

- Will the bass released in autumn be large enough to be substantially immune from yellow perch in the reservoir, and what is the basis for that response? What is the typical size range for the adult perch in autumn (or summer)?

2. Pond Management

- For the proposed ponds to be successful, it is important that they grow juvenile bass rapidly enough with acceptable survival through that time period (either through autumn or the following spring). The key issue is whether that will happen in the newly proposed pond or ponds. Inadequate information is provided to assess that, especially because the ponds were not part of the original HGMP and the Production Procedures Handbook.
- Cannibalism will likely be the largest potential source of mortality, assuming water quality is kept in a satisfactory range. How will cannibalism be minimized? Will fish be size-graded before being placed in the ponds? Will they be graded during summer/autumn/winter? How?
- How much is it anticipated they will grow during autumn/winter/spring (based on water temperature, etc.) and what will be typical winter water temperatures?
- Are they to be fed in the new pond(s) and/or will the ponds be managed to increase natural foods (zooplankton)? What food would be used and how would it be distributed to the ponds? Would feeding occur during winter?
- Are the ponds completely drainable to ensure that no predatory fish become established and to facilitate removal of bass when ready to stock?
- Will the water source for the ponds (river pumping) be of adequate quality for good bass growth and survival during the rearing period?
- Will the existing two 1-acre sloughs continue to be used for bass rearing? It appears they might be valuable to some extent.

Program Goals and Monitoring and Evaluation

The ISRP also requests further clarification on the program's goals and monitoring and evaluation. As identified in previous ISRP comments, there is no strong basis for supplementing the bass population in the reservoir. Experiments with careful monitoring could be carried out to help conclude whether, and at what level, supplementing the population is likely to produce the desired result. However, the proposed evaluation program for supplementation is inadequate. The study is only intended to determine whether fish released as fry, fingerlings, or larger sub-adult bass, each released at different locations, will be recaptured at the same or differing rates. This assessment may

not even be possible, so the proponents need to calculate how many tags must be recovered from each group so as to detect differences between groups with acceptable confidence, and determine whether that number is reasonable given their proposed methods. Further, the study does little to shed light on the impact for the overall goal, which is to enhance the quality (more large fish presumably) of the fishery. It is possible, for example, that the supplementation will reduce the number of large fish. The previous ISRP comment that supplementation of this bass population should be carried out as a carefully designed experiment still stands.

**KALISPEL TRIBAL
HATCHERY
POND CONSTRUCTION
MODIFIED THREE-STEP PROCESS**

Prepared by:

Kalispel Tribe of Indians

Prepared for:

**NORTHWEST POWER PLANNING COUNCIL
851 S.W. SIXTH AVENUE, SUITE 1100
PORTLAND, OREGON 97204-1348**

March 6, 2002

Table of Contents

Table of Contents.....	ii
List of Tables	iii
Introduction	1
Program Language Regarding Master Planning Requirements	2
Questions Identified in the September 1997 Council policy Document for FY98 Project Funding.....	14
Program Language Identified by the ISRP.....	16
Policies of the Artificial Production Review, Report and Recommendations	17
Development schedule and estimated cost expenditures	21
Literature Cited.....	22
Appendices	26
Appendix A. Lower Pend Oreille Goals, Objectives and Strategies	A-1
Appendix B. Hatchery and Genetics Management Plan.....	A-2
Appendix C. ISRP Comments and Kalispel Tribe Response February 22, 2001.....	A-3
Appendix D. ISRP Comments and Kalispel Tribe Response April 6, 2001	A-4

List of Tables

Table 1. Fish species found within the Lower Pend Oreille subbasin7

Table 2. Summary of all fish captured, Box Canyon Reservoir, 1988-1990.19

Introduction

Beginning in fall 2001, the Kalispel Tribe expressed needs for the Kalispel Tribal Hatchery to Northwest Power Planning Council (NWPPC) staff and Columbia Basin Fish and Wildlife Authority (CBFWA). The most important need is the addition of two ponds (½ to ¾ acres apiece) for rearing fry. Presently, operations call for newly hatched fry to be transferred to two rearing sloughs for grow out. These rearing sloughs have sheet pile dams at the mouth to hold water and keep fish in the slough along with fine mesh netting. However, since the dams were constructed, the hatchery has encountered problems (e.g. aquatic weeds, flooding, unable to gather fish) with these rearing sloughs, which make it impossible to meet our annual production goals of 100,000 largemouth bass fry and 50,000 fingerlings. Many possible solutions have been tried to fix these problems, but concluded that construction of a new ponds are needed in order to meet current production goals.

During the October 16-17, 2001 Resident Fish Committee (RFC) meeting, the Kalispel Tribe requested a within-year budget modification (i.e., allocation of \$180,000 from RFC placeholder) for Project 199500100 to allow for the design and construction of two half-acre lined rearing ponds. The RFC recommended that the request be forwarded to the Members Management Group (MMG) and subsequently to the NWPPC for review during their November 7, 2001, meeting in Idaho Falls, ID. Included in the recommendation to the MMG, the RFC believed that the construction of the new rearing ponds do not require a “Three-Step Review”. The new ponds will not expand the existing program; it will only be needed to meet current program goals. The MMG supported the recommendation and forwarded the request to the NWPPC for review.

During the December 11-12, 2001 NWPPC meeting, the Council passed a within year reallocation request of not to exceed \$180,000 for two rearing ponds and recommended postponing construction approval until completion of the 3-step process. Due to the small scope of the project, NWPPC staff indicated that the 3-step process would be modified.

The 3-step process includes responses to technical questions relating to: (1) master planning requirements according to Section 7.4B of the Council’s Fish and Wildlife Program, (2) questions identified in the Fiscal Year 1998 Annual Implementation Work Plan, (3) questions involving the Fish and Wildlife Program language identified by the Independent Scientific Review Panel, and (4) questions relating to the development schedule and estimated cost expenditures and future needs of

proposed project. In addition the Artificial Production Review (APR) policies and standards that need to be addressed.

Responses to the above mentioned technical questions are provided in this report. The responses are for the project itself (pond construction). When applicable, responses to the overall hatchery program were provided.

Program Language Regarding Master Planning Requirements

Project Goals

The goal of the project is to facilitate the production and rearing of juvenile largemouth bass for supplementation and thereby increase the production of harvestable bass. The project is to construct a two ½ acre or two ¾ acre ponds. This will allow the hatchery staff to rear 150,000 swim-up fry to a tagable size. Presently, operations call for newly hatched fry to be transferred to two rearing sloughs for grow out. These rearing sloughs have sheet pile dams at the mouth to hold water and keep fish in the slough along with fine mesh netting. However, since the dams were constructed, we have encountered problems (e.g. aquatic weeds, flooding, unable to gather fish) with these rearing sloughs, which make it impossible to meet our annual production goals of 100,000 largemouth bass fry and 50,000 fingerlings. We have tried many possible solutions to fix these problems but have come to the conclusion that construction of a new pond is needed in order to meet production goals. The construction of these ponds will need to be complete by July or August of 2002 for the hatchery staff to meet annual production goals for this year.

Reviewer Comments: Stocking goals are not consistently stated in this document: are they 100K fry and 50K fingerlings as stated in the above paragraph, or are they 150K age 1⁺ fish at 150 mm as stated on page 4?

This discussion does not provide enough detail to convince reviewers that problems with the sloughs will be overcome by construction of two new ponds.

Factors limiting production of the target species

The Upper Columbia United Tribes (UCUT) Fisheries Center conducted a three-year baseline assessment from 1988 to 1990 in the Box Canyon portion of the Pend Oreille River (Ashe and Scholz 1992). The objective of this study was to examine the

existing fishery, identify fishery improvement opportunities and recommend fishery enhancement projects. Baseline data assessed population dynamics, growth rates, feeding habits, behavior patterns and factors limiting the fishery.

Based on population estimates and relative abundance surveys, yellow perch were the most abundant species in the Box Canyon Reservoir, ranging from 42% to 45% of the total fish abundance. Pumpkinseed composed 16% of the total followed by tench (9%) and largemouth bass (8%). One of the reasons for an overabundance of yellow perch in the river is low angler interest and harvest. Three of the 419 (0.72%) anglers interviewed during the study were fishing for perch. The main reason for low popularity and harvest rates of perch is their small size. The perch population in the reservoir is stunted. Yellow perch captured during the survey ranged from 24 mm to 280 mm with an overall average length of between 149mm and 151mm. Although yellow perch in the Pend Oreille River start out at about the same size as perch from similar systems, growth rates of Pend Oreille perch were much lower at every annulus. The assessment identified several factors within the reservoir that limited the fisheries opportunities within Box Canyon Reservoir. Largemouth bass are currently the largest sized gamefish in the Pend Oreille River that provide a recreational and subsistence fishery. Some of the factors resulting in a low biomass of largemouth bass in the Pend Oreille River include water elevation fluctuations that result in decreased spawning success. Low water temperatures, late spawning time and lack of cover during the winter result in low overwinter survival rates for age 0⁺ bass. This results in an inadequate recruitment of largemouth bass into the system. Age 0⁺ fish are particularly susceptible to winter stress because they often have to face their first winter with reduced energy stores and a smaller body size than older conspecifics, which may lead to increased mortality due to starvation and predation (Henderson et al. 1988; Shuter and Post 1990; Thompson et al. 1991). Winter mortality of age 0⁺ largemouth bass has been reported to be size dependent, with smaller young experiencing higher mortality (Shelton et al. 1979; Toney and Coble 1979). Miranda and Hubbard (1994) indicated that winter survival of age 0⁺ largemouth bass smaller than 126 mm (TL) was affected by the presence of predators, whereas longer fish were largely unaffected. They also suggested that survival of small largemouth bass was enhanced by shelter availability. Fullerton et al (2000) found that winter severity (temperature, duration, and photocycle), geographic origin, food availability, and initial body size likely influence growth, survival, and therefore, recruitment of age-0 largemouth bass. They also found that largemouth bass from 33°N suffered high mortality in the high-latitude winter. The average back-calculated length of age 1 largemouth bass from Box Canyon Reservoir was 3.2 in (81.6 mm). In comparison, the median length of age 1⁺ largemouth bass, based on 31 studies on various waters across the U.S., were 4.5 in (114 mm) (Zweiacker 1972). The mean annual scale increment for age 2⁺ bass from Box Canyon Reservoir was larger than that of age 1 fish although growth of largemouth bass from Box Canyon Reservoir was significantly less than other bass populations studied in the Northwest (Rieman 1987; Bennett and Hatch 1991). The increased growth of ages 2 and 3 bass may be a result of bass attaining a length where they are able to shift from a zooplankton and invertebrate diet to a higher energy piscivorous (fish eating) diet. Although growth of ages 4 and 5 largemouth bass from

Box Canyon Reservoir declined, growth was still greater than any of the populations compared, including bass from Nebraska and Missouri.

It appears that bass growth and recruitment is also limited due to competition with yellow perch for zooplankton during the first few years of life. Ouedraogo (1991) reported similar results for his feeding habit study on largemouth bass in the Pend Oreille River, suggesting the slow stunted growth of young-of-the-year bass was a result of competition for food resources with sunfish (yellow perch, pumpkinseed and black crappie).

At about age 3⁺ to 4⁺, bass became primarily piscivorous and at this time yellow perch were the primary food item in their diet (Ashe and Scholz 1992). A definite change in bass growth was seen at the same age this change in diet was observed. At about age 4⁺ bass gained 100g a year. At age 6⁺ and older, bass can handle larger fish and therefore showed an increase in weight of over 200 g a year. Despite the limiting factors, quality sized (>500mm) largemouth bass were often captured. Since yellow perch were the most abundant fish species in the reservoir food availability does not present a problem.

Results of the three-year baseline study concluded that the bass population in the river has room for expansion and there is adequate habitat for a larger population. Current production of largemouth bass in the river was estimated by constructing a population model from data collected during the study. A model of the population was constructed based on population estimates, relative abundance of each class and estimated mortality rates (Ashe and Scholz 1992).

Based on the 7400-acre area of the reservoir, production of age 1⁺ and older fish was 7.7 lbs/acre (8.6 kg/ha) in 1989 and 7.8 lbs/acre (8.7 kg/ha) in 1990. Calculated biomass for fish of a harvestable size (245 mm or 10 inches) was 5.5 lbs/acre (6.2 kg/ha) in 1989 and 5.8 lbs/acre (6.5 kg/ha) in 1990. A quality bass fishery is considered to produce 15-20 lbs/acre (Hisata, WDW, personal communication 1988). The Pend Oreille River currently produces less than half that. It appears that there is adequate food supply and habitat available in the Pend Oreille River to support a larger population, however recruitment remains a limiting factor to population expansion. The estimated size of the age class 1⁺ in 1989 and 1990 was approximately 150,000. In order to enhance the bass fishery to “quality” production we estimate it will be necessary to double this number. The goal, based on recommendations for enhancing the largemouth bass population is to contribute 150,000 age 1⁺ fish at 150 mm into the population annually.

With an outproduct of 150,000 bass fingerlings, stocking rates would be approximately 20 fry/acre. Stocking ratios of 100 largemouth bass fingerlings per acre are commonly accepted around the U.S. as indicative of approximate carrying capacity, depending on fertility of the water and forage availability (Fletcher, WDW, personal communication 1988). Therefore, stocking rates recommended for the Pend Oreille River are substantially lower than common practices in other U.S. lakes and reservoirs.

The University of Idaho conducted a similar study as UCUT from 1989 to 1990 to evaluate the fish community in Box Canyon Reservoir, sloughs and major tributaries and Power Lake (Bennett and Liter 1991). For Box Canyon Reservoir, yellow perch, pumpkinseed, and largemouth bass were game species highest in relative abundance, while northern squawfish, tench, and largescale sucker were the most abundant non-game species. Overall, yellow perch was the most abundant species in Box Canyon Reservoir but contributed little to the sport fishery. Largemouth bass comprised about 6% of the fish community. Age, growth, and mortality analyses were conducted on largemouth bass, yellow perch and black crappie. Scale increments of age 1 largemouth bass showed slow growth, while age 5 fish exhibited faster growth than bass from nearby populations in Washington and northern Idaho and two reservoirs in Nebraska and Missouri.

The study indicated that increased fisheries management will be required to improve the quality of the sport fishery. One management possibility to enhance weak year-classes would be to provide artificial recruitment after the first winter. This would circumvent the apparent high mortality that occurs during the first year. Off-site rearing may have potential to enhance the number of largemouth bass within Box Canyon Reservoir.

Reviewer Comments: This is based on some major assumptions that are not well justified. A primary issue is that hatchery bass stocked at 150 mm are large enough to avoid debilitating levels of predation from yellow perch in the reservoir. If most perch are smaller than about 450 mm, the bass would be expected to be relatively immune from that predation.

The proposal to stock more juvenile bass is based more on “hope” than on sound information. There is a tradeoff between growth and higher fish density; growth of adult bass is likely to decline as density increases. The stocking rate proposed is a guess, and could lead to lower yield of large fish. Eventually this hypothesis concerning the potential for greater yield of large fish should be tested. Experiments with suitable monitoring are needed to show effects in abundance of desirable fish caused by relatively small increments of increase in juvenile populations.

Expected project benefits

Construction of rearing ponds would allow hatchery to produce annual production goals and supplement the existing bass population in the reservoir. The supplementation of largemouth bass will also provide a sport and subsistence fishery for tribal and non-tribal members. This will help meet Goal 2 in the Fisheries Section of the Lower Pend Oreille:

“Where native habitats are not available within the main stem of the Pend Oreille River or its tributaries, manage non-native fish species or non-native stocks to maximize available habitats to provide a subsistence and recreational sport fishing resource. Non-native species are to be managed in a way that maximizes available habitat conditions and minimizes negative impacts to native species.”

Reviewer Comments: As discussed above, there is no strong basis for supplementing the bass population in the reservoir. Experiments with careful monitoring could be carried out to help conclude whether, and at what level, supplementing the population is likely to produce the desired result.

Alternatives for resolving the resource problem

To enhance the overwinter survival of the juvenile largemouth bass, the construction and placement of artificial cover structures to increase the amount of winter cover in the reservoir has taken place as part of the Kalispel Resident Fish Project. By increasing cover within the Box Canyon reservoir, it is suspected that there will be an increase in overwinter survival of age 0⁺ largemouth bass. Currently overwinter survival of 0⁺ largemouth bass ranges from 0.4 - 3.9 percent (Ashe and Scholz 1992; Bennett and Liter 1991). Bennett and Liter (1991) suspected that poor overwinter survival of age 0⁺ largemouth is partially due to the lack of cover during the winter months. Adding artificial structures has been shown to improve fish habitat and increase local productivity and growth (Prince and Maughan 1979; Wege and Anderson 1979). These structures may increase productivity and growth, in that, they provide essential wintering habitat for bass (Carlson 1992).

Reviewer Comments: Is this (structure placement) proposed, or not proposed? If juveniles are planted from the hatchery and cover is added in the hope that overwinter survival will be enhanced, how will you monitor the results to separate any effects of these two treatments?

Rationale for the proposed project

At this time the hatchery staff has nowhere to rear largemouth bass fry. Presently, operations call for newly hatched fry to be transferred to two rearing sloughs for grow out. These rearing sloughs have sheet pile dams at the mouth to hold water and keep fish in the slough along with fine mesh netting. However, since the dams were constructed, we have encountered problems (e.g. aquatic weeds, flooding, unable to gather fish) with these rearing sloughs, which make it impossible to meet our annual production goals of 100,000 largemouth bass fry and 50,000 fingerlings. Recently I have discussed with you some of the needs of the Kalispel Tribal Hatchery. The most important is the addition of a one-acre pond for rearing our fry. We have tried many possible solutions to fix these problems but have come to the conclusion that construction of a new pond is needed in order to meet production goals.

Reviewer Comments: Is the request for one 1-A pond or for two smaller ponds? What is the basis for annual production goals? In the absence of experimental data to show need for supplementation, what is the basis for the numerical goal?

How the proposed production project will maintain or sustain increases in production

As of now the hatchery has not been able to meet our annual production goals. This is primarily a result of not having adequate rearing space. Therefore, there have not been any increases in production.

Reviewer Comments: Too brief to evaluate.

Historical and current status of anadromous and resident fish in the sub-basin

Historically, the Kalispel Tribe relied heavily upon anadromous fish in the Upper Columbia River and its major tributaries. The Kalispel Tribe made annual fishing trips below Big Eddy Canyon (Lower Pend Oreille) for the specific purpose of catching salmon (Sholz et al 1985). The Pend Oreille River was reported to have supported anadromous runs of chinook salmon, (*Oncorhynchus tshawytscha*), and steelhead trout, (*O. mykiss*). However, these fish were restricted primarily to the lower reaches of the Pend Oreille River due to natural fish barriers at Z canyon (river mile 18) (Bennett and Falter 1985), and Metaline Falls (river mile 27) (Bennett and Falter 1992; D. Bennett, University of Idaho, personal communication). Scholz et al (1985) provides evidence that some salmon and steelhead were able to ascend the Pend Oreille River to Albeni Falls. The Kalispel Tribe also fished for salmon at Kettle Falls, Little falls (Spokane River), Spokane Falls, and Little Spokane River. The construction of the Columbia River hydro-system, specifically Chief Joseph and Grand Coulee Dams, has eliminated upstream anadromous fish migrations from Kalispel ceded waters and traditional fishing sites. Not only was reliance upon anadromous fish for subsistence eliminated, the Kalispel Tribe also suffered cultural loss in the sense that the fish were also put to ceremonial, religious and other cultural uses.

Resident fish were at least as, if not more important to the Kalispel Tribe than anadromous fish (Bonga 1978, Smith 1983, 1985). Gilbert and Everman (1895) reported that in 1894 bull trout were abundant in the Pend Oreille River. Specimens as long as twenty-six inches long and weighing five pounds or more were not uncommon. Since the construction of Box Canyon and Albeni Falls Dams, the Pend Oreille River has changed from a cold-water fishery (i.e., predominately salmonids) to a warm-water fishery (i.e., primarily centrarchids). These changes have drastically decreased native fish populations; specifically bull trout and westslope cutthroat trout. An estimated 27 fish species are found within the Lower Pend Oreille subbasin (Table 1).

Table 1. Fish species found within the Lower Pend Oreille subbasin

Common Name	Genus species	Native
Bull trout	<i>Salvelinus confluentus</i>	Yes
Westslope cutthroat trout	<i>Oncorhynchus clarki lewisi</i>	Yes
Rainbow trout	<i>Oncorhynchus mykiss</i>	No
Brook trout	<i>Salvelinus fontinalis</i>	No
Brown trout	<i>Salmo trutta</i>	No
Mountain whitefish	<i>Prosopium williansoni</i>	Yes
Pygmy whitefish	<i>Prosopium coulteri</i>	Yes
Lake whitefish	<i>Coregonus clupeaformis</i>	No
Kokanee	<i>Oncorhynchus nerka</i>	No
Lake trout	<i>Salvelinus namaychush</i>	No
Smallmouth bass	<i>Micropterus dolomieu</i>	No
Largemouth bass	<i>Micropterus salmoides</i>	No
Yellow perch	<i>Perca flavescens</i>	No
Walleye	<i>Stizostedion vitreum vitreum</i>	No
Black bullhead	<i>Ictalurus melas</i>	No
Brown bullhead	<i>Ictalurus nebulosus</i>	No
Northern pike	<i>Esox lucius</i>	No
Northern pikeminnow	<i>Ptychocheilus oregonensis</i>	Yes
Peamouth	<i>Mylocheilus caurinus</i>	Yes
Redside shiner	<i>Richardsonius balteatus</i>	Yes
Tench	<i>Tinca tinca</i>	No
Sculpin (various species)	<i>Cottus spp.</i>	Yes
Pumpkinseed	<i>Lepomis gibbosus</i>	No
Black crappie	<i>Pomoxis nigromaculatus</i>	No
Burbot	<i>Lota lota</i>	Yes
Largescale sucker	<i>Catostomus macrocheilus</i>	Yes
Longnose sucker	<i>Catostomus catostomus</i>	Yes

Bull Trout

Bull trout were once abundant in the Pend Oreille River (Gilbert and Evermann 1895). Fish as large as 66 cm (26 in) long and weighing 1.9 kg (5 pounds) or more were in the possession of individual Kalispel tribal members (Gilbert and Evermann 1895).

However, due to factors such as degraded habitat, loss of connectivity, and non-native fish introductions, bull trout populations in the Lower Pend Oreille subbasin are low. Currently, only small remnant bull trout populations are found in the following tributaries: Indian Creek, East Branch LeClerc Creek, West Branch LeClerc Creek, Fourth of July Creek, Mill Creek, Cedar Creek, Sullivan Creek, the mouth of Slate Creek, and the South Fork of the Salmo River. It is suspected that the majority of these remaining populations are resident and not adfluvial.

Since 1998, the Kalispel Tribe has implemented an adfluvial trapping program on priority tributaries to Box Canyon Reservoir. Only one bull trout was found in the trap and may have come from Trestle Creek, a tributary to Lake Pend Oreille, since it had an adipose fin clipped. Many tributaries to the Pend Oreille River have not been surveyed to determine bull trout presence or absence.

Only a few bull trout have been found in the mainstem Pend Oreille River (Ashe *et al.* 1991, Bennett and Liter 1991). The Kalispel Tribe has done extensive electrofishing in Box Canyon Reservoir since 1997 and has not found any bull trout.

Westslope Cutthroat Trout

Westslope cutthroat trout in the Lower Pend Oreille subbasin are primarily the resident form residing in the tributaries. Some of the fish exhibit their migratory form as they are found in the reservoir and observed in adfluvial traps.

There has been some debate as to the origin of these westslope cutthroat trout populations. Behnke (1992) concluded that the historic distribution of westslope cutthroat trout in the Clark Fork/Pend Oreille drainage extended downstream only as far as Albeni Falls Dam. Williams (1998) believed that the historic distribution actually extended as far downstream as Metaline Falls, suggesting that the cutthroat trout populations in the tributaries of the lower Pend Oreille River above Metaline Falls were native. Extensive stocking of both westslope cutthroat trout and Yellowstone cutthroat trout in these tributaries adds doubt as to the origins of these populations (Williams 1998; WDFW unpublished hatchery records).

In 1999, WDFW collected genetic information for westslope cutthroat trout in eight Pend Oreille tributaries below Box Canyon Dam. The results indicated that genetically distinct populations of westslope cutthroat trout occurred in Pend Oreille tributaries. The results also failed to detect introgression by any of the hatchery strains of cutthroat trout examined, except in Slate Creek, which supports the conclusion by Williams (1998) that the populations were native (McLellan 2000).

Rainbow Trout

It is unknown if rainbow trout are native to the Pend Oreille River or introduced, but there is speculation that some may be native redband trout. Rainbow trout found in the Pend Oreille River and its tributaries are likely descendants of hatchery plantings in

the early 1930's through the early 1950's. In what is now Box Canyon Reservoir, 226,328 rainbow trout were planted from 1935 to 1953.

Managers may also want to re-evaluate current rainbow trout stocking in the Pend Oreille River (Williams 1998). Rainbow trout have been documented to hybridize with cutthroat trout (Reinitz 1977; Leary *et al.* 1996). Not all of the cutthroat trout populations surveyed in this study occur above fish passage barriers, so planting rainbow trout in the Pend Oreille River may expose native westslope cutthroat trout to introgression.

Brook Trout

Eastern brook trout are non-native and are the principle fish species in most tributaries. This is due, in part, to an extensive stocking program by WDFW from the 1930's to the early 1990's. Brook trout inhabit areas where the habitat is disturbed from land use practices. Behnke (1979) described how clearcutting along two streams in the Smith River drainage of Montana increased erosion, sediment loads, and water temperatures; the westslope cutthroat trout population was eliminated in the disturbed area, and brook trout was the principle species. Of all the factors threatening bull trout and westslope cutthroat trout, hybridization and interspecific competition with introduced salmonids are the most detrimental (Liknes and Graham 1988, Markle 1992).

Brown Trout

Brown trout were introduced to the Pend Oreille River via plantings in the 1890's from an original Scottish strain (Hisata, as cited in Ashe and Scholz 1992). Brown trout populations appear to be the most common adfluvial species as they can tolerate warmer temperatures. Brown trout are regularly seen in the Pend Oreille River and in some of the tributaries. Data collected during the two years of adfluvial trapping indicated that the streams likely to contain adfluvial populations included Indian Creek, Skookum Creek, and Cee Cee Ah Creek.

Previous investigations by the University of Idaho (Bennett and Liter 1991; Bennett and Garrett 1994) and Eastern Washington University (Ashe and Scholz 1992) describe the fisheries resources in Box Canyon Reservoir and its tributaries. Trout, although present in the reservoir, comprised less than 1% of the total fish captured using electroshocking, gillnetting, and seining methods. Brown trout were the most abundant, with 492 captured from 1988 to 1990. The WDFW annually stocks approximately 167,000 rainbow trout, 127,000 westslope cutthroat trout, and 14,000 eastern brook trout.

Mountain Whitefish

Mountain whitefish are native to the Lower Pend Oreille subbasin. Previous investigations by the University of Idaho (Bennett and Liter 1991; Bennett and Garrett 1994) and Eastern Washington University (Ashe and Scholz 1992) found that mountain whitefish were the most numerous salmonid in Box Canyon Reservoir, with 4,385

captured (5.4% of the total). Mountain whitefish are also found in tributaries to the Pend Oreille River.

Largemouth Bass

Bennett and LITER (1991), Bennett and Garrett (1994), and Ashe and Scholz (1992) found that largemouth bass are the fourth most common species in Box Canyon Reservoir. Over the past several decades, the largemouth bass fishery has received increasing interest from local Spokane fishing clubs and has become an important fishery for tribal and non-tribal members.

Ashe (1991) indicated that largemouth bass growth rates during the first four years in Box Canyon Reservoir were lower than bass from other locations in the northern U.S. and, conversely, growth rates after the fourth year were comparable or even higher than those in other locations. Slower growth combined with a high rate of juvenile mortality associated with overwintering has reduced the potential for the bass population within the reservoir.

Non-Native Fish

Non-native fish species have been introduced into the Pend Oreille River and its tributaries. Northern pike have migrated downstream from the Clark Fork River, Montana. Walleye were planted by WDFW in 1983 and 1984 (500,000 and 253,000 larvae, respectively) (Bennett and LITER 1991). The WDFW also planted 148-tagged adult walleye in 1987 (WDFW, Spokane, as cited in Ashe and Scholz 1992). During the course of past fisheries studies, several anglers reported catching walleye, but there were no confirmed sightings of walleye, nor were there any walleye caught during the fisheries studies (Ashe and Scholz 1992; Bennett and LITER 1991).

The data collected by Bennett and LITER (1991), Bennett and Garrett (1994), and Ashe and Scholz (1992) indicate that the most abundant game species in the reservoir are yellow perch (37% of the total), pumpkinseed (21.1%), largemouth bass (7.7%), and black crappie (2.2%). The most abundant non-game species is tench (7.6% of the total) (Bennett and LITER 1991; Ashe and Scholz 1992).

Reviewer Comments: Presumably the possibility of impact on bull trout by the bass hatchery program would be negligible? Has that been agreed upon previously in the bass hatchery construction process?

The above statement (“Slower growth combined with a high rate of juvenile mortality associated with overwintering has reduced the potential for the bass population within the reservoir.”) is written as fact, but indeed it is a hypothesis.

Current and planned management of anadromous and resident fish in the sub-basin

The Kalispel Natural Resource Department (KNRD) *Fish and Wildlife Management Plan* (Plan) is a comprehensive accumulation of present and future KNRD resource direction based upon the Kalispel Tribe's management authorities within its ceded lands. These authorities are based on federal law, tribal resolution, and agreements between the Tribe and other resource management agencies. The Plan identifies resource mission statements that are supported by specific goals and objectives. The Plan will direct each division's development of annual work plans. Strategies are developed annually and drive each division's on-the-ground activities to achieve its stated mission. It is important for the Tribe to actively manage resources within its ceded lands and provide management recommendations to attain resource improvement goals. The KNRD's approach is to manage sustainable native populations and habitats using watershed management principles. Non-native populations and/or artificial habitat management will be addressed based upon population health, habitat condition, and feasibility. The Tribe entered into an MOU with Washington Department of Fish and Wildlife for cooperative management of fishery resources of the Pend Oreille River and its tributaries.

The US Fish and Wildlife Service (USFWS) is the primary federal agency responsible for the conservation, protection, and enhancement of migratory birds, endangered species, and resident fish. The USFWS administers and manages the Little Pend Oreille National Wildlife Refuge. To protect and enhance fish and wildlife habitat, the USFWS reviews land management plans and permit applications for activities such as timber harvest, stream alteration, and hydroelectric projects. The USFWS is developing a draft recovery plan for bull trout for the Northeast Washington Recovery Unit. The area encompasses the mainstem Columbia River and all tributaries above Chief Joseph Dam up to the Canadian border, Spokane River and its tributaries upstream to the Washington/Idaho border, and the Pend Oreille River and its tributaries from the Canadian border upstream to Albeni Falls Dam. The overall goal for bull trout recovery in the Northeast Washington recovery unit is to "Ensure the long-term persistence of self-sustaining complex interacting groups of bull trout distributed within the Northeast Washington recovery unit".

The Pend Oreille Subbasin Summary also states goals and objectives for the subbasin. Appendix A includes the goals, objectives, strategies, and recommended actions for the Lower Pend Oreille.

Reviewer Comments: OK

Consistency of proposed project with Council policies, National Marine Fisheries Service recovery plans, other fishery management plans, watershed plans and activities

The proposed project is consistent with the 2000 Fish and Wildlife Program. The overall vision of the Fish and Wildlife Program states that: "*There is an obligation to provide fish and wildlife mitigation where habitat has been permanently lost due to*

hydroelectric development. Artificial production of fish may be used to replace capacity, bolster productivity, and alleviate harvest pressure on weak, naturally spawning resident and anadromous fish populations.” The 2000 Fish and Wildlife Program also states the following:

“If the potential for restoring the natural production of the habitat is low, or the biological potential of the target population is low because of survival problems elsewhere in its life cycle, the area may become a candidate for certain types of artificial production.”

“Eliminated habitat: Where habitat for a target population is irreversibly altered or blocked, and therefore there are no opportunities to rebuild the target population by improving its opportunities for growth and survival in other parts of its life history, then the biological objective will be to provide a substitute. In the case of wildlife, where the habitat is inundated, substitute habitat would include setting aside and protecting land elsewhere that is home to a similar ecological community. For fish, substitution would include an alternative source of harvest (such as a hatchery stock) or a substitution of a resident fish species as a replacement for an anadromous species.”

Substitution for Anadromous Fish Losses

“Part of the anadromous fish losses has occurred in the blocked areas. A corresponding part of the mitigation for these losses must occur in those areas. The program has a "Resident Fish Substitution Policy" for areas in which anadromous fish have been extirpated. Given the large anadromous fish losses in the blocked areas, these actions have not mitigated these losses.”

Production objectives, methods and strategies

See Appendix B (Hatchery and Genetics Management Plan)

Reviewer Comments: See other comments

Broodstock selection and acquisition strategies

See Section 5, 6, and 7 of Appendix B (Hatchery and Genetics Management Plan)

Reviewer Comments: See other comments

Rational for the number and life-history stage of the fish to be stocked, particularly as they relate to the carrying capacity of the target stream and potential impact on other species;

A hatchery would bypass the factors currently limiting hatching success of largemouth bass in the river; water level fluctuation causing nest abandonment and nest

dewatering, predation caused by nest abandonment due to angler removal of parent. Our data supports the hypothesis that there is sufficient habitat to support a much larger bass population. Calculated biomass for fish of a harvestable size was 5.5 lbs/acre (6.2 kg/ha) in 1989 and 5.8 lbs/ha) in 1990. Our biological objective is to double current biomass production in an attempt to achieve a quality bass fishery, which typically produce about 15-20 lbs/acre (Hisata, pers. Comm.). Current production (natural) of the first year class of bass is estimated to be 150,000, so supplementing the population with an additional 150,000 fish would effectively double current population. We propose stocking 100,000 fry and 50,000 fingerlings to determine which size of fish reflects the best growth, survival and predation rates once they are stocked into the river. An increase in the bass population should decrease the number of perch and pumpkinseed, as a result of predation. A decrease in the perch population would decrease the intraspecific competition and increase the size of perch in the river.

Also see Section 1.8 of Appendix B (Hatchery and Genetics Management Plan)

Reviewer Comments: Information describing the magnitude and timing of reservoir surface fluctuation would have been helpful to back up the assertion that it (fluctuation) is the primary cause of poor bass recruitment.

The desire to double current bass biomass appears arbitrary and without any basis. Given the geographic location and reservoir management, how safe is it to assume that 15-20 lbs/acre applies? What evidence exists to provide confidence that even if attain 15-20 lbs/acre it will provide a “quality bass fishery?” Shouldn’t the goal of this project be to provide a quality bass fishery rather than to double the lbs/acre? Different adaptive management strategies would apply depending on which of these goals is driving the program.

Production profiles and release strategies

See Section 9 of Appendix B (Hatchery and Genetics Management Plan)

Reviewer Comments: See other comments.

Production policies and procedures

See Attachment A of Appendix B (Hatchery and Genetics Management Plan)

Reviewer Comments: See other comments

Production management structure and process

See Attachment A of Appendix B (Hatchery and Genetics Management Plan)

Reviewer Comments: See other comments

Monitoring and evaluation plans, including a genetics monitoring plan

See Attachment A and B of Appendix B (Hatchery and Genetics Management Plan)

Reviewer Comments: The evaluation program for supplementation is inadequate. The study is only intended to determine whether fish released as fry, fingerlings, or fingerlings+, each released at different locations will be recaptured at the same or differing rates. This assessment may not even be possible so the proponents need to calculate how many tags must be recovered from each group so as to detect differences between groups with acceptable confidence, and determine whether that number is reasonable given their proposed methods. Further, the study does little to shed light on the impact for the overall goal, which is to enhance the quality (more large fish presumably) of the fishery. It is possible, for example, that the supplementation will reduce the number of large fish. The previous ISRP comment that supplementation of this bass population should be carried out as a carefully designed experiment still stands.

Conceptual design of the proposed production and monitoring facilities, including an assessment of the availability and utility of existing facilities

The ponds are to be ½ - ¾ acre each in size. They should have a concrete kettle, pond liners, and predator netting. A subcontractor through B.P.A will complete final design. The ponds will be adjacent to the existing effluent ponds and will tie into the water lines. The effluent from the ponds will also tie into existing effluent ponds.

Reviewer Comments: Can the ponds be completely drained? Will fish be fed? Size grading?

Cost estimates for various components, such as fish culture, facility design and construction, monitoring and evaluation, and operation and maintenance

Cost estimate for facility design is approximately \$20,000. Construction will be approximately \$160,000. The operation and maintenance of these ponds will not increase the current annual operation and maintenance of the Kalispel Tribal Hatchery.

Reviewer Comments: No comments.

Questions Identified in the September 1997 Council policy Document for FY98 Project Funding

Has the project been the subject of appropriate independent scientific review in the past? If so, how has the project responded to the results of independent review?

The Kalispel Tribe has responded to ISRP comments through the Mountain Columbia Provincial review. See Appendix C and D for specific ISRP comments and responses by the Kalispel Tribe.

Reviewer Comments: Appendix D dealt with trout issues. Appendix C describes how survival of various groups of tagged fish would be monitored (see above comment).

Have project sponsors demonstrated adequately at earlier stages that the project is consistent the Council's policies on artificial/natural production in section 7 (the specific concern of the panel)? If not, can these points be demonstrated now?

The construction of 2 rearing ponds is consistent with Council policies.

Reviewer Comments: No comment.

Is the final design of the project consistent with any master plan and preliminary design?

No, final design is not completed.

Reviewer Comments: No comment.

If not, do the changes raise any underlying scientific questions for further review?

No

Reviewer Comments: OK

Has information about the project or its purposes changed in a way to raise new scientific concerns?

No

Reviewer Comments: OK

Has the underlying science or the way it is understood changed so as to raise new scientific issues?

No

Reviewer Comments: OK

How technically appropriate are the monitoring and evaluation elements of the project?

Please see attachment A and B of Appendix B (Hatchery and Genetics Management Plan)

Reviewer Comments: See other comments.

Are there ways to obtain the same production benefits with facilities that are lower in cost or less permanent, should monitoring and evaluation later indicate that the effort be abandoned?

No, the hatchery program was designed as a low cost/low capital facility.

Reviewer Comments: This is a relatively low cost production facility. However, sponsors of the original proposal were confident that project goals could be met with rearing in the sloughs. Was that a faulty engineering assessment? Have engineers concluded that the sloughs are unsuitable and unfixable?

Program Language Identified by the ISRP

Measure 7.0D: Comprehensive environmental analysis assessing the impacts on naturally produced salmon of hatchery produced anadromous fish.

Not applicable

Reviewer Comments: OK

Measure 7.1A: Evaluation of carrying capacity and limiting factors that influence salmon survival.

Not applicable

Reviewer Comments: OK

Measure 7.1C: Collection of population status, life history and other data on wild and naturally spawning populations of salmon and steelhead.

Not applicable

Reviewer Comments: OK

Measure 7.1F: Systemwide and cumulative impacts of existing and proposed artificial production projects on the ecology, genetics and other important characteristics of the Columbia River Basin anadromous and resident fish.

See Section 5 and 6 of Appendix B (Hatchery and Genetics Management Plan)

Reviewer Comments: What about bull trout impacts?

Policies of the Artificial Production Review, Report and Recommendations (Document 99-15)

1. *The manner of use and the value of artificial production must be considered in the context of the environment in which it will be used.*

The fish community in Box Canyon Reservoir has a diverse species composition that does not resemble the historic native fishery. Prior to 1958, the Pend Oreille River was primarily a cold-water fishery with trout composing most of the creel (Ashe and Scholz 1992). This strong cold-water fishery dominated by trout depended on a system structured with favorable salmonids habitat (e.g., pools, runs, riffles), excellent water quality, cold-water temperatures, and connectivity between rivers and tributaries. However, as a result of impoundment, each of these factors has been affected in one way or another and has resulted in changes to the fish community.

Changes in the physical conditions since the impoundment of the Box Canyon Reservoir, especially elevated temperatures, increased depth, and decreased velocities, have eliminated habitat favorable to cold-water adapted, native trout species. In its place, habitat has been created that benefits warm-water fish species. The fishery is now dominated by exotic stunted yellow perch that make up 40-45 percent of the population (Ashe and Scholz 1992). The next two species in dominance are the introduced pumpkinseed and tench. It is estimated that exotic warm water fish made up some 80 percent of 1988-1990 populations with natives comprising the remaining 20 percent (Barber *et al.* 1990, Ashe *et al.* 1991). The trout community, comprised of brown trout, cutthroat trout, rainbow trout, bull trout, and brook trout, make up less than 1% of the species composition in the reservoir (Ashe and Scholz 1992; Bennett and LITER 1991).

Changes in habitat conditions within the Box Canyon Reservoir since impoundment have favored warm water species (predominately centrarchids) and inhibited the native species assemblages that were more adapted to cooler, pre-impoundment conditions (Bennett and LITER 1991). Largemouth bass habitat suitability curves indicate that habitat preference is optimum at zero velocity and drop to completely unsuitable at velocities over 0.66 feet per second (Stuber, Gebhart, and Maughan 1982). In short, the dominant fish community of the Box Canyon Reservoir has a clear preference for zero velocities and is not at all characteristic of a “free flowing” river. Weedbeds and fine sediments provide cover preferred by these species and spawning habitat for yellow perch (Ashe and Scholz 1992).

Largemouth bass, an introduced species, have become the primary sport fish in Box Canyon Reservoir. Largemouth bass spawn in the shallow shoreline areas and in the mouths of sloughs, but utilize a wide range of depths and cover combinations within Box Canyon Reservoir (Ashe and Scholz 1992). Data indicates relatively good results on bass tournaments for the reservoir compared to other tournaments in Washington State (Ashe and Scholz 1992). However, growth rates are low, production is low and mortality of bass through the first winter is high (Ashe and Scholz 1992). Temperature conditions in

the reservoir are not optimum as the growing season is relatively short and cool in spring and fall for bass. The bass populations are also limited by water level fluctuations during incubation, angler over-harvest, lack of cover during winter, and high macrophyte densities that reduce predation success and increase energy expenditure during hunting (ICD 1997).

Yellow perch, one of the more common non-native species in Box Canyon Reservoir, are the preferred forage for adult largemouth bass (Bennett and Liter 1991). Yellow perch have reached large numbers within the Box Canyon Reservoir but competition, compounded by dense macrophytes, may be limiting their size and condition. Presently, the effect of predation on yellow perch by largemouth bass is small because of the low predator to prey ratio. Age 0 yellow perch compete directly with young largemouth bass for food and cover, but the low growth rate observed for yellow perch is probably due to intraspecific rather than interspecific competition (Bennett and Liter 1991). Bennett and Liter (1991) found that yellow perch preferred the less common, open areas within the macrophyte colonies. Perch may also be limited by water level fluctuations during their spawning and incubation as they use shallow weedbeds for nesting like largemouth bass.

Reviewer Comments: It seems apparent that largemouth bass are poorly suited for the reservoir.

2. Artificial production must be implemented within an experimental, adaptive management designs that includes an aggressive program to evaluate benefits and address scientific uncertainties.

Please refer to Attachment B (Largemouth bass supplementation study)

Reviewer Comments: See other comments.

3. Hatcheries must be operated in a manner that recognizes that they exist within ecological systems whose behaviors is constrained by larger-scale basin, regional and global factors.

See response to #1.

Reviewer Comments: See other comments.

4. A diversity of life history types and species need to be maintained in order to sustain a system of populations in the face of environmental variation.

The Box Canyon Reservoir has a wide variety of fish species. Approximately 78.6% of the fish composition is made of non-native species. Table 2 shows a summary of all fish captured in Box Canyon Reservoir from 1988 to 1990. This is due primarily in part to the highly altered environment and past non-native fish stockings and introductions.

Table 2. Summary of all fish captured, Box Canyon Reservoir, 1988-1990.

Species	Number captured	Percentage
Yellow Perch	30,265	37.0%
Pumpkinseed	17,249	21.1%
Largemouth bass	6,294	7.7%
Tench	6,180	7.6%
Northern pikeminnow	5,679	6.9%
Largescale sucker	4,416	5.4%
Mountain whitefish	4,385	5.4%
Longnose sucker	1,860	2.3%
Black crappie	1,808	2.2%
Brown bullhead	1,273	1.6%
Peamouth	933	1.1%
Brown trout	492	0.6%
Black bullhead	464	0.6%
Redside shiner	159	0.2%
Rainbow trout	112	0.1%
Kokanee	58	0.1%
Sculpin	53	0.1%
Brook trout	11	0.0%
Bull trout	6	0.0%
Lake trout	5	0.0%
Goldfish	1	0.0%

Reviewer Comments: Hopefully, walleye are in fact not present and will never be present or any success of the bass hatchery program will be threatened.

5. Naturally selected populations should provide the model for successful artificially reared populations, in regard to population structure, mating protocol, behavior, growth, morphology, nutrient cycling, and other biological objectives.

The Kalispel Tribal hatchery uses only broodfish from the natural population to meet annual production goals. See Section 5 and 6 of Appendix B (Hatchery and Genetics Management Plan).

Reviewer Comments: OK

6. *The entities authorizing or managing a artificial production facility or program should explicitly identify whether the artificial propagation product is intended for the purpose of augmentation, mitigation, restoration, preservation, research, or some combination of those purposes for each population of fish addressed.*

The purpose and goal of the hatchery program is a mitigation hatchery. See Section 1.1 and 1.2 of Appendix B (Hatchery and Genetics Management Plan).

Reviewer Comments: OK

7. *Decisions on the use of artificial production tool need to be made in the context of deciding on fish and wildlife goal, objectives and strategies at the sub-basin and province levels.*

The project is consistent with goals, objectives, and strategies and recommend actions of the Pend Oreille Subbasin Summary. Appendix A includes the goals, objectives, strategies, and recommended actions for the Lower Pend Oreille.

Reviewer Comments: OK

8. *Appropriate risk management needs to be maintained in using the tool of artificial propagation.*

See Section 10.2 of Appendix B (Hatchery and Genetics Management Plan).

Reviewer Comments: See other comments.

9. *Production for harvest is a legitimate management objective of artificial production, but to minimize adverse impacts on natural populations associated with harvest management of artificially produced populations, harvest rates and practices must be dictated by the requirements to sustain naturally spawning populations.*

Not applicable

Reviewer Comments: Why is it not applicable?

10. *Federal and other legal mandates and obligations for fish protection, mitigation, and enhancement must be fully addressed.*

See Section 10 of Appendix B (Hatchery and Genetics Management Plan).

Reviewer Comments: Potential bull trout impact?

Development schedule and estimated cost expenditures

Schedule for Development

Facility	Step 1 completed	Step 2 completed	Step 3 completed	Final Design Completed	Construction Initiated	Construction Completed	Operation Begins
Ponds	June 2002	June 2002	June 2002	June 2002	July 2002	September 2002	September 2002

FY	02	03	04	05	06	07	08	09	10
Planning	\$20,000	0	0	0	0	0	0	0	0
Land Purchase	0	0	0	0	0	0	0	0	0
Construction	\$160,000	0	0	0	0	0	0	0	0
O&M*	0	0	0	0	0	0	0	0	0
M&E	0	0	0	0	0	0	0	0	0

* The operation and maintenance of these ponds will not increase the current annual operation and maintenance of the Kalispel Tribal Hatchery.

BPA is hiring a contractor on task order to complete the design of the ponds.

Literature Cited

- Ashe, B.L., K.L. Lillengreen, J.J. Vella, L.O. Clark, S. Graves, M.R. Barber, G.J. Nenema, Jr., and A.T. Scholz. 1991. Assessment of the fishery improvement opportunities on the Pend Oreille River. Upper Columbia United Tribes Fisheries Center, Dept. of Biology, Eastern Washington Univ., Cheney. Prepared for U.S. Dept. of Energy, Bonneville Power Administration, Division of Fish and Wildlife. Project No. 88-66, Agreement DE-A179-88BP39339.
- Ashe, B.L. and A.T. Scholz. 1992. Assessment of the Fishery Improvement Opportunities in the Pend Oreille River. Final Report. Upper Columbia United Tribes Fisheries Center, Dept. of Biology, Eastern Washington Univ., Cheney. Prepared for U.S. Dept. of Energy, Bonneville Power Administration, Division of Fish and Wildlife. Project No. 88-66, Agreement DE-179-88BP39339.
- Barber, M.R., B.L. Renberg, J.J. Vella, A.T. Scholz, K.L. Woodward, and S. Graves. 1990. Assessment of the Fishery Improvement Opportunities in the Pend Oreille River. 1989 Annual Report. Upper Columbia United Tribes Fisheries Center, Dept. Of Biology, Eastern Washington Univ., Cheney. Prepared for U.S. Dept. Of Energy, Bonneville Power Administration, Div. Of Fish and Wildlife. Project No. 99-66, Agreement DE-179-88BP39339.
- Behnke, R.J. 1979. The native trouts of the genus *Salmo* of western North America. Report to U.S. Fish and Wildlife Service, Denver, Colorado.
- Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society, Monograph 6, Bethesda, Maryland.
- Bennett, D.H. and C.M. Falter. 1985. Environmental impact statement for Ponderay Newsprint Company. Ponderay Newsprint Company, Usk, WA.
- Bennett, D.H. and D. Hatch. 1991. Factors limiting the fish community with emphasis on largemouth bass in Long Lake, Spokane County, Washington. Completion Report, Project No. 4. Washington Water Power Company, Spokane.
- Bennett, D.H. and M. Liter. 1991. Water quality, fish and wildlife characteristics of Box Canyon Reservoir, Washington. Fish Completion Report 1989-1990, Section 3: Department of Fish and Wildlife Resources College of Forestry, Wildlife and Range Sciences University of Idaho, Prepared for the Public Utility District No. 1 of Pend Oreille County, Washington July 1991. 94 pp.
- Bennett, D.H. and C.M. Falter. 1992. Letter to Dr. Allan Scholz, Eastern Washington University, Cheney. May 29, 1992.

- Bennett, D.H. and J.W. Garrett. 1994. Abundance and habitat use of Box Canyon Reservoir, Pend Oreille River, Washington and tributaries by trout with emphasis on brown trout. Completion report 1992-1993. Dept. of Fish and Wildlife res., College of Forestry, Wildlife and Range Sci., University of Idaho, Moscow. Prepared for the Public Utility District No. 1 of Pend Oreille County, Washington. Sept. 1994.
- Bonga, D. 1978. Kalispel Indians: A fishing tribe. Kalispel Tribe internal report.
- Carlson, D.M. 1992. Importance of winter refugia to the largemouth bass fishery in the Hudson River Estuary. *Journal of Freshwater Ecology* 7(2):173-180.
- Fullerton, A.H., J.E. Garvey, R.A. Wright, and R.A. Stein. 2000. Overwinter growth and survival of largemouth bass: interactions among size, food, origin, and winter severity. *Transactions of the American Fisheries Society*. 129:1-12.
- Gilbert, C.H. and B.W. Evermann. 1895. A report on investigations in the Columbia River Basin with descriptions of four new species of fish. *Bulletin U.S. Fish Commission* 14:169-207.
- Henderson, P.A., H.A. Holmes, and R.N. Bamber. 1988. Size-selective overwintering mortality in the sand smelt *Atherina bayeria* Risso, and its role in population regulation. *Journal of Fish Biology* 33:221-233.
- Leary, R. F., W. R. Gould, and G. K. Sage. 1996. Success of basibranchial teeth in indicating pure populations of rainbow trout and failure to indicate pure populations of westslope cutthroat trout. *North American Journal of Fisheries Management* 16:210-213.
- Liknes, G.A. and P.J. Graham. 1988. Westslope cutthroat trout in Montana: life history, status, and management. *American Fisheries Society Symposium* 4:53-60.
- Markle, D. F. 1992. Evidence of bull trout x brook trout hybrids in Oregon. Proceedings of the Gearhart Mountain Bull Trout Workshop, Oregon Chapter of the American Fisheries Society.
- McLellan, J. G. 2000. 1999 WDFW annual report for the project Resident Fish Stock Status Above Chief Joseph and Grand Coulee dams. *In press*. Report to U.S. Department of Energy, Bonneville Power Administration, Division of Fish and Wildlife, Contract No. 97-BI-35900.
- Miranda, L.E. and W.D. Hubbard. 1994. Winter survival of age-0 largemouth bass relative to size, predators, and shelter. *North American Journal of Fisheries Management*. 14:790-796.
- Ouedraogo, P.S. 1991. The food habits of largemouth bass (*Micropterus salmoides*) in the Pend Oreille River (Box Canyon), Pend Oreille County, Washington.

- Professional Paper, University of Idaho, Moscow.
- Prince, E.D. and O.E. Maughan. 1979. Attraction of fishes to tire reefs in Smith Mountain Lake, Virginia. North Central Division American Fisheries Society Special Publication 6.
- Reinitz, G.L. 1977. Electrophoretic distinction of rainbow trout (*Salmo gairdneri*), west-slope cutthroat trout (*S. clarki*), and their hybrids. Journal of the Fisheries Research Board of Canada 34:1236-1239.
- Rieman, B. E. 1987. Fishing and population dynamics of largemouth bass *Micropterus salmoides* in select northern Idaho lakes. Doctoral Dissertation, University of Idaho, Moscow.
- Scholz, A.T., K. O'Laughlin, D. Geist, D. Peone, J. Uehara, L. Fields, T. Kleist, I. Zozaya, T. Peone and K. Teesatuskie. 1985. Compilation of information on salmon and steelhead total run size, catch and hydropower related losses in the Upper Columbia River Basin, above Grand Coulee Dam. Upper Columbia United Tribes Fisheries Center Fisheries Technical Report No 2. Eastern Washington University, Cheney, Washington.
- Shelton, W.L., W.D. Davies, T.A. King, and T.J. Timmons. 1979. Variation in the growth of the initial year class of largemouth bass in West Point Reservoir, Alabama and Georgia. Transactions of the American Fisheries Society 108:142-148.
- Shuter, B.J., and J.R. Post. 1990. Climate, population viability, and the zoogeography of temperate fishes. Transactions of the American Fisheries Society 119:314-336.
- Smith, A.H. 1983. Traditional Kalispel fishing localities. Washington State University Department of Anthropology, Washington.
- Smith, A.H. 1985. Affidavit of Allen H. Smith. United States of America and Kalispel Indian Tribe v. Pend Oreille County Public Utility District No. 1 and The Department of Natural Resources, State of Washington. Docket No. C-80-116-RMB.
- Stuber, R.J., G. Gebhart, and O.E. Maughan. 1982. Habitat suitability index models: Largemouth bass. U.S. Fish Wildl. Serv. FWS/OBS-82/10.16. 33 pp.
- Thompson, J.M., E.P. Bergersen, C.A. Carlson, and L.R. Kaeding. 1991. Role of size, condition, and lipid content in the overwinter survival of age-0 Colorado squawfish. Transactions of the American Fisheries Society 120:346-353.
- Toneys, M.L. and D.W. Coble. 1979. Size-related, first winter mortality of freshwater fishes. Transactions of the American Fisheries Society 108:415-419.

Washington Dept. of Ecology. 1998. Section 303 (d) listing. June 16, 1998.

Wege, G.J. and R.O. Anderson. 1979. Influence of artificial structure on largemouth bass and bluegills in small ponds. North Central Division American Fisheries Society Special Publication 6.

Williams, K. 1998. Westslope cutthroat trout status in Washington. WDFW unpublished report.

Zweiacker, P.L. 1972. Population dynamics of largemouth bass in an 808-hectare Oklahoma reservoir. Doctoral Dissertation. Oklahoma State University, Stillwater.

Appendix B

Hatchery and Genetics Management Plan

HATCHERY AND GENETICS MANAGEMENT PLAN

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of Hatchery or Program

Kalispel Tribal Hatchery

1.2 Species and Population (strain) under propagation, ESA/population status.

Largemouth bass, *Micropterus salmoides*

1.3 Responsible Organization and Individuals

David Nenema, Hatchery Manager

Kalispel Tribe

P.O. Box 39

Usk, WA 99180

Phone: (509) 445-0298

Fax: (509) 445-0299

1.4 Funding Source, Staffing Level, and Annual Hatchery Program Operational Costs.

Funding Source: Bonneville Power Administration

Staffing Level: 2 (Hatchery Mgr., Hatchery technician)

Average Operational Cost: 96/97 188,178.00

97/98 183,565.00

98/99 130,007.00

99/00 152,308.00

Average: 163,514.50

1.5 Location of Hatchery and Associated Facilities.

Hatchery location: Kalispel Reservation

9171 LeClerc road

Stream: Pend Oreille River, Box Canyon Reservoir

90 river kilometers

Watershed code: WRIA 62

Box Canyon Reservoir

Washington

1.6 Type of Program.

Integrated Harvest: *Project in which artificially propagated fish produced primarily for harvest are intended to spawn in the wild and are fully reproductively integrated with a particular natural population.*

1.7 Purpose or Goal of the Program.

Mitigation. “Facilitate the production and rearing of juvenile largemouth bass for supplementation and thereby increase the production of harvestable bass.” The hatchery is designed to supplement the current largemouth bass population within the Box Canyon Reservoir.

1.8 Justification for the Program.

In 1987, the Northwest Power Planning Council (NPPC) amended its Columbia River Basin Fish and Wildlife Program to include a resident fish substitution policy. This policy called for substitution of resident fish in areas where anadromous fish historically occurred, but were blocked with the construction of the Chief Joseph and Grand Coulee Dams. One of the first projects adopted by NPPC was the “Assessment of fishery improvement opportunities in the Pend Oreille river within the boundaries of the Kalispel Indian Reservation” (Ashe, *et al.* 1992). The purpose of this three-year study was to establish baseline information of existing fish populations and habitat; and identify possible methods of improving fisheries within the reservoir. Recommendations from this study are proposed as resident fish substitution under the Northwest Power Planning Council’s 1987 Resident Fish Substitution Policy.

The assessment identified several factors within the reservoir that limited the fisheries opportunities within the Box Canyon Reservoir. Some of these factors included water elevation fluctuations, lack of overwinter cover for age 0⁺ bass, and inadequate recruitment of largemouth bass into the system. The University of Idaho also performed a study during this time (Bennett, Liter, 1991) and concurred with the above factors and proposed similar recommendations of the assessment study published by Ashe.

Ashe, *et al* (1991) indicated that growth rates of largemouth bass during the first four years in the Box Canyon Reservoir were lower than bass from other locations of the northern United States, and conversely growth rates after the fourth year were comparable or even higher than other locations. The slower growth combined with a high rate of juvenile mortality associated with overwintering have reduced the potential for the bass population within the reservoir. Largemouth bass density estimates are approximately 6 pounds per surface acre in the Box Canyon Reservoir.

In 1991, Ashe and Bennett suggested the possibility of an off-site rearing facility to supplement the number of juvenile largemouth bass within the Box Canyon Reservoir. Supplemental stocking of yearling largemouth bass has been proven successful in other reservoirs. In Chatfield Reservoir, Colorado, largemouth bass were hatchery-reared to one year of age using intensive and extensive culture from 1978 to 1981. Subsequent samples of age 2 bass in the reservoir composed 12%, 59%, and 59% of the population, during sample years 1980, 1981 and 1982, respectively (Kreiger and Puttman 1986). Increases in the age 2 class fish were directly attributed to hatchery supplementation.

Based on these findings, biological objectives for largemouth bass (*Micropterus salmoides*) were identified and incorporated into the NWPPC's program. The largemouth bass biological objectives are as follows.

- Increase the biomass of harvestable largemouth bass in the Box Canyon Reservoir from the current 6 pounds/acre to an interim target of 8 pounds/acre by 2003 and a final target of 12 pounds/acre by the year 2008.
- Increase age 0⁺ largemouth bass overwinter survival from current levels of 0.4-3.9 percent to approximately 15-20 percent.

Reviewer Comments: Above, the author states, "Based on these findings, biological objectives for largemouth bass ... were identified ... as follows." What was provided in "these findings" to justify the numerical objectives subsequently identified? Is there data to indicate that doubling the pounds per acre and increasing overwinter survival by many-fold are realistic objectives for fish in this reservoir? What data exist to show that doubling pounds per acre of bass will yield bass of the size desired by the fishery?

1.9 List of Program Performance Standards.

- Increase the biomass of harvestable largemouth bass in the Box Canyon Reservoir from the current 6 pounds/acre to an interim target of 8 pounds/acre by 2003 and a final target of 12 pounds/acre by the year 2008.
- Increase age 0⁺ largemouth bass overwinter survival from current levels of 0.4-3.9 percent to approximately 15-20 percent.

Reviewer Comments: see comment for 1.8

1.10 List of Program Performance Indicators designated by "benefits" and "risks".

1.10.1 Performance Indicators addressing benefits.

The supplementation of largemouth bass in the reservoir will help the natural occurring population re-establish itself in the overall fish population. Currently, largemouth bass account for approximately 8 percent of the total population in the reservoir. Recruitment is just one of the obstacles facing the largemouth bass population.

The overwinter survival of largemouth bass in the reservoir is estimated at 0.4-3.9 percent. Predation and lack of overwinter cover in the reservoir make the first year of survival very hard. Hatchery operations along with habitat improvements are geared to resolve these issues.

1.10.2 Performance Indicators addressing risks.

Not applicable.

Reviewer Comments: There is a risk that the proposed action will result in fewer fish of desirable size for the fishery. What is the added risk for native species in the reservoir of increasing the number of piscivores in the bass population?

1.11 Expected Size of Program.

1.11.1 Proposed Annual broodstock need (maximum # of fish).

The operation currently requires a minimum of 28 brood fish (14 male, 14 female). Ideally, we would like to have at least twice that much just in case something goes wrong during the year. Currently there is no extra space for any additional brood fish.

1.11.2 Proposed Annual Fish Release levels (Max.#) by life stage and location.

Life Stage	Release Location	Annual Release Level
Fry	Pend Oreille river	100,000
Fingerling	Pend Oreille river	50,000

1.12 Current program performance, including estimated survival rates, adult production levels, and escapement levels. Indicate the source of this data.

Survival rates: Bennett *et al* (1991) estimated the overwinter survival of age 0⁺ largemouth bass in the Pend Oreille river ranged from 0.4 – 3.9 % in 1989 and 1990. Our goal is to increase the age 0⁺ largemouth bass overwinter survival from current levels of 0.4 – 3.9 percent to approximately 15-20 percent.

Adult Production levels: Fourteen adult female largemouth bass are capable of producing between 224,000-728,000 eggs (based upon a 4 lb fish at 4,000-13,000 eggs per pound).

1.13 Date program started (years of operation).

Construction began in 1996. The hatchery was completed in the fall of 1997. Brood fish were immediately collected to overwinter in the hatchery. In the spring of 1998 no spawning occurred but most of the procedures were tested. The following year (1999) was our first year with spawning activity. About 75% of the operation was tested and revised.

1.14 Expected duration of program

The hatchery is funded for a five-year performance period from December 19, 1996 through December 19, 2001. We are now in the fourth year. The total program is intended to last approximately 25-40 years.

1.15 Watersheds targeted for program.

Box Canyon Reservoir.

1.16 Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

No other alternative has been attempted. All efforts have been focused on developing raceway spawning techniques and procedures for the current operation. The Kalispel Tribal Natural Resource Department has decided to work with the locally adapted largemouth bass population.

SECTION 2. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

- 2.1 Describe alignment of the hatchery program with other hatchery plans and policies (e.g., the NPPC *Annual Production Review* report and recommendations – NPPC document 99-15). Explain any proposed deviations from the plan or policies.**

Currently, the Kalispel tribe is the only entity performing largemouth bass supplementation efforts in the Box Canyon Reservoir. All hatchery operations are described in the Kalispel Tribal Hatchery-Production Procedures. These procedures reflect the original proposal presented to the NPPC for review and BPA for funding.

- 2.2 List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which the program operates.**

The Kalispel Tribe Natural Resource Department has cooperative management authority (MOU) with the Washington Department of Fish and Wildlife Service on the Pend Oreille River and its tributaries.

- 2.3 Relationship to harvest objectives.**

- 2.3.1 Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last 12 years, if available.**

Increased harvest and subsistence for Kalispel tribal members as well as the local non-tribal community members and bass clubs.

- 2.4 Relationship to habitat protection and purposes of artificial production.**

Some of the factors found to affect natural production in the reservoir include water elevation fluctuations, lack of overwinter cover for age 0⁺ bass, and inadequate recruitment of largemouth bass into the system. The Kalispel Natural Resource Department is currently placing artificial structures in the reservoir to help provide overwinter cover. They are currently monitoring and evaluating the effectiveness of specific artificial structures. The hatchery is designed to supplement the natural recruitment of new largemouth bass fry. Monitoring and evaluation efforts will commence once largemouth bass fry are released into the reservoir.

- 2.5 Ecological interactions.**

The species that negatively impact the supplementation efforts of largemouth bass are limited to the predators such as yellow perch, pumpkinseed, northern squawfish, and adult largemouth bass. Other predators such as bald eagles, osprey, and blue herons are positively impacted by the creation of a supplemental forage base. Once largemouth bass reach a certain age (1-2 years) they will start to consume the other predators. Currently the largemouth bass population is estimated to be around 8 percent of the total fish population in the reservoir.

SECTION 3. WATER SOURCE

3.1 Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

The water source for the Kalispel Hatchery is surface water from the Pend Oreille River. The intake screen for the hatchery is approximately 420 feet out from the pump station and is approximately 15 feet deep. The intake line feeds the sump located in the pump station (the water in the sump is the river elevation, no water is pumped into the sump). The water in the sump is then lifted to the pump station floor by 1 or 2 sumps rated at 150 gallons per minute each. The water is then pumped to the hatchery via three pumps.

Most problems associated with the water source are related to water quality. In the spring when the spawn is gearing up is when the runoff is the greatest. The incoming water has suspended silt and clay and poses problems with treatment. Other problems include total dissolved gas in the river. In the spring, the river is high and dams are spilling water. This increased mixing super-saturates the water with TDG, which is harmful to the fish in the hatchery.

Another factor involved with the surface water intake includes high river elevations. The elevation of the pump station is 2040 ft. The river can rise higher than this every year. We have been in operation for three years and the river elevation has been above the floor twice. When this happens, the hatchery staff has to constantly monitor the situation and keep the pumps on so the pump station stays dry and water still flows up to the hatchery.

Power outages in Pend Oreille County are very frequent in the spring. The pumps in the pump station do not automatically reset after an outage or power surge. We may not know about the outage until the alarm calls us. Sometimes when a power surge happens, we may not get a call but the pumps may be off.

3.2 Indicate any appropriate risk aversion measures that will be applied to minimize the likelihood for the take of listed species as a result of hatchery water withdrawal, screening, or effluent discharge.

Not applicable to this project.

Reviewer Comments: Are there no listed species in the source water supply? Is the hatchery free of disease organisms that may infect fish in the effluent receiving waters?

SECTION 4. FACILITIES

4.1 Broodstock collection, holding, and spawning facilities.

Brood stock is currently gathered in the Box Canyon through electro-fishing. A minimum of 28 brood fish is needed for the operation. These fish are gathered in areas similar to the designated outplanting locations. Once operational, we hope to replenish 20 percent of the brood fish each year with new stock. Currently, the brood fish are held in the covered raceway and treated with formalin to help keep parasites in check. All spawning activity also takes place in this raceway.

4.2 Fish transportation equipment (description of pen, tank truck, or container used).

A 300-gallon portable insulated fiberglass tank is used for transporting fish. The tank is equipped with oxygen and aeration devices and has excellent temperature retention. The main use of the tank includes the transfer of brood fish from the river to the hatchery and the delivery of fry/fingerlings from the hatchery to the designated outplanting location. Maximum loading rate of the tank is 150 pounds per haul.

4.3 Incubation facilities.

The water that enters incubation facility will go through a drum screen, U.V filtration, packed column, and a bead filter to ensure that water is treated thoroughly. All incubation activities are performed in the incubation troughs located in the hatchery building. These 600-gallon troughs have 2" water supplies and the water can be re-circulated or sent directly to the effluent ponds. The fertilized nests are removed from the raceway and placed vertically in the troughs for incubation. The fertilized nests are treated with fungicide and water is allowed to flow through the nest at approximately 5 gpm to aerate the eggs. After 2-3 days the eggs hatch and the newly hatched fry are visible at the bottom of the troughs. The fry will be ready to transfer to the holding slough for growout in 7-10 days. Each fertilized nest can produce approximately 20,000 – 25,000 fry.

4.4 Rearing facilities.

Rearing facilities at the project site include 1 raceway with approximately 1300 ft³ rearing space and six incubation troughs with 80 ft³ each). We also have two holding sloughs used for growout of the newly hatched fry. We stock these holding sloughs with approximately 100,000 newly hatched fry. Each slough is about 1 acre in size.

4.5 Acclimation/release facilities.

The newly hatched fry are acclimated in the holding sloughs

4.6 Describe operational difficulties or disasters that led to significant fish mortality.

Increased total dissolved gas in the reservoir killed 22 brood fish in the raceway. Mortality was noticed on May 9,2000 and 22 of the 29 broodfish died in a two day period.

4.6.1 Indicate available back-up systems and risk aversion measures that minimize the likelihood for the take of listed species that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

The hatchery is equipped with a generator for power loss and an alarm system for notifying hatchery staff of any problems. All nets, tools, containers are sanitized rigorously to help minimize and transmission of disease via equipment. Water quality is monitored to minimize any unforeseen changes in water quality in the river.

4.6.2 Indicate needed back-up systems and risk aversion measures that minimize the likelihood for the take of listed species that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality

Daily water quality measurements in the river (intake).

SECTION 5. BROODSTOCK ORIGIN AND IDENTITY

5.1 Source.

All brood fish were collected from the Pend Oreille River (Box Canyon Reservoir).

5.2 Supporting information.

5.2.1 History.

Largemouth bass are not native to Washington and have spread into the Columbia River system after being introduced into Idaho in 1916. Prior to the creation of Box Canyon Reservoir, largemouth bass habitat was limited in area. Even though largemouth bass are less than 10% of the fish assemblage present in the reservoir, they are now the primary sport fish in the reservoir (Bennett and Liler 1991).

5.2.2 Annual size.

In 1990, the largemouth bass population in the reservoir was estimated at 600,000 and comprised approximately 8% of the total population in the reservoir.

5.2.3 Past and proposed level of natural fish in broodstock.

We expect to have at least 32 brood fish on hand at all times and plan to gather 4-8 new brood fish each year.

5.2.4 Genetic or ecological differences.

Currently, all brood fish gathered are from the reservoir.

5.2.5 Reasons for choosing broodstock traits.

All brood fish collected from the Box Canyon Reservoir exhibited traits of survival. The brood fish collected are examined for any external injuries and physiological deficiencies. The overall health of the fish is very important along with its age and size. Older, larger fish are not desirable to the program due to their overall health and the length of time they would need to be in the hatchery. The viability of their eggs/milt would also be questionable.

5.2.6 ESA-Listing status.

Not applicable.

5.3 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects that may occur as a result of using the broodstock source.

Not applicable to the project brood sources.

SECTION 6. BROODSTOCK COLLECTION

6.1 Life-history stage to be collected (eggs, juveniles, or adults).

Adults.

6.2 Collection or sampling design.

A sampling design has been developed to measure the effectiveness of supplementation efforts. See the attached supplementation study for further information.

6.3 Identity.

All hatchery-reared fish released into the reservoir will be coded-wire tagged. During the study all largemouth bass captured will be examined for the presence of these tags. The location of the tag will help the hatchery staff identify the size of the fish at the time of release.

Reviewer Comments: What is the purpose of this tagging program? Are tags recovered from harvested bass? If tagging is to verify growth from scale data, when is the study to be terminated?

6.4 Proposed number to be collected:

6.4.1 Program goal (assuming 1:1 sex ratio for adults).
32 adult brood fish.

6.4.2 Broodstock collection levels for the last 12 years (e.g., 1988-99), or for most recent years available.

We lost all of the brood fish collected in the first two years of operation due to fungus and equipment failure. In 2000 we lost 22 brood fish due to total dissolved gas. We currently have 32 brood fish in the hatchery.

	ADULTS	
YEAR	MALES	FEMALES
1996	0	0
1997	10	10
1998	16	16
1999	16	16
2000	12	12

6.5 Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Currently, all brood fish collected will be used in the hatchery operation. We do plan on replenishing the brood fish numbers annually (20%). All surplus brood fish (if any) will be returned to the Pend Oreille River (Box Canyon Reservoir).

6.6 Fish transportation and holding methods.

Brood fish collection procedures are designed to minimize stress to the brood fish. When fish are collected, a target time of 30 minutes from time of capture to placement in the hatchery is desirable. . If more than 6 fish are needed, then successive trips will be needed. A maximum of 6 fish will be transported at once. This will minimize the amount of time the brood fish are exposed to the stress of the live well and transport tank.

6.7 Describe fish health maintenance and sanitation procedures applied.

Stress is the number one factor affecting the health of the brood fish. All brood fish are treated for external parasites with a 100 ppm bath treatment of formalin. These treatments are very important in the spring when water temperatures increase and when the brood fish are initially brought into the hatchery. The main objective of the treatments is to keep the parasites at manageable levels so the brood fish can fight them off themselves.

6.8 Disposition of carcasses.

All brood fish and fry/fingerlings lost to mortality will be disposed of by burial. Lye will also be added to the carcasses to help speed decomposition. The location of the burial site will be away from the hatchery at a place that will not contaminate the hatchery water system.

6.9 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed species resulting from the broodstock collection program.

Not applicable.

SECTION 7. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

7.1 Selection method.

All brood fish collected will be chosen as potential spawners through visual inspection of sex, health and overall appearance. A ratio of 1:1 for females/males will be the goal.

7.2 Fertilization.

Raceway spawning procedures will be used at the hatchery. As the water temperatures begin to increase the largemouth bass naturally begin to spawn. The males locate a suitable nest and then attract a female to lay eggs on the nest. The male then fertilizes the eggs and protects the eggs until they hatch. The hatchery staff removes the nest a day after the male fertilizes the eggs and incubates the eggs in the hatchery building.

7.3 Cryopreserved gametes.

Not applicable.

7.4 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

Not applicable. Largemouth bass are not listed under the Endangered Species Act.

SECTION 8. INCUBATION AND REARING

8.1 Incubation

8.1.1 Number of eggs taken/received and survival rate at stages of egg development.

Our Annual Production Goals at the hatchery is 100,000 largemouth bass fry and 50,000 fingerlings. We expect approximately 13,000 eggs per pound of fish spawned, which relates to about 40,000-50,000 eggs per spawn. The hatching rate for the eggs is above 90% with the swimup near 100%. The swimup to outplanting is where the survival is the toughest. Proper acclimation, feed, and protection from predators are vital for survival. No historical data is available at this time.

8.1.2 Loading densities applied during incubation.

Incubation operations take place in 600-gallon fiberglass troughs. One trough is able to incubate at least 150,000 eggs depending on the time of the spawn. No spawns greater than 3 days apart will be placed in one trough. Water flows through the trough at 2-4 gallons per minute.

8.1.3 Incubation conditions.

All incubation troughs are monitored daily to observe the development of the eggs. Water temperature, pH, and dissolved oxygen are all measured during this time.

8.1.4 Ponding.

Once the newly hatched fry “swimup” to the top of the water column they are enumerated and transferred to holding sloughs for growout. The holding sloughs are fertilized and full of the natural zooplankton from the reservoir. These fry remain in the sloughs for 6-8 weeks until they are gathered and tagged for release into the reservoir. Newly hatched fry are socked at approximately 150,000 fry/acre.

8.1.5 Fish health maintenance and monitoring.

All water entering the hatchery is UV disinfected. This unit treats most of the naturally occurring parasites and bacteria in the water. Parasites and bacteria are always present in the reservoir; we treat the water to keep them in check so the bass can naturally fight them off.

The incubation troughs and raceway are sanitized and disinfected with a fungicide approved for use in hatcheries. All food waste and fecal matter are removed weekly, when possible.

8.1.6 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to fish during incubation.

All eggs are incubated with surface water from the river. This water is cleaned and disinfected but not totally free of parasites, bacteria, or fungus. The water can be re-circulated if a power outage is to occur. All water quality equipment is connected to the backup generator.

8.2 Rearing

8.2.1 Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to release) for the most recent twelve years (1988-99), or for year’s dependable data are available.

There is no reliable data on the survival rates of the newly hatched fry-fingerling as of yet. The hatchery would expect a survival rate of 70-80% under the current conditions of the holding sloughs. The estimated survival rates for age 0⁺ bass in the reservoir (overwinter) is 0.4 – 3.9%.

8.2.2 Density and loading criteria (goals and actual levels).

Rearing densities in the sloughs will be approximately 75,000-100,000 fry/acre. At this level we would expect roughly 70-80% survival. We have two 1-acre holding sloughs, which will provide enough area to raise the APG of 150,000 largemouth bass. The fingerlings will be stocked and reared at 50,000-75,000 fish/acre.

8.2.3 Fish rearing conditions

Water inflow required during fry, fingerling and adult rearing will be calculated using a flow index of 1.05 associated with projected lengths and weights in the following formula:

$$I = \frac{W}{L \times 1.05}$$

where: I = total inflow
W = projected weight
L = projected length

Dissolved oxygen (DO) is expected to be near 100% saturation level (10 to 12 mg/l) while nitrogen (N₂) levels are expected to be slightly higher than 100% saturation level. Water flowing into the holding sloughs are able to be treated with hatchery water treatment equipment. DO and N₂ levels will be measured daily. Other parameters monitored by the hatchery staff will include temperature, pH, and conductivity.

8.2.4 Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

No sufficient data has been recorded for newly hatched largemouth bass in the hatchery.

8.2.5 Indicate food type used, daily application schedule, feeding rate range (e.g. %BW/day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Following swimup, the newly hatched fry are transported to the rearing sloughs for grow-out. The fry will remain in the sloughs for 6-8 weeks or until most of the zooplankton is consumed. After 6-8 weeks the fry should be approximately 2” in length and ready for release. The fry will be collected and transported to the hatchery for tagging operations. Approximately 50,000 fish will be held at the hatchery and trained on artificial feed of Rangen “trout and salmon starter” #1 granules. This feed will be supplemented with freeze-dried krill to help with training.

8.2.6 Fish health monitoring, disease treatment, and sanitation procedures.

The rearing troughs will be sanitized and disinfected with 600 parts per million solution of Hyamine 3500 before initial loading. Daily sanitation of fecal matter will be performed when production feeding begins. All wastewater will be drained to the settling pond.

This project operates in compliance with Fish Health Policies. Disease treatments include use of formalin (Parasite-S) and Salt. The Kalispel Tribal Hatchery is equipped with a laboratory capable of performing fish pathology. However, most pathology work is performed by Steve Roberts, certified fish pathologist of WDFW.

8.2.7 Indicate the use of "natural" rearing methods as applied in the program.

Currently, natural rearing methods are limited to the rearing sloughs. The newly-hatched fry are placed in the rearing sloughs for growout which involves naturally occurring zooplankton in the reservoir. Abundant zooplankton is produced through the fertilization of phytoplankton and the removal of all undesirable fish species in the slough.

8.2.8 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to fish under propagation.

At this time there are no measures associated with the genetic and ecological effects to fish under propagation. This has not been identified as a program measure prudent to ongoing hatchery practices.

SECTION 9. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

The Kalispel Tribal Hatchery is designed to produce approximately 150,000 largemouth bass fry/fingerlings for release into the Box Canyon Reservoir. The initial release levels include 100,000 fry and 50,000 fingerlings at three separate locations.

9.1) Proposed fish release levels.

Age Class	Maximum #	Size (fpp)	Release date	Location
Fry	100,000	500	September 2001	Box Canyon Reservoir
Fingerling	50,000	100	April 2002	Box Canyon Reservoir

9.2 Specific location(s) of proposed release(s).

Stream, river, or

watercourse Pend Oreille River (Box Canyon Reservoir)

Release point: Rednours slough, Dike slough, flying goose slough

Major watershed: Pend Oreille River (WRIA 62)

Basin or Region: Pend Oreille River

9.3 Actual numbers and sizes of fish released by age class through the program.

The hatchery successfully produced 242,000 largemouth bass fry in the 1999 season. These fish were produced in the hatchery and introduced into the reservoir. The fry were not tagged or counted. These fry escaped from the holding sloughs due to high river elevations in the spring of 1999.

9.4 Actual dates of release and description of release protocols.

The actual release date will depend on the water temperatures, growth rates, and tagging operations. The spawn occurs in June/July, incubation of the eggs takes 10-14 day, growout can take 6-8 weeks, and the tagging operation should take 1-2 weeks. Generally, the fry will be released around August/September and the fingerlings the following spring (April).

9.5 Fish transportation procedures, if applicable.

All outplanting operations will be conducted in a manner that minimizes stress and damage to the fish. The hatchery transport tank is equipped with oxygen tank to keep oxygen levels at an optimum. Estimated time of transport is 30 minutes.

9.6 Acclimation procedures.

All largemouth bass fry/fingerlings will be acclimated to the river water environment prior to outplanting. Untreated river water will be slowly introduced to the fish to minimized shock.

9.7 Marks applied, and proportions of the total hatchery population marked, to identify hatchery component.

All largemouth bass fry/fingerlings will be marked with a coded-wire tag prior to release. The placement of the tag will identify the size of the fish at the time of release. To our knowledge, there are no other coded-wire tags in the reservoir.

9.8 Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Not applicable to this program.

9.9 Fish health certification procedures applied pre-release.

The Kalispel tribe has various cooperative agreements with the Washington State Fish and Wildlife (WDF&W). All fish released into the reservoir will be inspected by the WDF&W Fish Pathologist prior to release.

9.10 Emergency release procedures in response to flooding or water system failure.

The Kalispel Tribal hatchery is equipped with a generator backup in the event of power failure. The hatchery is able to re-circulate the water for up to two-weeks if needed. During flood conditions, nets will be placed above the dams located at the rearing sloughs. The nets will serve to keep the newly-hatched fry in and keep any predators out of the slough.

9.11 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed species resulting from fish releases.

Not applicable to this program.

SECTION 10. PROGRAM EFFECTS ON ALL ESA-LISTED, PROPOSED, AND CANDIDATE SPECIES (FISH AND WILDLIFE)

10.1 List all ESA permits or authorizations in hand for the hatchery program.

Not applicable to this program.

10.2 Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

Direct impacts on aquatic habitat could occur from sediment introduced into the water by ground disturbances from clearing and construction. This could increase silt in spawning gravel and rearing habitat, which could suffocate eggs or fry, or adversely affect habitat for aquatic life important as a food source for fish. Only limited clearing of riparian vegetation is expected and impacts would be short term and minor; therefore the proposed action would have minor impacts on the fisheries within the reservoir, such as pumpkin seed and perch, the most

abundant species in the reservoir. The proposed project is located away from tributaries where bull trout spawn so there would be no impacts from construction on spawning habitats for bull trout.

The increased presence of largemouth bass in Box Canyon Reservoir may affect, but is not likely to adversely affect adfluvial populations of bull trout. Due to the different temperature gradient regimes in which largemouth bass and bull trout dwell, their different spawning habitats and food sources, and the number of bull trout found in the Box Canyon Reservoir, the proposed project may affect, but is not likely to adversely affect bull trout species. Should any changes to the project occur that could affect a listed species, or if any other species known to occur in the project area becomes officially listed before BPA completes this project BPA would reevaluate its responsibilities under the Endangered Species Act.

Reviewer Comments: Do data exist to show the amount of separation and differences in food habits implied to exist by this statement: "...different temperature gradient regimes in which largemouth bass and bull trout dwell, their different spawning habitats and food sources ..."?

10.2.1 Description of ESA-listed, proposed, and candidate species affected by the program.

Not applicable to this program.

Reviewer Comments: What about bull trout?

10.2.2 Status of ESA-listed species affected by the program.

Not applicable to this program.

Reviewer Comments: Bull trout?

10.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed species in the target area, and provide estimated annual levels of take (see "Attachment 1" for definition of "take"). Provide the rationale for deriving the estimate.

All monitoring and evaluation efforts performed in the Box Canyon Reservoir will adhere to the Federal Fish and Wildlife permit #TE844478-0.

Reviewer Comments: No comments.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1 Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1 Describe the proposed plans and methods necessary to respond to the appropriate “Performance Indicators” that have been identified for the program.

A supplementation study has been designed to monitor the effectiveness of the hatchery efforts. All hatchery-reared bass will be coded-wire tagged for later identification. A copy of the supplementation study is attached as Attachment A.

11.1.2 Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

All necessary staffing, funding, and techniques are ready and in place. All remaining is the last phase of the operation: the tag and release of all hatchery-raised bass.

11.2 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed species resulting from monitoring and evaluation activities.

All monitoring and evaluation efforts performed in the Box Canyon Reservoir will adhere to the Federal Fish and Wildlife permit #TE844478-0.

Reviewer Comments: No comments.

SECTION 12. RESEARCH

Any research related efforts directly related to the hatchery are included in the supplementation study (Attachment A). This supplementation study is designed to monitor and evaluate the effectiveness of the hatchery operation.

Further information for this section may be provided at a later time.

12.1 Objective or purpose.

Not applicable.

12.2 Cooperating and funding agencies.

Not applicable.

12.3 Principal investigator or project supervisor and staff.

Not applicable.

12.4 Status of population, particularly the group affected by project, if different than the population(s) described in Section 2.

Not applicable.

12.5 Techniques: include capture methods, drugs, samples collected, tags applied.
Not applicable.

12.6 Dates or time period in which research activity occurs.
Not applicable.

- 12.7 Care and maintenance of live fish or eggs, holding duration, transport methods.**
Not applicable.
- 12.8 Expected type and effects of take and potential for injury or mortality.**
Not applicable.
- 12.9 Level of take of listed species: number or range of individuals handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached “take table” (Table 1).**
Not applicable.
- 12.10 Alternative methods to achieve project objectives.**
Not applicable.
- 12.11 List species similar or related to the threatened species; provide number and causes of mortality related to this research project.**
Not applicable.
- 12.12 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed species as a result of the proposed research activities.**
Not applicable.

Reviewer Comments: Assume responses to above are in Attachment A.

SECTION 13. ATTACHMENTS

Attachment A Production Procedures
Attachment B Supplementation Study

SECTION 14. CITATIONS

Ashe, B.L., and A.T. Scholz. 1992. Assessment of the Fishery Improvement Opportunities on the Pend Oreille River. U.S. Bureau of Reclamation. Contact No. WPRS-0-07-10-0216; FWS-14-06-009-904, May 1985. 168 pp.

Bennett, D.H. and M. Liter. 1991. Water quality, fish and wildlife characteristics of Box Canyon Reservoir, Washington. Section 3: Fish, Completion Report 1989-1990. Dept. of Fish and Wildlife. University of Idaho. Moscow, ID.

Piper, R.G., I.B. McElwain, L.E. Orme, J.P. McCraren, L.G. Fowler, and J.R. Leonard.
1982. Fish Hatchery Management. U.S. Fish and Wildlife Service, Washington,
D.C.

**SECTION 15. CERTIFICATION LANGUAGE AND SIGNATURE
OF RESPONSIBLE PARTY**

“I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973.”

Name, Title, and Signature of Applicant:

Certified by: _____

David Nenema
Kalispel Tribe
Natural Resource Dept.

Date: _____

ATTACHMENT A

Kalispel Tribal Hatchery

Production Procedures Handbook

Prepared by:

**JR Bluff
Hatchery Manager**

**Updated
September 18, 2000**

**Kalispel Tribal Hatchery
Production Procedures**

Table of Contents

I. Introduction.....	1
II. Rearing Sloughs.....	1
III. Raceway Spawning.....	3
IV. Egg Incubation.....	4
V. Fry Transfer to Rearing Sloughs.....	4
VI. Harvest of Fry from Rearing Sloughs.....	5
VII. Tagging Operations.....	5
VIII. Brood Fish Gathering /Handling.....	6

I. INTRODUCTION

This handbook is intended to give detailed steps for the production of largemouth bass raised at the Kalispel Tribal Hatchery. The major components for the hatchery operation include: two rearing sloughs, raceway spawning, egg incubation, fry transfer, fry harvest, tagging operation, and brood fish collection and handling. This document is intended to list the procedures involved in the producing fry/fingerlings for outplanting. The specific procedures for operating all of the mechanical pumps are contained in the Operations and Maintenance Manual.

II. REARING SLOUGHS

The rearing sloughs are located adjacent to the river and can be accessed via the service road to the pump station. The mouth of the south slough is next to the pump station and the mouth of the north slough is located approximately 500 yards north of the pump station. Depending on the time of the year, you may only be able to access the north slough by ATV and even then it will be tough. The following section details the approximate timelines and activities needed to have the sloughs ready to accept the newly hatched fry.

Draining (Pre-Spawn)

If the river elevation is lower than the slough elevation, you can open the gate valve on the dam to speed up the draining process. Once the river and the slough are at the same elevation close the gate valve and begin draining with the 3” trash pump.

1. Before starting the engine, make sure that the oil level and gas are full and everything looks O.K.
2. Set the pump on top of the sheet pile dam and secure it. Attach the suction line. The suction line should be fairly level with no high spots. The discharge line should be OK-just run it over the dam and tie it off somewhere. It is a good idea to aim the end of the discharge line in the air so you can tell if the pump has lost its prime.
3. Prime the pump. The black knob on top of the pump. Pour in as much water as it needs and tighten the knob securely after finished.
4. Start the engine. Once the engine is started, keep an eye on the discharge, it should start splashing water. If not, you will need to turn off the engine and re-prime the pump. Try again.

The total amount of time needed to drain the slough is around 10-16 hours. You will need to have enough gas to make it through the day (5 gallons). Once the pump seems to be working correctly, you can leave and work on other items needing completed. Check on the pump every 45 minutes to refuel and check if still pumping.

If you are trying to drain the south slough during the spring you need to make sure that no water is pouring into the south slough. The stop logs may need to be re-installed. These stop logs are located at the head of the slough. If you cannot stop the water flowing into the slough, you won't be able to drain the slough completely. We need to drain the slough in order to remove any unwanted fish and aquatic vegetation.

Fertilization

Once the pond has been cleaned and all unwanted fish removed from the slough, it can be filled and made ready to receive the newly hatched fry. The only remaining step is the fertilization. There should be no need to inoculate the slough with zooplankton. Once the water warms up zooplankton will be everywhere. The water temp in the sloughs should be around 60 degrees F. during this operation.

1. The ponds should begin preparation 7 days prior to the spawn. This should give you about 3-4 weeks for phytoplankton/zooplankton growth before the fry arrive.
2. The initial application of organic fertilizer at 150 lbs/acre (Alfalfa meal) and Inorganic fertilizer (16-20-0) at 8 lbs/acre. The two sloughs are approx. $\frac{3}{4}$ acre each. Add approx. 100 pounds of organic fertilizer and about 5 pounds of inorganic to each slough. This is the first treatment.
3. The second treatment should be applied in two days and will be at the same rate as the initial.
4. After these two applications, the amounts will lessen to about 50 pounds of inorganic fertilizer per slough. I would apply the same amount inorganic.
5. Application rates should keep at this amount until the fry are ready for planting. You can fertilize every 3 days after the first two applications.

III. RACEWAY SPAWNING.

Spawning activities should take place as soon as the river water temperature reaches 65 degrees Fahrenheit. No water will need to be heated, once the river water warms up, the bass will spawn. This should be May/June. During this time, there shall be minimal contact w/ any hatchery personnel or visitors. This is our most critical time of year.

Once the first spawn is noticed, the brood fish will be allowed to spawn for an additional 14 days. Each nest will be visually inspected for the presence of a male protecting the fertilized nest. I am not sure that we will witness the female doing spawning, she may not lay her eggs until dawn or dusk. Once eggs are noticed on the nests, the nest will remain in the raceway for another day where the male will protect it from predators.

Once the nest is seen to have eggs it will be removed from the raceway and placed in the hatchery. Hatchery staff will raise the nest from the bottom of the raceway and gently slide a galvanized washtub underneath the nest, lifting the nest out of the raceway. The area in which the nest was located will be swept with a fine mesh net to pick up any loose eggs that may have fallen out of the nest. These eggs shall be placed in the galvanized washtub with the nest. This will minimize the amount of hatched fry swimming around in the raceway.

IV. EGG INCUBATION

The nest will be immediately transferred to the hatchery building and placed into an incubation trough. All spawns will be treated with formalin at 250 mg/l for 60 minutes (see Attachment 1). Treatment will continue until the eggs hatch (2-3 days). Once the eggs hatch, all formalin treatments will stop. The nests will be held vertical in the troughs so that the water flows through the nests. Each trough can hold 7-10 nests that are no more than 3 days apart.

Following the hatch, the nests will remain in the troughs for 7-10 days until the fry swim up. You will see the fry at the bottom of the tank when they hatch. Once the fry “swim up” they are ready to be moved to the sloughs. The “swim up” means that the fry are looking for food. Before the fry are to be moved to the sloughs, they first must be counted. The displacement technique can be used to estimate the numbers of fry. Place the fry into the beaker until the water level is displaced 1000 ml. In time, we will know how many fry/ml conversion. Down in Colorado, they estimated 275 fry/1000 ml water displaced.

V. FRY TRANSFER TO REARING SLOUGHS

After being weighed and estimated, the fry will be transferred to the sloughs using the 20-gallon galvanized washtubs. The water temperature, Ph, and DO need to be carefully monitored so we do not put too much stress on the fry. The trough water will need to be slowly converted to fresh river water to better acclimate the fry to their new environment.

Once the fry have arrived at the slough, lower the washtub into the water. Slowly tip the tub so that the river water gently mixes into the tub. This should take about 3-5 minutes. Closely observe the fry to see how they are taking the new water. After 3-5 minutes, the

fry should be thinking of swimming away. Let them swim away at their own pace. Note the amount of fry and the date at which you released them. They should be OK for 3-4 weeks. The fry will drastically increase in size within this 3-4 week period.

VI. HARVEST OF FRY FROM REARING SLOUGHS.

After the fry have been in the slough for 4-6 weeks, it is time to remove them and ship them out to the identified outplanting location. The 4-6 week time frame reflects the amount of time it will take the fry to eat all of the zooplankton within the slough. After this time, they will start looking to eat each other.

Drain the slough. (See section II). Once most of the water is gone the fry should be crowded near the dams. You will need to walk the slough to net some of the fry that may be trapped in small pools or depressions. Once the fish are crowded near the dams, we can use the TRANSVAC fish pump to suck the fry from the slough and into the truck. If this is not very effective, then you will need to net each fish and place them into the truck by hand. Once loaded, transport the fry up to the hatchery for tagging.

VII. TAGGING OPERATIONS.

The Kalispel Tribal Hatchery is responsible for marking all hatchery-raised fish before outplanting into the Box Canyon reservoir. We have decided to use Coded Wire Tags for all of the fish. The first year we will tag all fish with "Agency Only" tags and later we will use tags that can identify the fish as being raised in that particular year. We plan to mark the first 100,000 fry in the nape. We feel that this will be the best area to tag these small fry.

The other 50,000 fry will be held in the hatchery for 1-2 months. We plan on raising these fish until the fingerling-size. Prior to release, these fish will be tagged with the coded-wire tag in the cheek. These two separate locations should enable the hatchery staff to differentiate between release size strategies.

The actual tagging operation has not been performed as of yet. Once tagging operations commence, we will be able to detail the necessary steps involved in this task.

VIII. BROODFISH GATHERING/HANDLING

The collection of broodfish for spawning activities needs to be an annual event. Following spawning, the brood fish need to be checked for injuries. If they are injured they should be released back into the reservoir to live out the rest of their life. This section will detail the appropriate safety measures needed when collecting brood fish for the hatchery.

Brood fish collection will be performed with the shocking boat. There needs to be at least 5 people involved in this operation in order to lessen the stress to the fish. Once on the water, salt can be added to the live well at a .3% concentration. The live well holds approximately 94 gallons so this comes up to be about 4 cups (2 lbs.) of salt. This should calm the fish down while in the boat. When transferring them to the hatchery this same concentration can be used for the transfer tanks.

When selecting a site to gather brood fish pick one that is accessible by a truck. This way you can easily transfer the fish from the boat to the truck. Once shocking has begun and you have netted the first fish, try to have the fish in the hatchery within 30 minutes. That means shocking for 5 minutes, transferring to truck 5 minutes, hauling to hatchery 20 minutes. The fish cannot be over crowded during the haul to the hatchery-around 5-8 fish will be best, depending on the size of the tanks being used for transfer.

Once the fish have arrived at the hatchery, they can be held in the raceway for 1 day. This will give them some time to get acclimated to their new surroundings. The next day the brood fish need to be started on a formalin treatment schedule to help clean themselves of those unwanted external parasites. We have used a 1:10000 mixture for the brood fish and this seems to be sufficient. This bath needs to be administered every other day for at least 2 weeks. Treatment with formalin will be needed for the brood fish for their entire life in the hatchery.

For a more detailed method of administering the formalin bath and concentration calculations, see Attachment 2.

Egg Disinfectant

Once the broodfish has spawned and we have fertilized eggs on the mats we need to remove them to the hatchery troughs for incubation. All spawns need to be treated with a 250 ppm formalin bath for 1 hour. This treatment must be administered each day until they hatch.

1. Determine the volume of the trough. (Length x Width x depth). Make sure you convert the inches into a decimal. This answer will be cubic feet.
2. Once you have the volume of water we need to convert this number into an easier to measure form. Lets convert the cubic feet of water to LITERS. (The conversion is 28.32 liters = 1 cubic foot).
3. Now we need to calculate the amount of liters of formalin to add. The recommended dosage is 250 ppm. This is also shown as 250 mg/l and .025% treatment levels. We will use the .025% number. All we need to do is show the percentage as a decimal (.025 / 100) this comes out to be .00025. Multiply this number by the total amount of water in the trough (liters). This is the amount of formalin you need to add to the trough.

Example:

- 1. Trough volume**
- | | |
|------------|-------------------------------|
| Ht: | 18.5 inches = 1.54 ft. |
| Width | 29.0 inches = 2.42 ft. |
| Length | = 24.0 ft |

$$L \times W \times H = 89.4 \text{ cubic ft.}$$

2. Convert this to liters of water. 89.4 cubic ft. x 28.32 liters/cubic foot.
2,532 liters of water.
4. Recommended dosage (250 ppm or .025%). All we need to do is to convert the percentage into a decimal (divide .025 by 100) = .00025. Multiply this number by the volume of water in the trough to get (2,532 x .00025) the amount of formalin to add.
Answer: .633 liters.

ATTACHMENT B

KALISPEL TRIBAL HATCHERY

LARGEMOUTH BASS SUPPLEMENTATION STUDY

INTRODUCTION

In 1987, the Northwest Power Planning Council (NPPC) amended its Columbia River Basin Fish and Wildlife Program to include a resident fish substitution policy. This policy called for substitution of resident fish in areas where anadromous fish historically occurred, but were blocked with the construction of the Chief Joseph and Grand Coulee Dams. One of the first projects adopted by NPPC was the “Assessment of fishery improvement opportunities in the Pend Oreille River within the boundaries of the Kalispel Indian Reservation” (Ashe, *et al* 1992). The purpose of this three-year study was to establish baseline information of existing fish populations and habitat; and identify possible methods of improving fisheries within the reservoir. Recommendations from this study are proposed as resident fish substitution under the Northwest Power Planning Council’s 1987 Resident Fish Substitution Policy.

The assessment identified several factors within the reservoir that limited the fisheries opportunities within the Box Canyon reservoir. Some of these factors include water elevation fluctuations; lack of overwinter cover for age 0⁺ bass; and inadequate recruitment of largemouth bass into the system. The University of Idaho also performed a study in within this timeline (Bennett, Liter) and concurred with the above factors and proposed similar recommendations of the assessment study published by Ashe.

Based on these findings, biological objectives for largemouth bass (*Micropterus salmoides*), bull trout (*Salvelinus confluentus*), and cutthroat trout (*Oncorhynchus clarki*) were identified and incorporated into the NWPPC’s program. The largemouth bass biological objectives were as follows.

- Increase the biomass of harvestable largemouth bass in the Box Canyon reservoir from the current 6 pounds/acre to an interim target of 8 pounds/acre by 2003 and a final target of 12 pounds/acre by the year 2008.
- Increase age 0⁺ largemouth bass overwinter survival from current levels of 0.4-3.9 percent to approximately 15-20 percent.

Specific recommendations or strategies to attain these biological objectives were also formulated and presented to the NPPC for approval and funding. These recommendations are as follows.

- Operate and maintain low-capital warm water hatchery constructed on the Kalispel Indian Reservation to produce 100,000 largemouth bass fry and 50,000 fingerlings for release into Box Canyon reservoir.
- Construct, operate, and maintain water control structures on the Pend Oreille wetlands wildlife project for the purpose of creating bass nursery sloughs.
- Construct, place, and maintain artificial cover structures to increase the amount of bass age 0⁺ fry winter cover in the Box Canyon reservoir. The purpose of the cover is to increase the overwinter survival of age 0⁺ largemouth bass.
- Monitor effectiveness of largemouth bass supplementation.

The main objective for this study is to test the survivability of hatchery-raised bass through their first year following planting. Expected interpretations include strategies for release size and outplanting locations.

METHODS AND MATERIALS

All hatchery-raised largemouth bass released into the reservoir will be marked with a coded-wire tag. The location of the tag will identify the particular release-size. All supplementation efforts shall be performed within a 20-30 miles stretch of the 57-mile long Box Canyon reservoir that currently provides suitable largemouth bass habitat. Specific outplanting locations will focus on areas that currently support a viable largemouth bass population. A list of the outplanting locations along with stocking sizes are listed in Table 1, below.

Table 1. Outplanting locations and release numbers

Outplanting Location	Fry	Fingerling	Fingerling 1+	Totals
Rednours slough	33,333	15,000	1,667	50,000
Dike slough	33,333	15,000	1,667	50,000
Campbell slough	33,334	15,000	1,666	50,000
Totals	100,000	45,000	5,000	150,000

Three different fish sizes will be released at each location. The first stocking will take place in early summer and will consist of approximately 100,000 fry (~55mm). The second stocking will

take place in early fall and consist of approximately 45,000 fingerlings (~125mm). A third stocking will take place the following spring with approximately 5,000 fingerlings age 1⁺. Each group of fish will have its own distinctive mark that will indicate the specific release size (Figure 1).

Recapture rates of the different release sizes will be tested for significance using the Chi² test of significance (distribution). All hatchery released fish recaptured during the study will be re-marked and released into the reservoir. The mark-recapture numbers will then be summed up for the entire sampling period (March-October).

$$\text{Chi}^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$$

Each outplanting location will be sampled monthly (March-October) following release. Three ten-minute transects will be performed at each release site. Two transects shall be located on opposite banks within the slough and another located immediately downstream of the slough in the main channel. All areas will be sampled with a Smith-Root electro-shocking boat. Only largemouth bass will be sampled. A catch per unit effort (CPUE) will be calculated for each transect and release area.

$$\text{CPUE} = \sum \frac{\text{Sample time}}{\text{Fish sampled}}$$

A Jolly-Seber model will be used to generate survival estimates for the hatchery-raised fish. The data gathered during the study will be entered into a computer-based program entitled “MARK”. This program utilizes a Jolly-Seber model to generate survival estimates. The survival rates between hatchery-raised bass and the native population will be compared, along with different survival rates between release sizes.

The plot-level calls for each sampling area will be as follows:

1. Study name
2. Date
3. Time of day
4. Transect name and number
5. River elevations at Box Canyon, Albeni Falls, and Cusick
6. Water temperature
7. Crew initials

Only largemouth bass will be sampled within each transect. The specific measurements for each fish will be as follows:

1. Species
2. Total length (mm)

3. Total weight (grams)
4. Sex (if possible)
5. Other identifying marks

KALISPEL TRIBAL BASS HATCHERY
SUPPLEMENTATION STUDY

NULL HYPOTHESIS

H_0 : Survival release size 1 = Survival release size 2 = Survival release size 3

ALTERNATIVE HYPOTHESIS

H_1 : Survival release size 1 > Survival release size 2

H_2 : Survival release size 2 > Survival release size 1

H_3 : Survival release size 1 > Survival release size 3

H_4 : Survival release size 3 > Survival release size 1

H_5 : Survival release size 2 > Survival release size 3

H_6 : Survival release size 3 > Survival release size 2

Release size 1 = Fry age 0⁺ (approximately 100,000 released)

Release size 2 = Fingerling age 0⁺ (approximately 45,000 released)

Release size 3 = Fingerling age 1⁺ (approximately 5,000 released)

EXPECTED INTERPRETATIONS

Increased survivability of hatchery-raised fish within the reservoir shall be the most important variable considered when deciding which stocking size best satisfies the biological objective of increasing the biomass of harvestable bass. Another factor involved in the decision criteria is the overall cost associated with each release size. Generally, the smaller the fish at the time of release, the lower the cost.

NULL HYPOTHESIS (survival 1 = survival 2 = survival 3)

TRUE: If all three release sizes exhibit the same types of survival, then the most cost effective method of release will be employed.

FALSE: Go through alternative hypothesis key.

ALTERNATIVE HYPOTHESIS 1 (survival 1 > survival 2)

TRUE: If release size 1 is more cost effective, then release size 1 will be employed.
Note finding and go to hypothesis 3.

FALSE: Reject hypothesis, note finding, and go to hypothesis 2.

ALTERNATIVE HYPOTHESIS 2 (survival 2 > survival 1)

TRUE: If release size 2 is more cost effective, then release size 2 will be employed.
Note findings and go to hypothesis 3.

FALSE: Reject hypothesis, note finding, and go to hypothesis 3.

ALTERNATIVE HYPOTHESIS 3 (survival 1 > survival 3)

TRUE: If release size 1 is more cost effective, then release size 1 will be employed.
Note finding and go to hypothesis 5.

FALSE: Reject hypothesis, note finding, and go to hypothesis 4.

ALTERNATIVE HYPOTHESIS 4 (survival 3 > survival 1)

TRUE: If release size 3 is more cost effective, then release size 1 will be employed.
Note finding and go to hypothesis 5.

FALSE: Reject hypothesis, note finding, and go to hypothesis 5.

ALTERNATIVE HYPOTHESIS 5 (survival 2 > survival 3)

TRUE: If release size 2 is more cost effective, then release size 2 will be employed.
Note finding and go to hypothesis 6.

FALSE: Reject hypothesis, note finding, and go to hypothesis 6.

ALTERNATIVE HYPOTHESIS 6 (survival 3 > survival 2)

TRUE: If release size 3 is more cost effective, then release size 3 will be employed.
Note finding.

FALSE: Reject hypothesis and note finding.

Appendix C

ISRP Comments and Kalispel Tribe
Response February 22, 2001

February 22, 2001
Attention: Kendra Phillips
Response to ISRP
Northwest Power Planning Council
851 SW 6th Avenue, Suite 1100
Portland, OR 97204

Kalispel Resident Fish Project

Project # 199500100

Dear Ms. Phillips:

In the ISRP preliminary review of fiscal year 2002 project proposals for the Mountain Columbia Province, several items were identified for additional clarification in regards to this project. Provided below are specific comments by the ISRP and responses by the Kalispel Natural Resource Department (KNRD) followed by a general response pertaining to tributary assessment and enhancement. Literature cited is provided in Attachment A.

Specific Comments

ISRP Comment:

“A response is needed. Prior ISRP concerns regarding the effectiveness of a largemouth bass hatchery were reinforced by the presentation.”

KNRD Response:

Prior ISRP concerns regarding the effectiveness of a largemouth bass hatchery are based upon supplementation efforts that have been ineffective in most parts of the country. The Kalispel Tribal Hatchery has only been in operation for four years. It took brood fish that were collected in 1997 a year to acclimate to a hatchery. This was anticipated. In 1999, 242,000 largemouth bass fry were successfully hatched and transferred to rearing sloughs. However, during high water the fish escaped while the reservoir elevation exceeded the height of the rearing slough dams. This problem was addressed shortly thereafter with the addition of fine mesh nets above the dam. Many hatcheries experience mechanical and biological problems during early years and the Kalispel Hatchery has as well, but as problems arise they are addressed and fixed.

While there are some bass supplementation programs that have not met their goals and are considered ineffective, there are some bass supplementation programs that have been proven successful. Buynak and Mitchell (1999) reported that fin-clipped largemouth bass were stocked annually in 3,050-acre Taylorsville Lake, Kentucky in the fall from 1988 to 1992 at densities ranging from 9.8 to 27.8 fish/acre. In 1993, after 5 years of stocking, the stocked largemouth

bass accounted for 37.6% (<8.0 in), 18.2% (8.0-11.9 in), 24.1% (12.0-14.9 in), and 14.9% (>15.0 in) of the various size-groups and 24.5% of the total electrofishing catch. Contribution of stocked bass to the fishery also declined rapidly after 1995, 3 years after stocking ceased. In Chatfield Reservoir, Colorado, largemouth bass were hatchery reared to one year of age using intensive and extensive culture from 1978 to 1981. Subsequent samples of age 2 bass in the reservoir composed 12%, 59%, and 59% of the population, during sample years 1980, 1981, and 1982 respectively (Kreiger and Puttman 1986). Increases in the age two class fish were directly attributed to hatchery supplementation. In Oklahoma, stocked bass constituted 76% and 72% of the 1980 year class through the first two growing seasons in Liberty and Wiley Post lakes respectively (Boxrucker 1986). Supplemental stocking of largemouth bass fingerlings in Lake Lawtonka in southwestern Oklahoma appeared to increase the number of fish reaching the quality length of 300 mm (Boxrucker 1984). Fieldhouse (1971) reported that stocked largemouth bass averaging 190 mm in length constituted 18% of that year class, four years after stocking.

ISRP Comment:

“It remains unclear from the proposal and the presentation that the productivity of the reservoir is, or will be, amenable to a largemouth bass hatchery.”

KNRD Response:

The Upper Columbia United Tribes (UCUT) Fisheries Center conducted a three-year baseline assessment from 1988 to 1990 in the Box Canyon portion of the Pend Oreille River (Ashe and Scholz 1992). The objective of this study was to examine the existing fishery, identify fishery improvement opportunities and recommend fishery enhancement projects. Baseline data assessed population dynamics, growth rates, feeding habits, behavior patterns and factors limiting the fishery.

Based on population estimates and relative abundance surveys, yellow perch were the most abundant species in the Box Canyon Reservoir, ranging from 42% to 45% of the total fish abundance. Pumpkinseed composed 16% of the total followed by tench (9%) and largemouth bass (8%). One of the reasons for an overabundance of yellow perch in the river is low angler interest and harvest. Three of the 419 (0.72%) anglers interviewed during the study were fishing for perch. The main reason for low popularity and harvest rates of perch is their small size. The perch population in the reservoir is stunted. Yellow perch captured during the survey ranged from 24 mm to 280 mm with an overall average length of between 149mm and 151mm. Although yellow perch in the Pend Oreille River start out at about the same size as perch from similar systems, growth rates of Pend Oreille perch were much lower at every annulus.

The assessment identified several factors within the reservoir that limited the fisheries opportunities within Box Canyon Reservoir. Largemouth bass are currently the largest sized gamefish in the Pend Oreille River that provide a recreational and subsistence fishery. Some of the factors resulting in a low biomass of largemouth bass in the Pend Oreille River include water elevation fluctuations that result in decreased spawning success. Low water temperatures, late spawning time and lack of cover during the winter result in low overwinter survival rates for age 0⁺ bass. This results in an inadequate recruitment of largemouth bass into the system. Age 0⁺ fish are particularly susceptible to winter stress because they often have to face their first winter with reduced energy stores and a smaller body size than older conspecifics, which may lead to

increased mortality due to starvation and predation (Henderson et al. 1988; Shuter and Post 1990; Thompson et al. 1991). Winter mortality of age 0⁺ largemouth bass has been reported to be size dependent, with smaller young experiencing higher mortality (Shelton et al. 1979; Toneys and Coble 1979). Miranda and Hubbard (1994) indicated that winter survival of age 0⁺ largemouth bass smaller than 126 mm (TL) was affected by the presence of predators, whereas longer fish were largely unaffected. They also suggested that survival of small largemouth bass was enhanced by shelter availability. Fullerton et al (2000) found that winter severity (temperature, duration, and photoperiod), geographic origin, food availability, and initial body size likely influence growth, survival, and therefore, recruitment of age-0 largemouth bass. They also found that largemouth bass from 33°N suffered high mortality in the high-latitude winter.

The average back-calculated length of age 1 largemouth bass from Box Canyon Reservoir was 3.2 in (81.6 mm). In comparison, the median length of age 1⁺ largemouth bass, based on 31 studies on various waters across the U.S., were 4.5 in (114 mm) (Zweiacker et al. 1973). The mean annual scale increment for age 2⁺ bass from Box Canyon Reservoir was larger than that of age 1 fish although growth of largemouth bass from Box Canyon Reservoir was significantly less than other bass populations studied in the Northwest (Rieman 1987; Bennett and Hatch 1991). The increased growth of ages 2 and 3 bass may be a result of bass attaining a length where they are able to shift from a zooplankton and invertebrate diet to a higher energy piscivorous (fish eating) diet. Although growth of ages 4 and 5 largemouth bass from Box Canyon Reservoir declined, growth was still greater than any of the populations compared, including bass from Nebraska and Missouri.

It appears that bass growth and recruitment is also limited due to competition with yellow perch for zooplankton during the first few years of life. Ouedraogo (1991) reported similar results for his feeding habit study on largemouth bass in the Pend Oreille River, suggesting the slow stunted growth of young-of-the-year bass was a result of competition for food resources with sunfish (yellow perch, pumpkinseed and black crappie).

At about age 3⁺ to 4⁺, bass became primarily piscivorous and at this time yellow perch were the primary food item in their diet (Ashe and Scholz 1992). A definite change in bass growth was seen at the same age this change in diet was observed. At about age 4⁺ bass gained 100g a year. At age 6⁺ and older, bass can handle larger fish and therefore showed an increase in weight of over 200 g a year. Despite the limiting factors, quality sized (>500mm) largemouth bass were often captured. Since yellow perch were the most abundant fish species in the reservoir food availability does not present a problem.

Results of the three year baseline study concluded that the bass population in the river has room for expansion and there is adequate habitat for a larger population. Current production of largemouth bass in the river was estimated by constructing a population model from data collected during the study. A model of the population was constructed based on population estimates, relative abundance of each class and estimated mortality rates (Ashe and Scholz 1992).

Based on the 7400 acre area of the reservoir, production of age 1⁺ and older fish was 7.7 lbs/acre (8.6 kg/ha) in 1989 and 7.8 lbs/acre (8.7 kg/ha) in 1990. Calculated biomass for fish of a harvestable size (245 mm or 10 inches) was 5.5 lbs/acre (6.2 kg/ha) in 1989 and 5.8 lbs/acre (6.5 kg/ha) in 1990. A quality bass fishery is considered to produce 15-20 lbs/acre (Hisata, WDW, personal communication 1988). The Pend Oreille River currently produces less than half that. It appears that there is adequate food supply and habitat available in the Pend Oreille River to

support a larger population, however recruitment remains a limiting factor to population expansion. The estimated size of the age class 1⁺ in 1989 and 1990 was approximately 150,000. In order to enhance the bass fishery to “quality” production we estimate it will be necessary to double this number. The goal, based on recommendations for enhancing the largemouth bass population is to contribute 150,000 age 1⁺ fish at 150 mm into the population annually.

With an outproduct of 150,000 bass fingerlings, stocking rates would be approximately 20 fry/acre. Stocking ratios of 100 largemouth bass fingerlings per acre are commonly accepted around the U.S. as indicative of approximate carrying capacity, depending on fertility of the water and forage availability (Fletcher, WDW, personal communication 1988). Therefore, stocking rates recommended for the Pend Oreille River are substantially lower than common practices in other U.S. lakes and reservoirs

The University of Idaho conducted a similar study as UCUT from 1989 to 1990 to evaluate the fish community in Box Canyon Reservoir, sloughs and major tributaries and Power Lake (Bennett and Liter 1991). For Box Canyon Reservoir, yellow perch, pumpkinseed, and largemouth bass were game species highest in relative abundance, while northern squawfish, tench, and largescale sucker were the most abundant non-game species. Overall, yellow perch was the most abundant species in Box Canyon Reservoir but contributed little to the sport fishery. Largemouth bass comprised about 6% of the fish community. Age, growth, and mortality analyses were conducted on largemouth bass, yellow perch and black crappie. Scale increments of age 1 largemouth bass showed slow growth, while age 5 fish exhibited faster growth than bass from nearby populations in Washington and northern Idaho and two reservoirs in Nebraska and Missouri.

The study indicated that increased fisheries management will be required to improve the quality of the sport fishery. One management possibility to enhance weak year-classes would be to provide artificial recruitment after the first winter. This would circumvent the apparent high mortality that occurs during the first year. Off-site rearing may have potential to enhance the number of largemouth bass within Box Canyon Reservoir.

ISRP Comment:

“This should be considered an experiment. The response should lay out the bass hatchery as an experiment with milestones and performance standards to determine success or failure.”

KNRD Response:

In 1987, the Northwest Power Planning Council (NPPC) amended its Columbia River Basin Fish and Wildlife Program to include a resident fish substitution policy. This policy called for substitution of resident fish in areas where anadromous fish historically occurred, but were blocked with the construction of the Chief Joseph and Grand Coulee Dams. One of the first projects adopted by the NPPC was the “Assessment of fishery improvement opportunities in the Pend Oreille River within the boundaries of the Kalispel Indian Reservation” (Ashe, *et al.* 1991). The purpose of this three-year study was to establish baseline information of existing fish populations and habitat; and identify possible methods of improving fisheries within the reservoir. Recommendations from this study are proposed as resident fish substitution under the Northwest Power Planning Council’s 1987 Resident Fish Substitution Policy.

The assessment identified several factors within the reservoir that limited the fisheries opportunities within the Box Canyon reservoir. Some of these factors included water elevation fluctuations, lack of overwinter cover for age 0⁺ bass, and inadequate recruitment of largemouth bass into the system. The University of Idaho also performed a study during this time (Bennett and Litter 1991) and concurred with the above factors and proposed similar recommendations of the assessment study published by Ashe.

Based on these findings, biological objectives for largemouth bass were identified and incorporated into the NWPPC's program. The largemouth bass biological objectives are as follows.

- Increase the biomass of harvestable largemouth bass in the Box Canyon reservoir from the current 6 pounds/acre to an interim target of 8 pounds/acre by 2003 and a final target of 12 pounds/acre by the year 2008.
- Increase age 0⁺ largemouth bass overwinter survival from current levels of 0.4-3.9 percent to approximately 15-20 percent.

Specific recommendations or strategies to attain these biological objectives were also formulated and presented to the NPPC for approval and funding. These recommendations are as follows.

- Operate and maintain low-capital warm water hatchery constructed on the Kalispel Indian Reservation to produce 100,000 largemouth bass fry and 50,000 fingerlings for release into Box Canyon reservoir.
- Construct, operate, and maintain water control structures on the Pend Oreille wetlands wildlife project for the purpose of creating bass nursery sloughs.
- Construct, place, and maintain artificial cover structures to increase the amount of bass age 0⁺ fry winter cover in the Box Canyon reservoir. The purpose of the cover is to increase the overwinter survival of age 0⁺ largemouth bass.
- Monitor effectiveness of largemouth bass supplementation.

In 1996, construction activities commenced on the largemouth bass hatchery, located on the Kalispel Indian Reservation. The final completion date of the hatchery was November 1997. Upon completion of the hatchery, largemouth bass will be gathered, spawned, and reared in the facility. The initial outplanting of juvenile largemouth bass into the Box Canyon reach of the Pend Oreille River is scheduled for the spring of 1998. In summer of 1999, the hatchery staff was able to produce 242,000 largemouth bass fry for release.

The goals of this project are to facilitate the production and rearing of juvenile largemouth bass for supplementation and thereby increase the production of harvestable bass. The Kalispel Tribal Hatchery is designed to produce 100,000 fry and 50,000 fingerling-sized largemouth bass. The initial project goals or objectives included the following:

- Assembly of hatchery life support system,
- Prepare hatchery Operation and Maintenance manual.
- Develop egg collection, broodfish spawning, and egg collection techniques.
- Develop fry and fingerling rearing methods.
- Identification of outplanting location within the reservoir.
- Monitor the effectiveness of hatchery supplementation.

The early objectives of the hatchery were directed towards the development and construction of the hatchery operation. Most of the predetermined procedures and tasks were outlined but untested. The first 2-3 years of operations dealt with testing these procedures and adjusting them as needed.

The hatchery project began December of 1997 and has three distinct elements: (1) Getting the hatchery online and operational, (2) Begin supplementation efforts and monitor supplementation strategies, and (3) estimating the total amount of biomass being contributed to the overall population. Currently, we are on the second step. Once supplementation efforts begin, we will begin monitoring our release strategies, production procedures, etc. in order to maximize our supplementation efforts.

The supplementation study is designed to estimate the performance standard of increasing overwinter survivability of hatchery-raised largemouth bass in the reservoir. Ashe and Scholz (1992) estimate the overwinter survival of age 0⁺ largemouth bass to be between 0.4-3.9 percent. The goal of this project is to increase the overwinter survival to approximately 15-20 percent through supplementation and the placement of overwinter cover. Once supplementation efforts are performed and suitable release strategies developed, the overall largemouth bass biomass in the reservoir will be studied. It is expected that at least 1 ½ - 2 lifecycles will be needed to sufficiently estimate overall success of the hatcheries biological objective of 12 lbs/acre. The average lifecycle for largemouth bass in the reservoir is 8-9 years. To date, this study is not developed. The supplementation study is listed below. Another approach for determining the hatchery success or failure is to conduct a population estimate. Currently this additional monitoring is a strategy the hatchery has not explored nor budgeted for future years. However, if this were a method that would aid in determining the hatchery success or failure, the KNRD would do it based upon funding availability.

Kalispel Hatchery Supplementation Study

All hatchery-raised largemouth bass released into the reservoir will be marked with a coded-wire tag. The location of the tag will identify the particular release-size. All supplementation efforts shall be performed within a 20-30 mile stretch of the 57-mile long Box Canyon reservoir that currently provides suitable largemouth bass habitat. Specific outplanting locations will focus on areas currently supporting a viable largemouth bass population. A list of the outplanting locations along with stocking sizes are listed in Table 1, below.

Table 1. Outplanting locations and release numbers

Outplanting Location	Fry	Fingerling	Fingerling 1+	Totals
Rednours slough	33,333	15,000	1,667	50,000
Dike slough	33,333	15,000	1,667	50,000
Campbell slough	33,334	15,000	1,666	50,000
Totals	100,000	45,000	5,000	150,000

Three different fish sizes will be released at each location. The first stocking will take place in early summer and will consist of approximately 100,000 fry (~55mm). The second stocking will take place in early fall and consist of approximately 45,000 fingerlings (~125mm).

A third stocking will take place the following spring with approximately 5,000 fingerlings age 1+. Each group of fish will have its own distinctive mark that will indicate the specific release size.

Recapture rates of the different release sizes will be tested for significance using the Chi² test of significance (distribution). All hatchery released fish recaptured during the study will be re-marked and released into the reservoir. The mark-recapture numbers will then be summed up for the entire sampling period (March-October).

$$\text{Chi}^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$$

Each outplanting location will be sampled monthly (March-October) following release. Three ten-minute transects will be performed at each release site. Two transects shall be located on opposite banks within the slough and another located immediately downstream of the slough in the main channel. All areas will be sampled with a Smith-Root electro-shocking boat. Only largemouth bass will be sampled. A catch per unit effort (CPUE) will be calculated for each transect and release area.

$$\text{CPUE} = \sum \frac{\text{Sample time}}{\text{Fish sampled}}$$

A Jolly-Seber model will be used to generate survival estimates for the hatchery-raised fish. The data gathered during the study will be entered into a computer-based program entitled "MARK". This program utilizes a Jolly-Seber model to generate survival estimates. The survival rates between hatchery-raised bass and the native population will be compared, along with different survival rates between release sizes. Alpha value for type 1 error will be 0.1.

The plot-level calls for each sampling area will be as follows:

1. Study name
2. Date
3. Time of day
4. Transect name and number
5. River elevations at Box Canyon, Albeni Falls, and Cusick
6. Water temperature
7. Crew initials

Only largemouth bass will be sampled within each transect. The specific measurements for each fish will be as follows:

1. Species
2. Total length (mm)
3. Total weight (grams)
4. Sex (if possible)
5. Other identifying marks

NULL HYPOTHESIS

H_0 : Survival release size 1 = Survival release size 2 = Survival release size 3

ALTERNATIVE HYPOTHESIS

H_1 : Survival release size 1 > Survival release size 2

H_2 : Survival release size 2 > Survival release size 1

H_3 : Survival release size 1 > Survival release size 3

H_4 : Survival release size 3 > Survival release size 1

H_5 : Survival release size 2 > Survival release size 3

H_6 : Survival release size 3 > Survival release size 2

Release size 1 = Fry age 0⁺ (approximately 100,000 released)

Release size 2 = Fingerling age 0⁺ (approximately 45,000 released)

Release size 3 = Fingerling age 1⁺ (approximately 5,000 released)

EXPECTED INTERPRETATIONS

Increased survivability of hatchery-raised fish within the reservoir shall be the most important variable considered when deciding which stocking size best satisfies the biological objective of increasing the biomass of harvestable bass. Another factor involved in the decision criteria is the overall cost associated with each release size. Generally, the smaller the fish at the time of release, the lower the cost.

NULL HYPOTHESIS (survival 1 = survival 2 = survival 3)

TRUE: If all three release sizes exhibit the same types of survival, then the most cost effective method of release will be employed.

FALSE: Go through alternative hypothesis key.

ALTERNATIVE HYPOTHESIS 1 (survival 1 > survival 2)

TRUE: If release size 1 is more cost effective, then release size 1 will be employed.

Note finding and go to hypothesis 3.

FALSE: Reject hypothesis, note finding, and go to hypothesis 2.

ALTERNATIVE HYPOTHESIS 2 (survival 2 > survival 1)

TRUE: If release size 2 is more cost effective, then release size 2 will be employed.
Note findings and go to hypothesis 3.
FALSE: Reject hypothesis, note finding, and go to hypothesis 3.

ALTERNATIVE HYPOTHESIS 3 (survival 1 > survival 3)

TRUE: If release size 1 is more cost effective, then release size 1 will be employed.
Note finding and go to hypothesis 5.

FALSE: Reject hypothesis, note finding, and go to hypothesis 4.

ALTERNATIVE HYPOTHESIS 4 (survival 3 > survival 1)

TRUE: If release size 3 is more cost effective, then release size 1 will be employed.
Note finding and go to hypothesis 5.

FALSE: Reject hypothesis, note finding, and go to hypothesis 5.

ALTERNATIVE HYPOTHESIS 5 (survival 2 > survival 3)

TRUE: If release size 2 is more cost effective, then release size 2 will be employed.
Note finding and go to hypothesis 6.

FALSE: Reject hypothesis, note finding, and go to hypothesis 6.

ALTERNATIVE HYPOTHESIS 6 (survival 3 > survival 2)

TRUE: If release size 3 is more cost effective, then release size 3 will be employed.
Note finding.

FALSE: Reject hypothesis and note finding.

ISRP comment:

"No description of the type of structures placed was provided."

Reviewer Comments: What is the evidence that these structures increase the productivity of the system and increase it in such a way that it benefits the population?

KNRD Response:

The type of structure implemented is selected to offset the limiting factors identified in the baseline habitat assessments. The specific types of structures were chosen using guidelines from Rosgen (1996). The following structures were implemented from 1996 to 1998:

<u>Stream</u>	<u>Reach</u>	<u>Structure Types and Number Constructed</u>
Cee Cee Ah Cr.	4	12 K-dams
Cee Cee Ah Cr.	5	11 cross logs and revetments
Cee Cee Ah Cr.	6	10 upstream log V-weirs
Indian Cr.	3	3 double wing deflectors
Indian Cr.	4	3 upstream log V-weirs
Browns Cr.	4	6 K-dams
Browns Cr.	9	3 single wing log deflectors, 3 upstream log V-weirs
Fourth of July Cr.	8	6 upstream log V-weirs
Mineral Cr.	1	10 double wing deflectors
Whiteman Cr.	4	3 channel blocks, 6 log cover structures
Whiteman Cr.	5	8 vortex rock weirs
Whiteman Cr.	6	8 vortex rock weirs

Structure type descriptions from Hunter (1991) and Rosgen (1996):

- **Channel block:** Channel blocks consist of log cribs constructed at the upper and lower ends of side channel braids to consolidate flows into a single channel. The cribs are placed slightly below the bankfull mark so the channel can be used as flood flow channels.
- **Cross log and revetment:** A lateral scour pool with cover at a naturally occurring bend in the channel is created with this structure. The brace (cross) log is anchored into the stream bank and extends across the channel, oriented upstream approximately 45°. The revetment log is pinned to the upstream end of the brace log and then to the stream bottom. The brace log creates a scour pool while the revetment log provides cover and bank protection.
- **Double wing deflectors:** The double wing deflector narrows the channel and increases velocity to promote the formation of a scour pool. Two logs are anchored into opposite stream banks and oriented upstream approximately 45°. The logs are cut to a length so that channel width is reduced 40% to 80%.

- **K-dam:** This structure creates a mid-channel scour pool. A single log, >16 inches in diameter, spans the entire channel. Each end of the log is toed into the bank 4-6 feet. Brace logs are placed at the downstream side of each end of the spanning log at approximately 45°. The brace logs are anchored into the bank and stream bottom.
- **Log cover structure:** This structure incorporated a bank crib with a cover log. The crib consisted of logs toed into the bank 4-6 feet and positioned perpendicular to the channel. The logs anchored into the bank extended beyond the bank 18-24 inches. Planks and woody debris were placed on top of the logs to provide cover.
- **Single wing deflector:** Deflectors are used to direct streamflows to create or enhance pools, or to divert flow away from unstable banks. A single log is anchored into the stream bank, usually oriented upstream 45°, and pinned to the stream bottom.
- **Upstream log V-weir:** This structure creates a mid-channel scour pool. Two logs are anchored into each bank 4-6 feet and oriented upstream at approximately 45°. The upstream ends of the logs are pinned together and both logs are pinned to the channel bottom.

ISRP comment:

" It was evident from the results presented that the structures did not in most cases result in an increase in native trout, but did in some cases benefit non-native salmonids."

KNRD Response:

The data presented were from only two and three years of monitoring. Hunt (1976) suggests that projects targeting natural populations probably require 6-7 years to produce population changes. Young et al. (1999) present cutthroat trout density estimates when examining the effects of two different logging treatments. In the control section, cutthroat trout density ranged from 0.15 to 0.37 fish/m² in a three-year period. Platts and Nelson (1989) studied allopatric populations of cutthroat trout in two streams from 1975 to 1985. Densities in the two streams fluctuated 448% and 772% over that time period. When discussing problems associated with long term restoration monitoring, Kershner (1997) states that, "Part of the problem is that much restoration implemented today may not yield significant benefits for years or even decades". The Tribe believes that more monitoring needs to be performed before an accurate assessment of instream restoration success or failure can be determined. In the end, we will likely see individual instances of success and failure. However, through our failures and those presented in literature, we will learn to adapt and failures will become infrequent. It is premature to abandon instream restoration as part of our recovery plan based on 2-3 years of monitoring. The Tribe agrees that structures in some streams benefited only non-native salmonids. In the future, the non-natives will be eradicated and replaced with translocated native species.

Results from baseline habitat surveys show a general trend: large woody debris densities are low and substrate embeddedness is high. As a result, winter and spawning habitat appear to limit native populations. High embeddedness decreases the amount of winter habitat available

for salmonids (Bustard and Narver 1975; Griffith and Smith 1993). Translocation of native trout is likely to fail if the receiving stream has habitat that will not support a population. When examining translocations of greenback cutthroat trout, Harig et al. (2000) found that some translocations appear to have failed because the habitat in the receiving streams was unsuitable.

Increases in native trout populations were not observed in some restoration areas because few native fish remain. In the Cee Cee Ah Creek watershed (which includes Browns Creek), only seven cutthroat trout have been observed in the restoration areas since 1996. Habitat degradation and interspecific competition with brook and brown trout have severely depressed the cutthroat population. In 1996, the Tribe and the U.S. Forest Service jointly initiated a project to remove brook trout in upper Cee Cee Ah Creek by electrofishing. Upper Cee Cee Ah Creek is isolated from the lower creek and Browns Creek by a natural falls. The project was started in 1996 and then suspended shortly thereafter because a technician captured what was thought to be a bull trout or possible hybrid. Genetic analysis determined that the fish was a brook trout. In the summer of 1997, brook trout were observed during snorkel surveys of the treated areas. Therefore, the project was terminated because it appeared that electrofishing would not effectively eradicate the brook trout population.

The Cee Cee Ah Creek watershed has been identified by area fishery managers as a core watershed for recovery of native species. It is important to the Tribe as a historical fishery and because it is one of two perennial streams that flow through the reservation. Federal, state, and tribal land ownership is relatively high in the watershed. Therefore, the potential to restore watershed processes is higher than the many watersheds in the lower Pend Oreille that have checkerboard land ownership. The management plan for the Cee Cee Ah watershed includes non-native fish removal along with habitat restoration. Phase 1 of the fish removal project is scheduled to be implemented in 2001. Upper Cee Cee Ah Creek will be chemically treated by personnel from the Washington Department of Fish and Wildlife. Prior to treatment, the stream will be electrofished to remove cutthroat trout. Captured cutthroat trout will be transferred to Browns Creek. Post treatment monitoring will occur for at least one year to ensure that treatment was successful. Phase 2 of the fish removal project entails chemically treating Browns Creek after cutthroat are captured and relocated to the previously treated section of Cee Cee Ah Creek.

In addition to the five reaches where habitat restoration was implemented through this project, restoration has been completed in two additional reaches in Browns Creek and one reach in Cee Cee Ah Creek. Future restoration work will include addressing eroding banks in lower Cee Cee Ah Creek.

Although increases in native fish densities have not been observed in the Cee Cee Ah watershed restoration sites, non-native species densities have increased in 4 of the 7 sites. The mean decrease in sites with declined density is 33% while increases averaged 198%. We expect that improved habitat conditions will benefit re-established cutthroat trout populations once non-native species are removed.

Reviewer Comments: How will the monitoring associated with these channel rehab projects provide assessment of the number and kinds of structures needed for optimum productivity for the native species?

ISRP comment:

" What evidence will indicate that habitat is limiting the population and needs to be enhanced?"

KNRD Response:

Whether cutthroat populations are impacted by non-native fish through competitive displacement or habitat degradation (with non-natives simply filling in the void) is unknown. Of the 150 reaches surveyed by the Tribe, 67 reaches contained cutthroat trout. Brook trout were present in over 50% of those 67 reaches; however, the 8 highest cutthroat densities were observed in reaches absent of brook trout. This suggests that interspecific competition may be impacting cutthroat trout populations. However, we have also observed low densities in isolated populations. Hilderbrand and Kershner (2000) estimated minimum stream lengths and abundances to maintain isolated cutthroat populations. Of those reaches we surveyed that contained isolated populations of cutthroat, 35% had abundances lower than the minimums that Hilderbrand and Kershner proposed (each stream also had reaches higher than the minimum). Low densities in reaches with isolated populations suggests that habitat is limiting the population.

To determine what habitat attributes may be limiting, summarized baseline data for are compared to threshold values suggested by Hunter (1991) and MacDonald et al. (1991). Tributary reaches are ranked by the number of threshold values that are exceeded. Reaches with the most habitat attributes exceeding threshold values are examined first. If those reaches have a correspondingly low fish density, then they are considered for restoration.

ISRP comment:

" From the site visit, the LeClerc looks like an appropriate site for restoration and enhancement of westslope cutthroat populations. However, the proposal was not as convincing."

KNRD Response:

Instream structures have been placed Whiteman, Mineral, and Fourth of July creeks. Riparian exclosures have been constructed in Whiteman, Fourth of July, and Middle Branch LeClerc riparian areas. These are all within the LeClerc Creek watershed. Future projects in the watershed with secured funding include slope stabilization, road obliteration with floodplain restoration, and brook trout removal.

ISRP comment:

"Section 5 Objective 1. What is the purpose of determining species distribution and abundance? How are the results interpreted?"

KNRD Response:

We propose to conduct additional baseline habitat and fish surveys. Currently, less than 20% of the tributaries in the lower Pend Oreille River sub-basin have been surveyed by the Tribe or other agencies. Determining species distribution and abundance is key to future fisheries and other resource management. Identifying watersheds with resident fish populations will guide management activities. Conservation strategies will be determined based on native fish distribution and abundance. Core watersheds, where future conservation and restoration efforts will be focused, are identified using species distribution and abundance information. Other

factors considered when designating core watersheds include: 1) non-native fish distribution and abundance, 2) relative stream habitat condition, 3) land ownership, and 4) connectivity of the watershed. Results will identify species and densities of fish present in the snorkel station.

ISRP comment:

" Page 5, Goal 1: How will project personnel know when the goal is met?"

KNRD Response:

See the following response.

ISRP comment:

"Page 5. Goal 1, Objective 1: How will project personnel know when adult escapement is well distributed? What are the criteria for defining a "healthy spawning population" and how far are these populations from that level at present?"

KNRD Response:

The goals and objectives in question are those listed in the Pend Oreille Sub-basin Summary and were referred to in the Kalispel Resident Fish proposal. At this time, those goals and objectives have not been defined quantitatively. The Northeastern Washington Bull Trout Recovery Team will establish criteria for distribution and population requirements for recovery of bull trout. Since the sub-basin summary is a working document, recovery criteria will be defined by the Pend Oreille Sub-basin committee in the final sub-basin plan.

Less than 20% of the sub-basin tributaries have been surveyed. Determination of species distribution, abundance, and the amount of suitable tributary habitat continues to be assessed through habitat and snorkel surveys. Once tributary assessments are complete throughout the sub-basin and recovery criteria are defined by the sub-basin committee, we can determine how far we are from meeting population objectives.

General Response for Tributary Assessment and Enhancement

The tributary assessment and enhancement portion of this project is a fundamental part of restoring native fish populations in the Lower Pend Oreille sub-basin. However, many other processes and efforts work toward recovery. The Tribe believes that restoration on a watershed scale needs to occur to ensure recovery of native fish. However, since the Kalispel Reservation encompasses a very small area within the sub-basin, the Tribe's influence in land management decisions that impact native species and their watersheds is limited. We are involved in many on the ground projects and policy processes that strive to protect and restore the structure and function of our tributary watersheds. The Tribe provided comments to both the Washington Forest Practice Board and the U.S. Fish and Wildlife Service stating that the proposed new rules in Forest and Fish are not adequate enough to protect aquatic resources. These new rules would govern forest practices on state and private lands. Tribal staff is involved in monitoring and consultation for forest practices and water quality issues in the sub-basin. The Tribe provides comments on all projects or processes within the sub-basin that may effect native fish and their

watersheds. These include Biological Opinion for Albeni Falls Dam, Stimson Conservation Agreement, and the Plum Creek HCP.

Through a settlement agreement pertaining to an amendment to an existing license, the Tribe received \$870,000 from the Pend Oreille Public Utility District (PUD) #1. The work is to conduct fish habitat assessments and restoration in tributaries to Box Canyon Reservoir from 1999-2001. The PUD project compliments the Kalispel Tribe Resident Fish Project and will help to accomplish the goals identified in the Pend Oreille Subbasin Summary. PUD funded restoration in the initial year of the project (1999) was implemented from recommendations developed from the Kalispel Resident Fish Project. The Kalispel Tribe is also very involved in the re-licensing of Box Canyon Dam, but also will be involved in the re-licensing of Boundary Dam (license expires 2011).

The Tribe is also involved in the development of the Northeastern Washington Bull Trout Recovery Plan. A staff member is also a member of the overall recovery team, which oversees recovery across five states and the five distinct population segments.

Through the State of Washington Salmon Recovery Funding Board (SRFB), the Tribe was recently awarded funding to rehabilitate an abandoned road section and stabilize a large cut-slope that is estimated to be contributing 85% (237 tons/year) of the channel sediment in lower East Branch LeClerc Creek. In addition, the WDFW and U.S. Forest Service received funding through the SRFB for a brook trout removal and riparian planting/fencing project on Middle Branch LeClerc Creek. The Tribe and U.S. Forest Service have also secured funding and in-kind labor from Trout Unlimited for various stream restoration projects the past several years.

The Tribe recognizes that instream habitat restoration is a temporary solution to habitat degradation and that recovery will only occur when future human impacts are minimized and watershed processes are restored. However, watershed restoration will not yield significant improvements for years or decades. The Tribe also recognizes that some of the native fish populations will not persist for years or decades. Baseline habitat surveys have indicated that streams are lacking complexity due to low woody debris densities and excess fine sediment. In some watersheds, individual native fish sightings are rare or populations are isolated in small tributaries. We have seen populations extirpated in the last decade. For instance, one cutthroat trout was observed in Middle Branch LeClerc Creek (upstream of an impassable culvert) during a pre-assessment snorkel survey in 1997. In 1999, stations were snorkeled in eight reaches and no cutthroat was observed. Degraded habitat, a result of cattle grazing and roadbed impingement, and competition from brook trout are the cause of the apparent extirpation of this cutthroat population.

Much effort has been expended to improve habitat conditions in Middle Branch LeClerc Creek. The U.S. Forest Service and the Tribe, with partial funding through this project, have constructed three riparian exclosures on the Middle Branch. The exclosures have yielded significant results to the habitat and brook trout densities. In 1999 densities in the exclosures were very high (>140 fish/100 m²) and nearly double the density of any other reach. Through funding awarded by the SRFB, the Washington Department of Fish and Wildlife will chemically eradicate the brook trout in Middle Branch LeClerc Creek. The Tribe will perform post treatment monitoring to ensure success. Westslope cutthroat will be collected from nearby tributaries and translocated to the Middle Branch.

In summary, the Kalispel Natural Resource Department's plan for recovering native salmonid populations are:

1. Perform baseline stream habitat and fish population assessments to determine current distribution and abundance and identify core watersheds where recovery efforts will be focused.
2. Work to protect existing native populations and good habitat through participation in regional policy setting groups and consultation with area land, fish, and wildlife management agencies.
3. Pursue funding from various sources and participate jointly with other agencies in watershed restoration projects.
4. Implement instream and riparian restoration in identified recovery areas.
5. In recovery areas with non-native populations, relocate native species, treat streams to remove non-native species, and translocate genetically identical or similar native fish from sister watersheds.
6. Monitor restoration and adapt management plans if needed.

Literature Cited

- Ashe, B.L., and A.T. Scholz. 1992. Assessment of the Fishery Improvement Opportunities in the Pend Oreille River. Final Report. Upper Columbia United Tribes Fisheries Center, Dept. Of Biology, Eastern Washington Univ., Cheney. Prepared for U.S. Dept. Of Energy, Bonneville Power Administration, Div. Of Fish and Wildlife. Project No. 88-66, Agreement DE-179-88BP39339, March 1992. 295 pp.
- Bennett, D.H. and E.C. Bowles. 1985. Recruitment and survival of young-of-the-year largemouth bass *Micropterus salmoides* in the Coeur d'Alene Lake system, ID. Completion Report, Proposal Number II, Washington Water Power Company, Spokane.
- Bennett, D.H., and M. Liter. 1991. Water Quality, Fish and Wildlife Characteristics of Box Canyon Reservoir, Washington. Completion Report 1989 - 1990, Section 3: Fish, Dept. Of Fish and Wildlife Res., College of Forestry, Wildlife and Range Sci., Univ. of Idaho, Prepared for the Public Utility District No. 1 of Pend Oreille County, Washington. July 1991. 94 pp.
- Bennett, D.H. and D. Hatch. 1991. Factors limiting the fish community with emphasis on largemouth bass in Long Lake, Spokane County, Washington. Completion Report, Project No. 4. Washington Water Power Company, Spokane.
- Boxrucker, J.C. 1984. Evaluation of supplemental stocking as a black bass management procedure in large impoundments. Oklahoma Department of Wildlife conservation, Federal Aid in Fish Restoration, F-39-R, Job 4, Final Report, Oklahoma City.
- Boxrucker, J.C. 1986. Evaluation of supplemental stocking of largemouth bass as a management tool in small impoundments. North American Journal of Fisheries Management 6:391-396.
- Bustard, D.R., and Narver, D.W. 1975. Preferences of juvenile coho salmon (*Oncorhynchus kisutch*) and cutthroat trout (*Salmo clarki*) relative to simulated alteration of winter habitat. Journal of the Fisheries Research Board of Canada 32:667-680.
- Buynak, G.L. and B. Mitchell. 1999. Contribution of stocked advanced-fingerling largemouth bass to the population and fishery at Taylorsville Lake, Kentucky. North American Journal of Fisheries Management 19:494-503.
- Fieldhouse, R.D. 1971. Results of stocking largemouth bass in Nassau Lake. New York Fish and Game Journal 18:68-69.
- Fullerton, A.H., J.E. Garvey, R.A. Wright, and R.A. Stein. 2000. Overwinter growth and survival of largemouth bass: interactions among size, food, origin, and winter severity. Transactions of the American Fisheries Society. 129:1-12.

- Griffith, J.S., and R.W. Smith. 1993. Use of winter concealment cover by juvenile cutthroat and brown trout in the South Fork of the Snake River, Idaho. *North American Journal of Fisheries Management* 13:823-830.
- Harig, A.L., K.D. Fausch, and M.K. Young. 2000. Factors influencing success of greenback cutthroat trout translocations. *North American Journal of Fisheries Management* 20:994-1004.
- Henderson, P.A., H.A. Holmes, and R.N. Bamber. 1988. Size-selective overwintering mortality in the sand smelt *Atherina bayeria* Risso, and its role in population regulation. *Journal of Fish Biology* 33:221-233.
- Hilderbrand, R.H., and J.L. Kershner. 2000. Conserving inland cutthroat trout in small streams: how much is enough? *North American Journal of Fisheries Management* 20:513-520.
- Hunt, R.L. 1976. A long term evaluation of trout habitat development and its relation to improving management related research. *Transactions of the American Fisheries Society* 105:361-364.
- Hunter, C.J. 1991. *Better trout habitat: A guide to stream restoration and management*. Island Press, Washington D. C.
- Kershner, J.L. 1997. Monitoring and adaptive management. Pages 116-131 in J. E. Williams, C. A. Wood, and M. P. Dombeck, editors. *Watershed restoration: principles and practices*. American Fisheries Society, Bethesda, Maryland.
- Kreiger, D.A. and S. Puttman. 1986. Evaluation of supplemental stocking of yearling largemouth bass in Chatfield Reservoir, Colorado. Colorado Division of Wildlife, Fort Collins, Colorado.
- MacDonald, L.H., A.W. Smart and R.C. Wissmar. 1991. Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. EPA/910/9-91-001. Developed for Region 10, US Environmental Protection Agency.
- Miranda, L.E. and W.D. Hubbard. 1994. Winter survival of age-0 largemouth bass relative to size, predators, and shelter. *North American Journal of Fisheries Management*. 14:790-796.
- Ouedraogo, P.S. 1991. The food habits of largemouth bass (*Micropterus salmoides*) in the Pend Oreille River (Box Canyon), Pend Oreille County, Washington. Professional Paper, University of Idaho, Moscow.
- Platts, W.S., and R.L. Nelson. 1989. Stream canopy and its relationship to salmonid biomass in the intermountain West. *North American Journal of Fisheries Management* 9:446-457.

- Rieman, B. E. 1987. Fishing and population dynamics of largemouth bass *Micropterus salmoides* in select northern Idaho lakes. Doctoral Dissertation, University of Idaho, Moscow.
- Rosgen, D. 1996. Applied river morphology. Wildland Hydrology, Pagosa Springs, CO.
- Shelton, W.L., W.D. Davies, T.A. King, and T.J. Timmons. 1979. Variation in the growth of the initial year class of largemouth bass in West Point Reservoir, Alabama and Georgia. Transactions of the American Fisheries Society 108:142-148.
- Shuter, B.J., and J.R. Post. 1990. Climate, population viability, and the zoogeography of temperate fishes. Transactions of the American Fisheries Society 119:314-336.
- Thompson, J.M., E.P. Bergersen, C.A. Carlson, and L.R. Kaeding. 1991. Role of size, condition, and lipid content in the overwinter survival of age-0 Colorado squawfish. Transactions of the American Fisheries Society 120:346-353.
- Toneys, M.L. and D.W. Coble. 1979. Size-related, first winter mortality of freshwater fishes. Transactions of the American Fisheries Society 108:415-419.
- Young, K.A., S.G. Hinch, and T.G. Northcote. 1999. Status of resident coastal cutthroat trout and their habitat twenty-five years after riparian logging. North American Journal of Fisheries Management 19:901-911.
- Zweiacker, P.L. 1972. Population dynamics of largemouth bass in an 808-hectare Oklahoma reservoir. Doctoral Dissertation. Oklahoma State University, Stillwater.

Appendix D

ISRP Comments and Kalispel Tribe Response April 6, 2001

Final ISRP recommendations and comments 4/6/2001:

Fundable in part.

Although a minor component of the proposal, there seems to be no justifiable need for Objective 2, task a, to develop recommendations for habitat enhancement and implement additional enhancement for \$66K. This objective may have minimal or negative impacts on native fisheries. An early assessment of the bass hatchery component is needed within three years by the time of the next review cycle. In this time there should be clear evidence of whether this project is a success or a failure. If a failure, the bass hatchery component should be terminated.

It is unfortunate that project personnel feel that they have to wait for a federal agency to provide objective goals for the fish populations when they seem capable of doing it themselves. The federal agency may be more than willing to accept what the project produces as needs for species viability. Work could then proceed in the core areas identified, and be directed to realistic, quantitative goals instead of the "proceed in the dark" approach now being followed while they wait for federal input.

The response provides information about the bass hatchery operation that is much clearer than that in the proposal. They re-cast the bass hatchery program as an experiment with evaluation methods and criteria. The goal is pretty modest - provide 12 lb/A of "harvestable" bass by the year 2008 (no mention of what fraction of those are to be hatchery fish). But then on page 6 of the response, there is a more detailed description of performance standards (need for 1.5 to 2 lifecycles @ 8-9 yrs, need for funding to determine assessment strategy, etc.) that seem unwarranted. The cost of ~ \$150-250K per year to increase bass abundance by a few pounds per acre should be examined by the Council.

The stream rehabilitation portion of the response did (unlike the proposal) show evidence of an organized approach. Monitoring and evaluation of previous rehabilitation work, as well as additional stream survey work, should continue. Chemical removal of brook trout in upper Cee Cee Ah Creek should proceed.

Kalispel Tribal Comments for Project# 199500100 – Kalispel Resident Fish Project

The Tribe disagrees with specific comments the ISRP provided for project 199500100 (Kalispel Resident Fish Project). The ISRP recommends not funding additional enhancement for \$66,000 because "this objective may have minimal or negative impacts on native fisheries". However, they go on to say that "the stream rehabilitation portion of the response did (unlike the proposal) show evidence of an organized approach". The Tribe has an approach that incorporates stream surveys, habitat restoration, and non-native species removal, of which the ISRP agreed with. The ISRP also had some concerns with the bass hatchery component. The ISRP expects that at the end of this three year review cycle, that there should be "clear evidence of whether this project is a

success or a failure.” The Tribe disagrees with the time frame that the hatchery is constrained to in order to determine if it is a success or failure. The ISRP also questions the annual O&M cost of the hatchery, which is inappropriate, and not a technical review. The ISRP misunderstands how objective goals for fish populations are determined. The ISRP states that; “It is unfortunate that project personnel feel that they have to wait for a federal agency to provide objective goals for the fish populations when they seem capable of doing it themselves”. What the ISRP is referring to is goals for bull trout being developed under the bull trout recovery plan. However, in the project proposal, project presentation, subbasin presentation, and site visit, it was noted several times that the Kalispel Tribe is a member of the bull trout recovery team. The Kalispel Tribe also is a member of the bull trout oversight team for the entire recovery process. The Kalispel Tribe is not waiting for the federal agency to develop objective goals; we are working with the federal agency and others in developing those goals.

Reviewer Comments: If the goal setting is to be put off until the “team” makes its decisions, then why shouldn’t the work should be delayed until the goals are in place?

Reviewer Comments: The evaluation program for supplementation is inadequate. The study is only intended to determine whether fish released as fry, fingerlings, or fingerlings+, each released at different locations will be recaptured at the same or differing rates. This assessment may not even be possible so the proponents need to calculate how many tags must be recovered from each group so as to detect differences between groups with acceptable confidence, and determine whether that number is reasonable given their proposed methods. Further, the study does little to shed light on the impact for the overall goal, which is to enhance the quality (more large fish presumably) of the fishery. It is possible, for example, that the supplementation will reduce the number of large fish. The previous ISRP comment that supplementation of this bass population should be carried out as a carefully designed experiment still stands.

w:\em\ww\isrp\1 final isrp reports\isrp 2002-7 prelim kalispel bass 3 step.doc