Council Document ISRP 2000-1

Independent Scientific Review Panel

for the Northwest Power Planning Council

Review of Coeur d'Alene Tribe
Trout Production Facility Master Plan

Step One of the Northwest Power Planning Council's
Three-Step Review Process

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ISRP 2000-1
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ISRP Review of Coeur d'Alene Tribe Trout Production Facility Master Plan

REVIEW PROCESS

The Coeur d'Alene Trout Production Facility Master Plan was the first project reviewed by the ISRP as part of the Northwest Power Planning Council's Three-Step Review. The ISRP review included several steps. The ISRP selected three members to conduct the review. These three members individually reviewed the Coeur d'Alene's Production Facility Master Plan and supporting documents, including the Supplementation Feasibility Report and the Program Management Plan. The reviewers commented on each of the responses by the Coeur d'Alene Tribe to the questions (or criteria) asked by the Council as part of the Three-Step review. The ISRP members then discussed their reviews via teleconference and identified areas where more information was needed from the Coeur d'Alene Tribe and drafted a preliminary review. This preliminary review was discussed with the full ISRP. Consensus was reached on the approach, and questions to obtain further information from the Coeur d'Alene Tribe were refined. The ISRP then submitted a request for additional information to the Coeur d'Alene Tribe (attachment 1). The Coeur d'Alene Tribe provided a written response to the questions (attachment 2). The ISRP reviewed the responses and developed a second set of questions to discuss with the Coeur d'Alene representatives via teleconference (attachment 3). The teleconference took place on February 7, 2000 and included Ron Peters, and Kelly Lillengreen, representing the tribe, Mark Fritsch and Erik Merrill from the Council, and the three ISRP subcommittee members. The ISRP reviewers then presented their findings to the entire ISRP and consensus was reached. The ISRP findings are described below.

RECOMMENDATION

The ISRP recommends that planning for the Facility proceed from Step 1 to Step 2 if the following conditions are met.

CONDITIONS

The ISRP, in its review of the Plan, had several concerns that were alleviated by correspondence and conversation with Tribal Staff. The ISRP recommendation stated above is given with the understanding that:

1. Effects on wild-spawned adfluvial trout of fisheries directed at hatchery-released trout can be minimized by harvest regulation. Trout produced from the Facility will be identifiable by external marks (excised adipose fins.) Anyone catching an unmarked trout can be required to release it unharmed. Specific harvest regulations, coordinated with the Idaho Department of Fish and Game who manage part of the Lake's fisheries, remain to be developed. This condition can be met by further development of a harvest plan in conjunction with the monitoring and evaluation plan. *(Three-Step Question 8. Harvest Plan)*

2. Trout produced by the Facility will be prevented from displacing wild-spawned trout from stream habitats by a volitional release strategy by which only trout competent to migrate directly to the Lake will exit the holding ponds into

migration corridors near the stream mouths. The behavior of the trout will be monitored by a trap-sampling program both above and below the release location to document the degree of upstream and downstream migration. This condition can be met by further development of the monitoring and evaluation plan. *(Three-Step Questions 1-3. Goals and Limiting Factors; Question 20. Monitoring and Evaluation Plan)*

3. Interactions between Facility-produced and wild-spawned trout in Lake Coeur d'Alene, and resulting displacement of wild-spawned trout from limited habitat there, are not expected. Any potential ecological interactions can and will be monitored by sampling fish in the Lake. This condition can be met by further development of the monitoring and evaluation plan. *(Three-Step Questions 1-3. Goals and Limiting Factors; Question 20. Monitoring and Evaluation Plan)*

4. A sufficient sustainable water supply must be available to provide the 60 gallons per minute required by the conceptual plan for the hatchery. This condition can only be satisfied by further engineering studies to determine the yields of test wells and the additional cost of delivering the water to the facility. *(Three-Step Question 21. Conceptual Design)*

POTENTIAL AMENDMENTS

In addition to the conditions described above, the ISRP recommends that the Tribe consider two amendments to its plan that may enhance its effectiveness.

1. Rather than producing rainbow trout at the Facility for planting in ponds for an interim fishery, it may be more efficient and safer to purchase such trout from another source. If these trout were cultured in the Facility simultaneously with the native cutthroat trout, they would compete for resources (water and others) in times of short supply, and they would present a potential pathogen source for the native cutthroat trout. Furthermore, it seems likely that rainbow trout can be purchased from a commercial source at lower cost than they could be produced in this Facility. Sterile rainbow trout are available at large sizes, which could add to the interest by participants in the program. *(Three-Step Question 5. Alternatives)*

2. Maintain a single stock of adfluvial cutthroat trout in the Facility, rather than maintaining four groups whose differences are probably negligible. This would simplify operation of the Facility and is probably justified by the relatively homogenous genetic structure of trout in the streams around the Lake. *(Three-Step Question 5. Alternatives, Point B; Question 19. Constraints and uncertainties, including genetic and ecological risk assessments and cumulative impacts.)*

Specifically, based on information presented in Appendix C of the Coeur d'Alene Master Plan (Knudsen and Spruell 1999, and the appended letter and dendrogram from Spruell), there appears to be little geographic structure in the genetic variation observed among the populations as well as little genetic distance. Work by Spruell et al. (1999, also in appendix C) examined westslope cutthroat trout from 16 sites for evidence of

hybridization with rainbow trout. They identified six populations that appeared free of introgression and might be used as broodstock sources. The remaining ten sites showed evidence of hybridization with rainbow trout, although the levels of introgression were quite low.

Spruell and colleagues' genetic work suggest that while genetic distances are very small among populations, overall genetic diversity is high minimizing the concern that mixing fish from different local populations will result in a decrease of fitness associated with outbreeding depression. While small genetic differences were observed among populations, the genetic data suggest that prior to recent fragmentation, considerable gene flow likely occurred among the Coeur d'Alene populations.

General Comments

The approach to restoration of Coeur d'Alene westslope cutthroat trout populations on reservation lands might be most successful if it focused on stream habitat restoration and on the resident, rather than the adfluvial, life history pattern. While an overall project goal is to increase adfluvial fish, which due to their larger size present the best harvest opportunity consistent with the tribe's goals, a biologically viable approach might be to focus on increasing resident westslope cutthroat trout abundance in tributary streams – including reintroduction into streams where they have been extirpated or are at very low numbers.

At first glance, the focus on resident fish – in order to bolster adfluvial production – may seem counterintuitive. However, a hallmark of trout and salmon biology, particularly within the genus *Oncorhynchus*, is a high level of behavioral and life history plasticity and diversity. It is not uncommon in cutthroat and rainbow trout populations to find several life histories including resident, fluvial, adfluvial, and even anadromous forms co-occurring, assuming the fish have downstream access to either a lake or the ocean. Seemingly, the life history patterns within the population expand to take advantage of the various habitats that are available. Examples exist in the literature where one life history form is introduced to a new location then other life histories appear subsequently. Therefore, reestablishment of viable resident westslope cutthroat trout populations in numerous Lake Coeur d'Alene tributary streams could provide the population base for additional expression of the adfluvial cutthroat trout life history pattern.

Despite the ISRP recommendation for the Coeur d'Alene to consider the use of a single stock described above, the reviewers were impressed by the willingness of the Coeur d'Alene tribe to support supplementation activities on four individual tributaries and the westslope cutthroat trout populations endemic to each tributary. The plan recognizes and responds to many scientists' concerns about local adaptation, the uniqueness (or potential uniqueness) of individual populations, and maintenance of the fitness of individual populations. Some fisheries managers have been reluctant to manage artificial production facilities at this scale (that of the individual population) due to the expense and logistical difficulties. The Coeur d'Alene tribe is to be commended for their foresight and concern about the future of specific populations within the reservation.

Finally, the Three-Step process includes numerous questions and criteria that the ISRP considered in its review of the master plan documents but are not elaborated on here. The ISRP found the Coeur d'Alene Tribe adequately addressed these other questions and criteria in the master plan documents or in subsequent communications with the ISRP.

References Cited

Knudsen, K. L. and P. Spruell. 1999. Genetic analysis of westslope cutthroat in tributaries of Coeur d'Alene Lake. Final Report WTSGL99-106, pp. 17. Wild Trout and Salmon Genetics Laboratory, Missoula, Montana. June 1999.

Spruell, P., K. L. Knudsen, J. Miller, and F. W. Allendorf. 1999. Genetic analysis of westslope cutthroat trout in tributaries of Coeur d'Alene Lake. Progress Report WTSGL99-101, pp. 17. Wild Trout and Salmon Genetics Laboratory, Missoula, Montana. January 1999.

Attachment 1. First ISRP Request for Additional Information

INDEPENDENT SCIENTIFIC REVIEW PANEL

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January 18, 2000

MEMORANDUM

TO: Mark Fritsch, NWPPC

FROM: Rick Williams, ISRP Chair

SUBJECT: ISRP Questions for Coeur d'Alene Tribe as Part of Step 1 Review Process

The Coeur d'Alene Tribe has assembled a meritorious set of documents for review by the ISRP as part of the Council's Step 1 process. The documents are full of interesting information. However, we found ourselves unsure on some points. Accordingly, we assembled the following list of subject matter and questions that we need clarification on to complete our Step 1 review. These are numbered in the same order that the questions were given in the Council's letter "Program Language Regarding Master Planning Requirements".

(1). Goals of the Project
The goals of the project are not entirely clear. Part of the problem might stem from the format of the request from the council for elements that are to be part of the Master Plan. The goal might very broadly be stated as an intention to mitigate for fishing opportunity lost as a result of development of the hydroelectric system. On the other hand, for technical review by the ISRP what is needed is a full description of the specific end point desired, i.e., the fish that will constitute mitigation, the tasks that need to be undertaken to achieve mitigation, and how the hatchery fits into the program. For this purpose, the goals and rationale need to be closely linked. Our questions that follow are aimed at accomplishing this linkage.

The ISRP understands the goal with westslope cutthroat trout to be to increase abundance of spawners in four selected streams by supplementing each stream with juvenile cutthroat trout developed from brood stock taken from each stream. There appears to be spawning area available that is not being fully used. The concept appears to be to enhance populations of adfluvial cutthroat trout that eventually (by the year 2007) will return to the streams in sufficient abundance to provide a surplus of fish for harvest. Reference is made in the documents both to "smolts" and "returning adults". Meanwhile stream improvement measures will be undertaken to increase productive capacity of the tributaries.

Question. If, as we are given to understand in various places in the documents, temperature and interactions in the lake with introduced species limit the abundance of adfluvial cutthroat trout, how can supplementation in the tributaries overcome this problem?

Question. There is a suggestion in the documents that conditions are improving in the lake, but we can find no explanation for this, nor is there any discussion of efforts that might be underway to improve conditions in the lake. Is anything being done to improve cutthroat habitat in the lake?

(3). Factors limiting production of the target species;
Reference is made to the calculation of HSIs (Habitat Suitability Indices), but no description of the method is provided.

Question. How was this methodology employed?

Question. Is there an extension of this or a similar method to the lake habitat?

(5). Alternatives for resolving the resource problem
Point A. We feel that alternatives should be explored on a larger scale than those discussed in this proposal in order to place the hatchery proposal in a larger perspective. For example, it might seem appropriate to include at least a discussion of the pros and cons of providing fish passage at Chief Joseph and Grand Coulee dams that were considered at the time these projects were constructed. The arguments used against such provision at the time of their construction may or may not be valid any longer.

Question. Given the proposal at hand, since the greatest potential for increased production of cutthroat trout probably exists in the lake rather than the tributaries, has the tribe investigated the feasibility of physical manipulations to improve lake habitat, such as regulation of lake elevation in time and space and/or diking of the southern, shallow portion of the lake?

Question. What is the relationship between operations at Post Falls Dam and introduction into Lake Coeur d'Alene of warm water from Round Lake and other sources?

Question. What other sources of pollution are present in the watershed, in addition to the high temperature water from the shallow bays and southern end of the lake?

Question. Has the tribe considered biological manipulations, such as trapping of northern pike populations to reduce predation on cutthroat trout in the lake?

Point B. Some finer scale alternatives should also be explored.

Question. Given the genetic information available (i.e., very small genetic distances and evidence suggesting that CDA cutthroat populations were physically linked until recent times), could the project objectives be reached with a single brood stock developed from a mixture of the genetically pure westslope cutthroat trout populations on CDA lands? Is it necessary to maintain separate brood stocks for cutthroat from the four tributaries that have been chosen?

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

It is clear that adequate water is not available at the site chosen. If more water is not found, there would have to be radical changes in the conceptual design before proceeding to Step 2 in the Council's process. Even more to the point, the basic concept of supplementing westslope cutthroat trout by means of a hatchery at this location might have to be scrapped. Therefore, until the water supply problem is solved, the ISRP feels that it cannot recommend moving this project out of Step 1.

Our finding that the section on alternatives needs to be enlarged becomes even more relevant.

Question. Is there additional information available as to the water supply, or relocation of the hatchery site?

Attachment 2. Coeur d'Alene Response to First Set of ISRP Questions

Coeur d'Alene Tribe

850 A Street P.O. Box 408 Plummer, ID 83851

TO: Erik Merrill
ISRP Coordinator
Northwest Power Planning Council

FROM: Kelly Lillengreen
Trout Production Facility Project Manager

SUBJECT: Additional clarification for completion of ISRP Step 1 review of the Coeur d'Alene Tribe Trout Production Facility Master Plan

The Coeur d'Alene Tribe is pleased that the ISRP was able to participate in the NWPPC's Step review process for our proposed Trout Production Facility. We hope that the following responses adequately address the ISRP's list of subject matter and questions that you sent us. Each response is numbered in the same order that the questions were given in the ISRP's letter to you regarding this subject

1.) Goals of the Project

Response to comments on subject matter

As stated the broad goal of the project is to partially mitigate for lost fishing and subsistence harvest opportunities resulting from the development of the Columbia River hydroelectric system. Some of the specific technical goals that will achieve partial mitigation needed for your review are found in the master plan section 4.2.

Table 4.2.1 Biological and harvest objectives for adfluvial cutthroat trout in tributaries of the Coeur d'Alene Reservation

Tributary	Target Level[a] (percent)	Escapement[b] Target	Harvest Target[c]	Biological[d] Objective	Year
Alder Creek	25	1,708	920	2,628	2007
	50	3,416	1,840	5,256	2012
	75	5,123	2,759	7,882	2016
	100	6,831	3,679	10,510	Beyond
Benewah Creek	25	2,179	1,174	3,353	2007
	50	4,357	2,347	6,704	2012
	75	6,534	3,519	10,053	2016
	100	8,713	4,692	13,405	Beyond
Evans Creek	25	984	530	1,514	2007
	50	1,968	1,060	3,028	2012
	75	2,951	1,589	4,540	2016
	100	3,935	2,119	6,054	Beyond
Lake Creek	25	2,002	1,078	3,080	2007
	50	4,004	2,156	6,160	2012
	75	6,006	3,234	9,240	2016
	100	8,008	4,312	12,320	Beyond

The previous table represents the harvest and escapement targets necessary for completing the stepped approach described in the master plan resulting in the specific goal of having self-

sustaining harvestable populations of naturally reproducing westslope cutthroat trout in the target tributaries described in the master plan. These fish constitute partial mitigation.

The harvest goal is 35% of the total numbers of adults returning to the target tributaries once the populations have stabilized and it has been determined that the trend is increasing. Until the 75% objective is met only hatchery fish will be harvested. Total allowable tributary harvest will be based on meeting spawning escapement goals. No changes to the limited harvest mixed stock fishery in Coeur d'Alene Lake are anticipated until populations of tributary stocks have stabilized and the 75% objective has been met.

Response to question 1:

The Tribe is currently focussing restoration efforts toward eliminating the limiting factors in the target watersheds as well as increasing our understanding of what is happening in the lake. At this point, we know that productivity is limited in both the stream and lake environments. We know that egg to juvenile survival is poor thus, we are proposing to release fish as migrating juveniles. Lake survival is unknown but we would be able to determine lake survival by reconstructing the runs based on brood year returns of hatchery raised fish. This information would allow us to better target our efforts in the lake. It also must be understood that the conditions in the lake only limit the population (to some degree that currently has not been defined) not eliminate it. Thus, the intent of the Tribe is to use supplementation to increase the survival rate of the population during its early life history (egg through juvenile) relative to its survival rate under natural conditions in the stream while exploiting the niche that these fish have established in the lake.

There is no doubt that inter-specific species competition occurs between cutthroat trout and other fish species, especially the introduced ones (Griffith 1974,1988; Marnell 1986, 1987, 1988; and others). Two mechanisms are controlling the population of cutthroat trout competitive exclusion and species replacement due to rapid changes in the environmental conditions within the lake. The extent that each individual mechanism controls the population has yet to be worked out. However, the fact that the adfluvial population has not been extirpated from the lake shows that these fish have some resiliency to the detrimental effects from interactions with the introduced species. Petroskey and Bjornn (1985) demonstrated that cutthroat in the St. Joe River system show little detrimental effects from the introduction of hatchery reared rainbow trout. Griffith (1988) postulated that this resiliency may be attributed to the fact the cutthroat trout are not existing in habitat that is optimal for them but existing in habitat that is sub-optimal for the other species.

We understand the supplementation in itself will not overcome the habitat problems these fish face. We also understand that by eliminating the limiting factors governing the habitat these fish will have a much better chance of survival. This however, will take many decades (50-100 years). In the mean time, these fish, given the current population trend may go extinct. Thus, from a strictly biological point of view supplementation is necessary. Secondarily, harvest is also an issue with the Tribe. The Tribe is not willing to wait 50-100 years for harvestable surpluses of fish thus, any returning fish not needed for spawning in both the natural setting as well as the hatchery would be available for harvest.

Response to question 2:

Trophic state indices calculated in 1975 (U.S. EPA, 1977) classified Coeur d'Alene Lake as mesotrophic lakewide. Data collected in 1989 (Breithaupt, 1990) classified the southern lakes area as eutrophic during the peak runoff period and mesotrophic for the other times of the year. Woods (1994) classified Coeur d'Alene Lake as oligotrophic for all parameters except secchi disk transparency, which classified the lake as mesotrophic. Our data classified the lake as oligotrophic in the north and meso-eutrophic in the south with water quality parameters associated with eutrophic conditions increasing in a southerly direction.

The Clean Water Act (CWA) is the tool used by regulatory agencies to set standards for water quality on the Reservation and in the State of Idaho. As such, enforcement of the CWA has been and still is the primary tool used to clean up Coeur d'Alene Lake. The reduction of the mining and smelting activities along the South Fork Coeur d'Alene River has also had a dramatic effect on the quality of the water in Coeur d'Alene Lake. Historically high levels of heavy metals would flow through the system decreasing the habitat suitability for cutthroat trout throughout the entire sub-basin including Coeur d'Alene Lake. Additionally, municipal waste contributed large quantities of phosphates and nitrogen that accelerated the eutrophication process in Coeur d'Alene Lake. However, over the last 25 years work has been completed (as a result of enforcement of the CWA) to reduce the annual load of these materials. Wastewater treatment facilities have also been established near all major municipalities in and around the basin. These combinations of factors have led to a general increase in water quality in Coeur d'Alene Lake as it relates to cutthroat trout production.

The Tribe is currently assessing 36 sites encompassing approximately six miles of shoreline throughout the lake. The primary goal of this assessment is to determine the habitat suitability of the littoral zone for cutthroat trout. We are assessing several different habitat parameters and associating them with habitat suitability for cutthroat trout. We hope to be able to use this information to predict what type of habitat in the lake will be able to support the highest populations of cutthroat trout. Thus, in the future, we would be able use this information to determine what habitat manipulations (if any) need to take place to increase suitability for cutthroat trout throughout the lake.

3.) Factors limiting production of the target species

Response to comments on subject matter

The HSI methodology was referenced in the supplementation feasibility report. A modified habitat suitability index (HSI) model was used to evaluate the effect of water quality parameters on cutthroat trout populations within and among the target watersheds and Coeur d'Alene Lake. A HSI was calculated for the water quality subcomponent of the model described by Hickman and Raleigh (1982). Model variables included: average maximum water temperature (V_1); average minimum dissolved oxygen (V_3); annual maximal or minimal pH (V_{13}); and average annual base flow as a percentage of the average annual daily flow (V_{14}). Individual suitability index (SI) values were calculated for each variable using curves published in Hickman and Raleigh (1982). The following equation was used to calculate the final HSI score:

$$C_{OQ} = (V_1 x V_3 x V_{13} x V_{14})^{1/4}$$

Where; C_{OQ} = HSI for water quality component, and

V_n = suitability index for water quality parameters.

Water quality data collected in 1997 and in 1998, when available, were used as input variables. The following modifications were made to address site specific conditions: a seven-day running average of maximum temperature was used; and average minimum dissolved oxygen was calculated for the period of greatest average water temperatures. Continuous discharge measurements were only available for the two sample sites on Lake Creek. For the remaining sites, average annual daily flow was calculated based on a minimum of 12 discharge measurements taken during the year, and average annual base flow was calculated for the period of low flow which corresponded to the greatest average water temperatures.

The final HSI was calculated using both a compensatory and a non-compensatory method. The compensatory method assumes that moderately degraded water quality conditions can be partially compensated for by good physical habitat conditions. The non-compensatory method assumes that degraded water quality conditions cannot be

compensated for, and variables with suitability indices (SI) < 0.4 become limiting factors on habitat suitability. For purposes of interpretation, HSI with values ranging from 0 - 0.25 were considered very poor; 0.25 – 0.4 were poor; 0.4 – 0.6 were good; and 0.6 – 1.0 were very good.

Response to question 1:

The suitability index (SI) values for individual water quality parameters vary considerably between sample locations (Table 3.20). The greatest variability occurs for the temperature parameter (V_1), where the SI ranges from 0 to 1.0. Water temperatures are limiting for the mainstem of Benewah Creek, lower Lake Creek, and lower Windfall Creek. The SI for the base flow parameter (SI_{14}) is < 0.4 for all sample locations except for Evans Creek and mainstem Benewah Creek, indicating that base flow is also a limiting factor at most locations. The SI for dissolved oxygen (SI_3) and pH (SI_{13}) are generally greater than 0.8, and therefore are not considered limiting. The exception occurs in School House Creek where dissolved oxygen is limiting (SI_3=0.3) during the period of warmest water temperatures.

Table 3.20 Habitat Suitability Index (HSI) calculations for riverine cutthroat trout.

Location	V1	SI1	V3	SI3	V13	SI13	V14	SI14	Comp HSI	Non-Comp HSI
L. Lake	22.6	0	9.5	1	6.8/7.7	1	9	0.2	0.00	0
U. Lake	17.9	0.78	7.9	0.9	6.5/7.5	1	13	0.25	0.65	0.25
L. Benewah	23	0	8.9	1	7.0/8.3	1	18	0.4	0.00	0
U. Benewah	22.8	0	7.7	0.87	6.7/7.6	1	18	0.4	0.00	0
S.E. Benewah	14.7	1	9.7	1	6.6/7.6	1	16	0.32	0.75	0.32
School House	16.4	0.92	5.7	0.3	6.8/7.4	1	6	0.15	0.45	0.15
W.F. Benewah	16.6	0.9	9.3	1	6.7/7.5	1	11	0.25	0.69	0.25
Windfall	25.1	0	7.8	0.89	6.7/7.6	1	13	0.25	0.00	0
Evans	16.4	0.92	9.6	1	6.3/7.7	0.95	28	0.6	0.85	0.6
Alder	20.6	0.45	9.6	1	6.8/7.8	1	16	0.32	0.62	0.32

HSI scores that are calculated using the non-compensatory method show a very poor to poor rating for all sample locations, with the exception of Evans Creek, which is considered good. In other words, when habitat suitability is rated based on water quality parameters alone, then all sample locations, with the exception of Evans Creek, are rated very poor to poor with regard to cutthroat trout preferences. In six of ten locations, however, differences between HSI calculations using the compensatory versus non-compensatory method indicate that good habitat conditions have the potential to partially compensate for short-term degradation in water quality. These sites include upper Lake Creek, S.F. Benewah Creek, School House Creek, W.F. Benewah Creek, Evans Creek, and Alder Creek. Lower Lake Creek, the mainstem of Benewah Creek, and lower Windfall Creek are considered very poor regardless of the method used.

Response to question 2:

A habitat based model developed by Hickman and Raleigh (1982) was used to evaluate the suitability of lacustrine habitat types for cutthroat trout. The lacustrine model consists of two components: water quality and reproduction. The water quality component takes three variables into consideration, including temperature, dissolved oxygen and pH. Water quality data collected in 1997 were used to calculate the individual suitability index (SI) values using published curves. The reproduction component was not examined in this report.

Results from the water quality component of the HSI model indicated that there is suitable habitat for cutthroat trout in the lake (Table 3.19). The quantity of suitable habitat, however, decreases as water temperature increases during the year. The suitability index was poor or very poor (<0.25) in the shallow portion of the water column at all sample stations. While water quality does not directly exclude cutthroat trout from these shallow areas, unsuitable habitat exerts added stress on cutthroat trout making foraging runs into the upper 10 meters of the water column.

Table 3.19 Habitat suitability index for lucustrine cutthroat trout based on water quality.

Location	Depth	HSI[a]		Suitability Index
Rockford Bay	0-7 Meters	$(0.25x1x1)^{1/3}$	=	0.25 SI
	7-11 Meters	$(0.60x1x1)^{1/3}$	=	0.845 SI
	11-Bottom (14)[b]	$(1x1x1)^{1/3}$	=	1.0 SI
Windy Bay Shallow	0-7 Meters	$(0.0x1x1)^{1/3}$	=	0.0 SI
	7-10 Meters	$(0.85x1x1)^{1/3}$	=	0.94 SI
	10-Bottom (15)	$(1x1x1)^{1/3}$	=	1.0 SI
Windy Bay Deep	0-10 Meters	$(0.0x1x1)^{1/3}$	=	0.0 SI
	10-15 Meters	$(0.85x1x1)^{1/3}$	=	0.94 SI
	15-Bottom (33)	$(1x1x1)^{1/3}$	=	1.0 SI
Coeur d'Alene River	0-Bottom (10)	$(0.0x1x1)^{1/3}$	=	0.0 SI
Mid-Lake Coeur d'Alene	0-10 Meters	$(0.0x1x1)^{1/3}$	=	0.0 SI
	10-13 Meters	$(0.85x1x1)^{1/3}$	=	0.94 SI
	13-Bottom (17)	$(1x1x1)^{1/3}$	=	1.0 SI
Carey Bay	0-10 Meters	$(0.0x1x1)^{1/3}$	=	0.0 SI
	10-12 Meters	$(0.85x1x1)^{1/3}$	=	0.94 SI
	12-Bottom (13)	$(1x1x1)^{1/3}$	=	1.0 SI
Conkling Park	0-10 Meters	$(0.0x1x1)^{1/3}$	=	0.0 SI
	10-13 Meters	$(0.85x1x1)^{1/3}$	=	0.94 SI
	13-Bottom (16)	$(1x1x1)^{1/3}$	=	1.0 SI
Hidden Lake	0-5 Meters	$(0.0x1x1)^{1/3}$	=	0.0 SI
	5-7 Meters	$(0.8x1x1)^{1/3}$	=	0.92 SI
	7-Bottom (10)	$(1x0.0x1)^{1/3}$	=	0.0 SI
Round Lake	0-Bottom (1.5)	$(0.0x1x1)^{1/3}$	=	0.0 SI
Chatcolet Lake	0-6 Meters	$(0.0x1x1)^{1/3}$	=	0.0 SI
	6-9 Meters	$(0.85x1x1)^{1/3}$	=	0.94 SI
	9-Bottom (11)	$(1x0.0x1)^{1/3}$	=	0.0 SI
Chatcolet Shallow	0-Bottom (1.5)	$(0.0x1x1)^{1/3}$	=	0.0 SI
Benewah Lake	0-Bottom (4.5)	$(0.0x1x1)^{1/3}$	=	0.0 SI
St. Joe River	0-Bottom (12.5)	$(0.4x1x1)^{1/3}$	=	0.4 SI

[a] Habitat Suitability Index (HSI).
[b] Numbers in parenthesis represent the bottom in meters.

5.) Alternatives for resolving the resource problem

Response to comments on subject matter point A:

Multiple alternatives to the current program were explored and described in the documents:

Scholz, A.T., D.R. Geist, and J.K. Uehara. 1985. Feasibility report on restoration of Coeur d'Alene Tribal Fisheries. Upper Columbia United Tribes Fisheries Center. Cheney, WA. 85 pp

The 1987 and 1994 NWPPC Fish and Wildlife Program

In January 1995 the Coeur d'Alene Tribe submitted an application for amendment to the fish and wildlife program. Document # 95-2/0020 in NWPPC Recommendations to Amend the Resident Fish and Wildlife Sections of the Columbia River Basin Fish and Wildlife Program. 95-1 dated February 2, 1995. Within this document alternatives of both broad scale (i.e. fish passage at Chief Joseph, Grand Coulee, and all six Spokane River Dams) and finer scale (i.e. terminal fisheries for exotic adfluvial resident chinook salmon in Coeur d'Alene Lake) were explored. It was determined that the current program provided the most cost-effective means for partial mitigation of lost fishing opportunities while meeting Tribal goals and objectives. It was also determined that the current program provided the greatest chance for success over the other alternatives.

The following alternatives were explored:

Restore anadromous fish runs into the Upper Columbia Basin. Estimated cost to be 500+ million in capital construction costs for fish ladders and juvenile bypass systems at 8 dams. Fifty to sixty million in lost power revenues annually. And 12 million in capital construction with 3-5 million annual operations and maintenance costs for four anadromous salmon hatcheries for the reintroduction of salmon into the upper basin. It was also determined that the chances of success were small due to probable fish passage problems at an additional eight dams as well as, downstream harvest management problems and probable lack of appropriate genetic strains. Most likely not enough fish would return to produce a viable subsistence, commercial and/or sport fishery to warrant the expense at this time.

Operations of a chinook salmon hatchery on Coeur d'Alene Lake for terminal fisheries for exotic resident adfluvial chinook salmon. Estimated cost would be 3-5 million in capital construction and 1 million operations and maintenance cost. Idaho Fish and Game is already stocking chinook salmon into Coeur d'Alene Lake and from this two feral runs have established themselves in two of the best resident fish producing rivers in the basin. It is predicted that these runs will have some impact on the native species in the basin. Exotic species introduction is also contrary to the native fish management policy employed by the Tribe. As well, declining growth rates of the chinook salmon and exceptionally low numbers of kokanee salmon indicate that the productivity of Coeur d'Alene Lake for chinook salmon production may already be maximized. Therefore, stocking the lake with additional chinook salmon is not recommended at this time.

Habitat restoration of all streams (20) located on the reservation without the aid of a hatchery. Costs would be similar to existing proposal and biological outcome would be similar. However, it would take 50-100 years longer to rebuild stocks and the Tribe is not willing to wait this long for harvestable surpluses. Furthermore, given the general poor quality of habitat it is conceivable that within the 50-100 year time frame for restoration these stocks could go extinct.

Also,

This project is a resident fish substitution project. In 1987, the NWPPC prioritized the areas above both Chief Joseph and Grand Coulee Dams as resident fish substitution areas.

Response to question 1.

Work conducted by the Coeur d'Alene Tribe Fish, Water and Wildlife Program has helped determine that habitat components utilized in each of the three critical life history phases, as well as interactions with introduced species, potentially limit production of adfluvial fishes. These components include spawning habitat and juvenile rearing habitat in tributary streams, and adult rearing habitat in the lake. In order to effectively increase populations of westslope cutthroat trout, habitat restoration must take place in natal streams. However, restoration of the critical tributary habitat does not guarantee increases in adfluvial trout production because adfluvial westslope cutthroat trout reside in Coeur d'Alene Lake for two-thirds of their life cycle. Evidence suggests that production of cutthroat trout is indirectly limited by lake habitat features, but the extent of this limitation is not fully understood. We feel that our best shot at increasing productivity in the short term (5-20 years) is to focus our restoration efforts on the streams. Given the geomorphology of Coeur d'Alene Lake any physical manipulations (restoration opportunities) available to us are long term projects (25-50 years to produce an effect).

Diking the southern end is not feasible economically. Results would not justify the expense. Natural levees protect the migration corridors in the St. Joe and Coeur d'Alene Rivers. Some protection from degradation of these natural levees should be afforded in the near future. This is something that the Tribe is currently working on.

Response to question 2:

Regulation of the lake level by Post Falls Dam occurs 5-7 months of the year. Avista Corporation currently operates the Dam. Post Falls Dam is up for FERC relicensing in 2007 thus, lake elevational issues will be addressed through that process. Typically Avista maintains the lake at summer elevation (2128) after spring runoff through the first part of September. Avista then attempts to lower the lake by 7.5 feet by the end of January. Depending on weather, Coeur d'Alene Lake discharges naturally until after runoff. Lake level during this time frame depends entirely upon precipitation and temperature. Post Falls Dam does not effect the lake's outlet capacity under high flow conditions, the natural restriction controls the flow. Without Post Falls Dam summer mean lake elevations would be 7.5-9 feet lower and the surface area would be 7km^2 smaller. Thus, Post Falls Dam controls the introduction of warm water to the lake during the summer months when it controls lake level for recreation.

Response to question 3:

Over 100 years of mining activities in the Silver Valley have previously had devastating effects on the quality of the water in the Coeur d'Alene River drainage and Coeur d'Alene Lake. Effluent from tailings and mining waste have contributed vast quantities of trace heavy metals to the system. Since the secession of most of the mining activities along the South Fork Coeur d'Alene River dissolved heavy metal concentrations have decreased. However, contaminated sediments throughout the river corridor and Coeur d'Alene Lake north of the Coeur d'Alene River still remain. The deposition of trace elements in the sediments of Coeur d'Alene Lake is well documented by (Funk 1973; Rieman 1980; Woods 1989; Woods and Beckwith 1996). Lakebed geochemistry analyses revealed that most of the trace elements in surficial and subsurface sediments are associated with a ferric oxide phase thus, under reducing (anoxic D.O. values at 0.0) conditions, the trace elements would be readily solubilized and available for release to the overlying water column (Woods and Beckwith, 1996). The fact that trace metals are found in the sediments at the mouth of the river and north causes us some concern when sample points just north and south of the river mouth have dissolved oxygen values below 6.0 mg/L and a measurable hypolinetic oxygen deficit during periods of thermal stratification.

Poor agricultural and forest practices have also contributed to the degradation of water quality and habitat suitability for resident salmonids. Increased sediment loads from agricultural runoff and

recent and recovering clearcuts, and riparian canopy removal may be one of the most important problems currently affecting westslope cutthroat trout. Increases in water temperature have reduced the range of resident salmonids to a fraction of its historic extent. Within this new range, sediment has reduced the quality of both spawning and rearing habitats. Historically, municipal waste contributed large quantities of phosphates and nitrogen that accelerated the eutrophication process in Coeur d'Alene Lake. However, over the last 25 years work has been completed (as a result of enforcement of the CWA) to reduce the annual load of these materials. Wastewater treatment facilities have been established near all major municipalities in and around the basin.

Response to question 4:

The Tribe has considered different management options for exotic piscivorous fishes. The current alternative being employed is having liberal bag, both daily and possession, limits on all exotic species. A typical limit is one that is higher than what could normally be caught in one day.

Point B some finer scale alternatives should also be explored.

Response to point B:

As stated above several alternatives were explored and it was determined that the current program was the most cost effective and efficient way to provide harvest opportunities to the Reservation community in both the short and long term.

Response to question 1:

We are currently exploring the possibility that project objectives could be reached with a single adfluvial brood stock. A brood stock management strategy is currently being technically reviewed. Additionally, this idea is currently being explored with all agencies that have jurisdiction. We intend to use the most cost effective and genetically sound brood stock management plan whether it is a single brood stock for release in all four streams or individual stocks for each individual stream.

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

Response to comments on subject matter:

As stated in Appendix A of the Master Plan water is a main concern however, we feel that the plan stated should alleviate any of these concerns. The plan is to draw water from three separate aquifers near the hatchery compound as well as, withdraw water from Rock Creek when necessary. This should sufficiently supply the facility with all the water needed. Water from these different sources is currently being analyzed for critical elements (quality and quantity), ensuring that a dependable long-term supply of high quality water will be provided to the facility.

We have drilled one test well on site that exceeded one hundred gallons of water per minute, although, the recovery test of this well indicated that it could not sustain this rate (100 GPM) for a long period of time. The recovery test did indicate that it could sustain 10 GPM indefinitely. There will also be an additional well drilled on site, located approximately ¼ of a mile away in a easterly direction from the first test well. The second well field area will be located one mile to the north, well one for this area will be in T47NR04W29 in the NW quarter and the second well for this area will be in T47NR04W19, approximately ½ mile away in a northwesterly direction. The third well field area also in T47NR04W will be approximately ¾ of a mile to the north. Well one will be located in the northeast quarter of section nineteen, and the second well will be located in northwest quarter of section 20, the approximate distance between these wells is about ¾ mile.

In conclusion, the design of the hatchery requires 60 GPM at full production. There will be a total of six production wells producing water year around as well as, diverted water from Rock creek during the winter and spring months. The plan is to withdraw on the average 10 GPM per year from each well to ensure that the facility receives the required 60 GPM while not exceeding the recharge capacities of the affected aquifers. Wells will be managed and utilized in a manner that best suits the available water. Thus, if the well field complex and pipeline are implemented as planned 60 GPM to the facility will not be a problem.

Attachment 3. ISRP Questions for Teleconference

INDEPENDENT SCIENTIFIC REVIEW PANEL

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Date: February 3, 2000
To: Mark Fritsch
From Rick Williams, ISRP Chair
Sub; ISRP review of Trout Production Facility Master Plan

Thanks to Kelly Lillengreen for the helpful additional clarifications. The ISRP members reviewing the plan still, however, have some questions. Two of them have to do with possible direct detrimental effects of hatchery-bred trout on existing trout populations; the third with the hatchery's water supply.

1. If the facility is successful in producing harvestable numbers of adfluvial trout, how will fishery managers prevent fishermen from taking wild trout? We are reading in particular the passage of the memo "Until the 75% objective is met only hatchery fish will be harvested". How will this directed fishery be achieved? Will all hatchery trout be externally marked and will fishermen be required to release unharmed all unmarked trout? Will the fishery be allowed each year only after spawning ground escapement goals have been met and then be allowed on an indiscriminate mixture of hatchery and wild trout? If the latter, how will the inseason census of the spawning populations be maintained? Can the fishing season be opened and closed on short notice?

2. How will hatchery-produced trout be prevented from displacing wild trout from their limited habitat in the streams? We understand that the hatchery intends to release trout only when they are ready to migrate into Lake Coeur d'Alene. If successful this would eliminate the displacement of wild trout from their limited fluvial habitat. But we remain concerned about two potential problems. First we are not convinced that it will be possible to determine that "the fish are ready to migrate into Lake Coeur d'Alene", and we remain concerned that these hatchery-released trout may displace wild-spawned trout from their lacustrine habitat. And second, we read in the memo that, "[e]vidence suggests that production of cutthroat trout is indirectly limited by lake habitat features, but the extent of this limitation is not fully understood" and "conditions in the lake only limit the population (to some degree that currently has not been defined) not eliminate it." Physical limitations (incipiently lethal and extraordinarily stressful temperatures and oxygen supplies—the elements of the habitat suitability indices) are roughly known in the lake, but no other ecological dimensions (food and growth potential, predation) are known. A small likelihood of displacement of wild trout from the lake may be a reasonable risk to take given the agency's local knowledge of the lake and its productivity, but should the plan for the facility proceed without a plan to detect displacement of introduced trout both in the streams and in the lake?

3. Is the project assured of an adequate (quantity and quality) water supply? We read in the memo "The plan is to draw water from three separate aquifers near the hatchery compound as well as, withdraw water from Rock Creek when necessary. This should sufficiently supply the facility with all the water needed. Water from these different sources is currently being analyzed for critical elements (quality and quantity), ensuring that a dependable long-term supply of high quality water will be provided to the facility" (emphasis added). Are the aquifers independently recharged? Will they indefinitely supply the hatchery for the six months out of the year that we understand is necessary? Are the aggregate costs of supply from three wells known, including piping, pumping and maintenance? If quality and quantity and costs are not yet known, should the plan for the facility proceed? We are concerned that it may be necessary to change the concept of the hatchery if the water supply required by it can not be assured.

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