Independent Scientific Review Panel
for the Northwest Power & Conservation Council
851 SW 6th Avenue, Suite 1100
Portland, Oregon 97204
www.nwcouncil.org/fw/isrp

Memorandum (ISRP 2013-7) **July 15, 2013**

To: Bill Bradbury, Chair, Northwest Power and Conservation Council

From: Greg Ruggerone, ISRP Chair

Subject: Lake Roosevelt Kokanee - Comprehensive Management Plan

Background

On May 24, 2013, the ISRP received a request from the Northwest Power and Conservation Council to review the *Lake Roosevelt Kokanee - Comprehensive Management Plan* (2010) prepared by the co-managers of Lake Roosevelt: the Spokane Tribe of Indians (STOI), Colville Confederated Tribes, and Washington Department of Fish and Wildlife. Development of the management plan document was a requirement included in Council recommendations responding to a number of ISRP reviews.

These past reviews include:

- the 2006 review of Fish and Wildlife Program proposals (ISRP 2006-6; pages 603-610)
- a workshop and review of the Lake Roosevelt Kokanee Program (ISRP 2007-10)
- a review of the Lake Roosevelt Guidance Document (ISRP 2009-16)
- and most recently a review of Lake Roosevelt fishery management projects in the Resident Fish, Data Management and Regional Coordination Category Reviews (see ISRP 2012-6, pages 55-82).

In response to the 2012 ISRP review, on July 10, 2012, the Council recommended that the sponsors develop and submit "a Kokanee Plan for Lake Roosevelt with partners WDFW (1991-047-00) and STOI (1991-046-00 and 1994-043-00) called for in the current ISRP Review and the previous ISRP Review Document 2009-16. Final plan to be submitted by March 2013 to inform implementation in 2014 and beyond."

Particularly relevant to this review are the ISRP's comments under the Spokane Tribes' Lake Roosevelt Data Collection project (#1994-043-00):

Qualifications:

1. The sponsors should establish a scientifically justified timeline, decision points, and criteria for determining whether a viable hatchery kokanee fishery can be established lake-wide, or if the goals of the hatchery kokanee program should be modified. A decision tree should be developed to aid in this process.
2. Similarly, the sponsors should establish a scientifically justified timeline, decision points, and criteria for determining whether a mixed stock/mixed species fishery can be established lake-wide. A decision tree should be developed to aid in this process.

In addition, the ISRP's review of the projects preceding the Resident Fish Category Review is relevant (ISRP 2009-16). In that review, the ISRP found that an earlier version of this plan titled Lake Roosevelt Guiding Document did not meet scientific review criteria and commented:

> The ISRP finds that the Lake Roosevelt Guiding Document does not provide scientific justification for continuation of the kokanee hatchery program. An adequate guiding document would include:
>
> 1. a summary of comprehensive biological information on the fish population dynamics, trophic relationships, food webs, and nutrient processes that determine kokanee life-stage survivals, abundance, and fishery yields in Lake Roosevelt;
> 2. the fishery program goals for kokanee and a timeframe for closing the gap between the current state and desired state of the resource;
> 3. using the life-stage survival information from (1) above, development of a strategy to reduce mortality attributed to each limiting factor sufficient to achieve the program goals (the adaptive management experiment); and
> 4. an outline of a monitoring plan sufficient to estimate the importance of biological and environmental parameters thought to determine kokanee abundance, escapement, and fishery yields in Lake Roosevelt.

Our review below is organized around these four items from the 2009 review.

ISRP Recommendation

Does not meet scientific review criteria

The Lake Roosevelt Kokanee Management plan does not adequately address the ISRP qualifications recommended in previous reviews including the 2009 review (ISRP 2009-16) of the Lake Roosevelt Kokanee Guiding Document or those from the recent resident fish review (ISRP 2012-6; projects 1991-043, 1991-046, and 1991-047). Additionally, the sponsors did not show a reasonable or realistic path for achieving the kokanee goals within the six to ten year period specified in the plan. Areas where the plan needs improvement are noted below.

ISRP Comments

1. *a summary of comprehensive biological information on the fish population dynamics, trophic relationships, food webs, and nutrient processes that determine kokanee life-stage survivals, abundance, and fishery yields in Lake Roosevelt*

The introduction and background summary of the kokanee management plan seems to call into question the utility of what few baseline studies have been completed to date. It points out how little is known regarding kokanee management in Lake Roosevelt: lack of a trophic dynamics model; total lack of information on the smallmouth bass population and its predation on kokanee; concern about the applicability (and accuracy?) of previous walleye studies; questions about the value of the 1998-99 entrainment study; and major questions regarding the value of kokanee creel data. It leaves the impression that there are no basic building blocks upon which to continue a research and management effort, and we need to start over. Yet despite the lack of information regarding factors currently limiting kokanee, the intent of the plan seems to be to significantly increase kokanee production.

Since completion of the 2009 Guiding Document very little new biological information has been added. The plan states that "currently there is insufficient information for a complete trophic model for Lake Roosevelt. In this plan, existing productivity information is combined with a simple kokanee carrying capacity model to suggest kokanee stocking numbers." The sponsors make the case that food in the lake is not limiting for kokanee and that Daphnia are abundant, especially in the downstream half of the lake. This seems reasonable. However, while recognizing the importance of developing a comprehensive trophic model, the sponsors did not present any information on the model's development. "In addition to secondary productivity and fish length at age, a comprehensive trophic model for Lake Roosevelt should be designed in the ***future*** to consider many more factors, such as primary nutrient availability, primary productivity, and loss through predation, entrainment and spawning."

The sponsors also state "Currently, the fish community in Lake Roosevelt appears to be moving towards an increasing percentage of predator species such as walleye and smallmouth bass and a decreasing percentage of prey species such as suckers, northern pikeminnow, sculpin, rainbow trout and kokanee." This species-by-species statement suggests just how unclear and poorly understood the food web actually is in the reservoir. Population estimates of non-native predators of kokanee, walleye, and small mouth bass, are needed as baseline data for monitoring predator reduction efforts and only a couple of localized estimates have been done with very large confidence limits (Stroud et al. 2010). Species interactions are largely unknown, trophic relationships are not well known, and there does not seem to be a conceptual framework for understanding these relationships.

The life stage survival and age structure information on kokanee returning to Hawk Creek remains somewhat confusing but seems significant. The authors state that "The only tributary that regularly receives a large (and monitored) return of hatchery kokanee spawners (mainly

age 2 males) is Hawk Creek (McLellan et al. 2006, 2007, 2008, 2009). In 2007, a total of 6,143 hatchery kokanee spawners entered the mouth of Hawk Creek (2.2% of the post smolt kokanee released 14km east of Hawk Creek at Fort Spokane Boat Launch) (McLellan et al. 2008). Fish released from Fort Spokane doubled in body length when caught in Hawk Creek following their four months residence in the lake (167 mm to 312 mm). Such fast growth in the lake and the accelerated growth in the hatchery used to drive the majority of these fish into early maturity at age 2, at a sex ratio of 5-10 males to 1 female (McLellan et al. 2008)." They then state that "In 2008, 162 age-3 spawners were caught in Hawk Creek (McLellan et al. 2009)." It does not make sense how there would be 6,143 fish, a very high fraction age-2 males, in 2007 and only 162 age-3 spawners, perhaps mostly females, in 2008 unless there is *very high* mortality or entrainment loss (as high as 97.5%) on fish between age-2 and age-3.

This means that recruitment to a harvestable size must result from increased survival at each life stage, not just getting them up to age-2. Given the results of Hawk Creek, restoration will be very difficult if the fish never get past high mortality/entrainment loss pressure but exhibit a high loss rate until the few remaining (age-3 and up) individuals are harvested. Survival rate results suggest that if predation mortality from the large walleye population is a problem, that larger walleye, now protected, might be more of a threat than smaller walleye, appropriately not protected, on these larger fish between age-2 and age-3. The ISRP previously noted that "To reduce predation of walleye on kokanee the walleye bag limit was increased from five to eight fish per day beginning in 2006. The regulations target smaller fish and allow only one fish over 22 inches to be harvested. Little evidence is provided to support the contention that the proposed increase in walleye harvest would significantly reduce predation mortality on kokanee". This comment still applies. The rationale for protecting the 22 inch-fish is questionable in the context of providing a kokanee fishery.

2. *the fishery program goals for kokanee and a timeframe for closing the gap between the current state and desired state of the resource*

Thus far, kokanee survival from release to harvest has not met program goals. For 2007 to 2010, the kokanee harvest goal was 12,500 fish from stocking yearlings (the annual harvest goal from the 2009 Guiding Document was 35,000 fish – 25k from yearlings and 10k from fry). Kokanee harvest for those four years was 122; 368; 1,086; and 1,842 fish. This is a harvest yield ranging from 0.04% to 0.80%. Although the numbers are increasing, they still are well below the 5% goal for yearling kokanee.

The new plan proposes to switch from a goal of total number of fish harvested to a CPUE goal of 0.5-1.0 kokanee per hour. The timeline in Table 11 indicates that this catch rate is to be achieved in six to ten years for continuation of the program. As with the difficulty in achieving the earlier numerical goal, it will be difficult to close the gap in current CPUE and the future goal of 0.5-1.0 fish per hour, unless reservoir environmental conditions are significantly improved, including operational constraints (i.e., entrainment and drawdown) and the fish community structure (i.e., predation by non-native walleye and smallmouth bass) being altered.

There is no scientific justification supported by data from Lake Roosevelt that the goals and timeline can be achieved.

The plan includes new artificial production goals and strategies with timelines and decision points in Table 10. With the limited state of knowledge of factors affecting hatchery survival of fry and the limited capacity for yearling rearing, the outlook for success of any hatchery program seems poor. As stated in the management plan, "The water supply and rearing capacity of the combined Lake Roosevelt kokanee hatcheries (Spokane Tribal and Sherman Creek Hatcheries) cannot produce enough yearling kokanee to seed Lake Roosevelt to a level that would result in 50 catchable kokanee per hectare as has been suggested by Rieman and Maiolie (1995) for creating attractive kokanee fisheries in other reservoirs. The release of fry requires less hatchery resources but has not proven successful to recruit kokanee into the fishery or to escapement. Therefore, if an attractive kokanee fishery is to be created in Lake Roosevelt through a put-and-take program, hatchery capacity needs to be increased by about five times." This would seem to be a cause for concern about the viability of the hatchery program, but the sponsors seem undeterred. Fisheries results to date indicate that release of fry is ineffective, and release of adequate numbers of yearlings is not effective with existing hatchery capacity. Furthermore, if hatchery capacity were actually increased by 5X, there *must* be some other desirable species more effective to rear than kokanee that would recruit and return to a creel at a higher rate. Based on information presented on pages 9-12, a strong case is made for *not* having a kokanee hatchery program at all. This conclusion differs from the conclusions of the management team: "All members of the Lake Roosevelt Management Team have approved the Lake Roosevelt Artificial Production Program for kokanee as outlined in the Lake Roosevelt Fisheries Guiding Document (Lake Roosevelt Management Team 2009)."(p. 36). There is a strong disconnect between the desire to have a kokanee fishery and the wisdom of pursuing an expensive and ecologically challenging kokanee fishery.

The goal for restoring wild kokanee also seems forced rather than historically driven in that the wild stock rearing there is not linked to the historical wild stock, which may no longer be in the basin. There is little evidence that there was ever an indigenous stock in the Sanpoil River. So why is it imperative to restore a wild stock that does not seem to have been there historically? Reviewers question if the program described in Table 12 might be a large undertaking to "restore" fish that were probably never in the Sanpoil River.

3. *using the life-stage survival information from (1) above, development of a strategy to reduce mortality attributed to each limiting factor sufficient to achieve the program goals (the adaptive management experiment)*

Some general strategies related to entrainment and predation are included in section 3 of the plan and in Tables 10, 11, and 12. These tables contain the core of the plan having timelines and decision criteria. Unfortunately, many goals in the tables are not justified with existing data and appear to be unrealistic. The timelines are overly optimistic and very uncertain if limiting factors are not addressed. Most of these strategies need baseline data on limiting factors to set realistic goals.

Entrainment - In Table 12 the goal is to reduce entrainment to < 50%. This is assumed so a study to collect data to determine a base entrainment loss is needed. The proposed entrainment study in section 3 is a good start in determining or estimating losses of kokanee due to entrainment. Therefore, it should be given a high priority. Once reasonable estimates of entrainment loss are documented, then the significance of entrainment may be learned and *effective strategies may be developed to reduce losses to entrainment.*

Predation - Reducing predation in the lower reach of the Sanpoil River will be a major challenge because some data (Stroud et al., 2010) indicate that walleye and smallmouth bass are quite abundant and are able to consume up to 5 times more kokanee than are now emigrating from the Sanpoil. Table 12 seems to indicate that a goal (or decision criterion) of reducing predation by walleye by 10% over current levels is needed for continuation of the program. No specific strategies are included on how predation will be significantly reduced to that level. A detailed study plan is needed for reducing predation to a desired/defined level, and better estimates of population sizes of walleye and smallmouth bass are needed.

4. *an outline of a monitoring plan sufficient to estimate the importance of biological and environmental parameters thought to determine kokanee abundance, escapement, and fishery yields in Lake Roosevelt.*

The plan indicates that CPUE will be used to monitor harvest goals for kokanee in Lake Roosevelt. The goal is to increase hatchery output of kokanee yearlings to reach a density of 50 catchable kokanee per hectare of Lake Roosevelt and work towards more efficient usage of Hawk Creek spawners to establish a kokanee captive brood-stock program and to establish a self-sustaining kokanee population in the Sanpoil River. Instead of a 35,000 total catch per year goal, the goal will be switched to a CPUE harvest goal (aim to reach a range of 0.5 – 1 fish per hour).

The 50 catchable kokanee per hectare and catch rate of 0.5-1 fish per hour are taken from the literature where kokanee fisheries are established. The timeline in Table 11 indicates that those goals should be reached by 6 to 10 years for program continuation. Without major reductions in limiting factors (i.e., artificial production shortfalls due to insufficient egg availability, significantly reduced walleye and smallmouth bass predation, and entrainment losses), the goals will not be attainable, certainly not in 6 years.

Monitoring efforts by creel census will increase and made kokanee-specific, and the daily kokanee bag limit will be increased from 2 fish to 6 fish (only 2 can be wild). Completion of the statistical evaluation and revision of the creel program including a strategy to improve tracking of the subsistence fishery will be necessary to attain a sound harvest monitoring program. The ISRP has seen no significant progress on revising this creel program to date.

Monitoring of primary and secondary production will also be conducted, especially for *Daphnia* density in response to increased kokanee densities.

Monitoring of walleye predation, along with predator suppression, will also be conducted only in the lower reach of the Sanpoil River. However, no details of that predator monitoring and suppression are provided.

Additional ISRP Questions for a Future Kokanee Management Plan

The plan was prepared in 2010, and a fair amount of time has passed since then (~3 data years). In essence, the 2010 plan is somewhat outdated; therefore, any future plan will also need to address the following questions:

- Is there progress in achieving fishery goals or narrowing the gap between goals and annual take?
- What are the estimates of kokanee life stage survival post release (other than the Hawk Creek survival/return estimate of 2.2% from hatchery raised yearlings release in 2007)?
- What are the results regarding the reduction in mortality from major limiting factors (i.e. predation, entrainment, or drawdown) and has the entrainment study been initiated?
- What are the findings of the 2010 spawning habitat study in the West Fork of the Sanpoil River?
- What was the response in the fishery CPUE to the 2010 increase in bag limits of kokanee to 6 fish (only 2 could be wild)?
- Is there an increase in egg availability or egg take from Hawk Creek spawners?
- What is the status of statistical evaluation and revision of the creel program including a strategy to improve tracking of the subsistence fishery?
- What were the results from the acoustic tagging of the wild kokanee to determine their movements, behavior, and possible spawning location(s)?
- The plan states “A kokanee spawning capacity model for the Sanpoil River will be produced when results from the 2009-2010 Sanpoil River habitat study (conducted by the Colville Tribes Fisheries Department) are finalized.” The results of that study should be described.
- Was the 2009 walleye and smallmouth bass predation study in the Sanpoil Arm continued in 2010? If so, what are the results?
- Have fry plants been terminated as described in Section 5 and Table 10 of the plan? If so, what are the results?