

**Response to ISRP Preliminary Questions and Comments: Cowlitz Proposals, Project ID: 31005 and 31017**

**Sponsor:** WDFW  
**Province:** Lower Columbia  
**Subbasin:** Cowlitz

**Project ID 31005: Incorporating Pit Tag Technology to Evaluate and Monitor the Reintroduction Effort for Anadromous Salmonids in the Upper Cowlitz Watershed.**

**Short Description:** We propose to update pit tag system to basin ISO standards at the Cowlitz Falls Dam and Fish Facility and use pit tags to monitor and measure collection, collection efficiency, smolt production, and a prototype surface collector entrance.

**ISRP Preliminary Questions and Comments:**

**“A response is requested on how the Anadromous Fish Reintroduction Program is being evaluated. This project could potentially be very worthwhile but its value needs to be assessed within the context of the evaluation. “**

**What are the objectives of the evaluation?**

The goal of the reintroduction program is to reintroduce anadromous salmonids to 240 miles of habitat above the Cowlitz Falls Dam to develop self sustaining populations using the juvenile fish collection facilities at the dam coupled with the transportation and release of smolts downstream and adults upstream to the upper watershed. The objectives for the evaluation focus on the potential smolt production from the upper watershed and the ability to collect the smolts at the Cowlitz Falls Dam and Fish Facility.

Objective 1. Determine and measure the ability of the upper watershed to produce healthy robust smolts from fry and fingerling plants, from hatchery origin adults (HOR) and ultimately natural origin adults (NOR) released in the upper watershed and allowed to spawn naturally. The anadromous stocks are indigenous to the watershed and have been sustained by hatchery production at the Cowlitz Hatchery Complex in the lower Cowlitz River.

Key program activities for this objective include:

- The release of adults in the upper watershed as they become available, beginning with HOR and gradually moving to NOR as the program continues.
- The distribution of available fry and fingerlings from the Cowlitz Hatchery Complex production throughout the accessible areas of 240 miles of anadromous habitat in the upper watershed.
- And as the number of HOR and NOR adults available approaches and or exceeds initial escapement targets for the upper watershed, discontinue fry and fingerling releases.

Objective 2. Determine the ability and efficacy of the surface collection system at the Cowlitz Falls Dam and Fish Facility to collect smolts.

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Key program activities for this objective include:

- The enumeration and monitoring of the health and condition of smolts collected, transported and released from the stress relief ponds at the Cowlitz Salmon Hatchery (CSH)
- The evaluation and monitoring of the performance of the surface collection system that include:
  - Measuring Fish Collection Efficiency based on mark recapture throughout the collection season
  - Identifying and conducting research to improve FCE in effort to achieve FCE of up to 95 %

Objective 3. Determine the total production of smolts from the upper watershed and the production of adults from these smolts.

Key program activities for this objective include:

- Estimate total smolt yields from the upper watershed as well as fry/fingerling to smolt yields, egg to smolt yields
- Identify and enumerate unmarked adults that return to the CSH from smolts produced in the upper watershed and return these adults to the upper watershed to spawn
- Estimate Smolt to Adult Return survival for each species. Smolts collected and released from the upper watershed are unmarked. Smolts released from the Cowlitz Hatchery complex are marked with a fin clip. Most smolts from the Tilton watershed are marked with a coded wire tag.

### **What are the results of the evaluation to date?**

The 2002 smolt migration season will mark the seventh season of smolt collection at the Cowlitz Falls Project. The results of each year's work have been reported in annual reports and submitted to BPA.

- The 2001 draft annual report has been submitted to BPA for review.
- Smolt collection has increased steadily.
- Smolts are robust, healthy and typically disease free.
- Fry releases of coho in the upper watershed have been discontinued as the number of adults released in the upper watershed to spawn naturally have increased dramatically the past three years.
- Fry and fingerling releases of spring chinook and late winter steelhead continue.
- Estimates of smolt yields from chinook fry plants in 2001: 32 %
- Estimates of smolt yields from steelhead fingerling plants in 2000: 13 %
- Total smolt collection exceeded 435,000 smolts in 2001.
- Project staff frequently handled more than 5,000 smolts daily with a peak one day total of nearly 26,000 smolts in 2001.
- Last season's 335,000 coho smolts collected were the offspring of HOR and NOR adults that spawned naturally in the upper watershed.

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- Based on the estimates of fish collection efficiency from mark recapture releases, over 800,000 coho smolts were produced last season. This represents an egg to smolt survival of over 1.5 %.
- We estimated total smolt production from the upper watershed at over one million smolts in 2001.
- We continue to mark smolts collected at the facility with an elastomer visible implant tag and releasing these fish upstream to measure collection efficiency.
- We estimated collection efficiency at 58 % for steelhead, 42 % for coho, and 23 % for spring chinook in 2001.
- We estimated coho smolt to adult survival from the 1999 smolt out migration that returned in the fall/winter of 2000-01 at 5.0 %.
- Initial smolt to adult survival estimates for steelhead and sea-run cutthroat of ~2.5 %.
- Over 730 late winter adult steelhead were released in the upper watershed to spawn naturally in 2001: a potential egg deposition of 1.2 million eggs.
- Over 200 adult spring chinook were released in the Cispus watershed to spawn naturally: a potential egg deposition of 381,000 eggs.
- Over 48,000 adult coho including over 6,000 NOR adults were released in the upper watershed to spawn naturally between October 2001 and January 2002: a potential egg deposition of more than 54 million eggs.
- We confirmed the production and emigration of juvenile spring chinook from over 200 adults that spawned naturally in the Cispus in the fall of 2000. These juveniles would be expected to smolt as yearlings in 2002.

The relatively good survival to smolt, increasing numbers of smolts collected and the numbers collected and handled per day to recover visual elastomer marks is an important element of our proposal to update the PIT tag detection system. This would enable us to minimize the number of smolts handled and enhance the evaluation efforts.

Collection efficiency of smolts is a critical component of the overall project and evaluation of the production of smolts from the upper watershed. Research scheduled in 2002 will focus on fish behavior near the collection flumes to increase the fish collection efficiency and the development and testing of modified entrance to the surface collection flume.

Past efforts to monitor, assess and improve collection efficiency have been guided and assisted by a technical advisory committee, fisheries management agency direction (NMFS, USFWS, WDFW), Bonneville Power Administration and the United States Geological Survey-Biological Resources Division in Cook, WA. The following bullets briefly highlight research efforts undertaken over the last six years and cites the publications associated with the research.

In 1996 and 1997:

- Mark recapture estimates of collection efficiency lead WDFW staff to conclude that fish collection efficiencies were lower than expected and much lower than that reported by Adeniyi et al. (1997) based on single beam hydroacoustics.

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- *Adaptive Management Action: WDFW and TAC seek fish behavior study*

In 1998:

- USGS conducts pilot study of radio-tagged juvenile steelhead by USGS and WDFW (Adams et al. 1998). Results indicate passage through the induction slot is a problem.

In 1999:

- The U.S. Geological Survey conducted studies to determine fish behavior as they approached the surface collection system (Evans et al. 1999). They concluded that the baffle panel configuration at the upstream face of the dam created a hydraulic condition that was unfavorable for entrance into the collection flumes. Tests of strobe lights in the induction slot entrance did not reduce entrainment into the turbines.
  - *Adaptive Management Action: Proposal to test three different baffle panel configurations to identify improved hydrodynamic conditions at face of dam.*

In 2000:

- USGS tests of a modified baffle panel configuration (top panel removed) resulted in two to three times as many fish entering entrance to the gate and surface collection flume over the modified panel based on radio-tagged steelhead and fish collected in the flumes (Hausmann et al. 2001). As a result, the modified panels were accepted by management and both turbines use the new baffle panel configuration.
  - *Adaptive Management Action: New test configuration replaces original baffle panel configuration at the upstream face of the dam on both turbine intakes.*
- USGS conducted initial large-scale test of directed flow using current mixers in Cowlitz Falls forebay. Results show significant response of coho to directed flow. (citation)

In 2001:

- Research efforts to improve collection efficiency focused on evaluating a flared entrance to a collection flume in cooperation with the United States Geological Survey-Biological Resources Division using radio tags complemented with sampling catches in the flumes. Flume sampling and facility catches indicate that the tested flared entrance did not improve collection efficiency. USGS-BRD staff are currently completing the analysis of the radio telemetry data.
- Based on radio telemetry work, USGS-BRD staff concluded that 90% of the radio-tagged steelhead and 72 % of the spring chinook that entered the forebay were also detected at the collection flume entrances (U.S. Geological Survey, unpublished data). Based on these results and past studies, they have concluded that fish pass near the collection flumes, but they also have a high rejection rate and many do not enter the flumes.
  - *Adaptive Management Action: radio-tag studies of juvenile salmon will not be continued and passage studies will focus on fish behavior near the flume entrances of the fish collections system*

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**“The ISRP would strongly recommend the development of an experimental design to utilize this unique opportunity.**

WDFW recognizes the need for an experimental design for the reintroduction program and is in the process of developing a comprehensive management plan for the watershed that will address this as well. Implicit in the current reintroduction program are several hypotheses: One, that the upper watershed is still capable of producing significant numbers of healthy robust smolts. Two, that the indigenous stocks maintained by the Cowlitz Hatchery Complex in the lower river can produce healthy robust smolts from fry and fingerling releases in the upper watershed and or HOR adults returned to the upper watershed and allowed to spawn naturally. And, three, that collection at the surface collection system and fish facility at the Cowlitz Falls Dam will be sufficient coupled with the collection, transport and release of smolts downstream and adults upstream to allow the returning adults to sustain the population.

**Further, the PIT equipment would provide the tool for assessing collector designs but what is being done to re-design this system for improved efficiency?**

BPA is funding a pilot research effort to construct and test a modified entrance to the surface collection flumes this season. Design and fabrication are underway. Installation is scheduled for late April 2002. Testing and evaluation is scheduled to begin in May and end in July. Key cooperators in this effort include Montgomery-Watson-Harza, Lewis County Public Utility District, United States Geological Survey-Biological Resources Division and Washington Department Fish and Wildlife.

The current pit tag detection equipment at the Cowlitz Falls Project does not need to be redesigned, only updated from the non ISO system to the current basin standards. The addition of PIT tag detectors in the collection flumes in the outyears, addressed in the proposal, would improve efficiency and complement research efforts to improve collection efficiency.

**Project ID 31017: Monitor and evaluate the success of hatchery salmonid reproduction for reintroduction of anadromous salmonids to the upper Cowlitz Basin**

**Short Description:** Monitor the success of the reintroduction of anadromous salmonids to the upper Cowlitz Basin, including distribution, timing and success of reproduction of hatchery adults and success of upper basin seeding.

**ISRP Preliminary Questions and Comments:**

**“This project has potential to answer basin-wide questions about the efficacy of supplementation strategies in the restoration of salmonid populations. One strategy for establishing salmon above the dam is to transport mature adults above the dam.**

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**Some of these fish will be offspring of naturally spawning fish above the dam (NORs) but some will be offspring of hatchery spawnings (non-“acclimated” [sic], HORs).”**

**Why wouldn't a strategy of relying strictly on NOR adults be more successful?**

A strategy of relying strictly on natural origin adults may be more successful and is a long- term program goal, but is not practical at this time. After 30 years of dams blocking 80% of the Cowlitz River spawning habitat and a large hatchery program to replace natural spawning, there were few, if any, natural origin adults available to start the reintroduction. However, in the short term, hatchery origin adults, when available, provide a tool to supplement natural origin adults in effort to fully seed the available habitat.

Additional benefits to the reintroduction of transporting hatchery origin adults to the upper watershed include providing nutrients to the upper watershed and reconditioning spawning beds.

**“A source of mortality for these fish is recreational harvest.” What is the justification for allowing harvest of these fish transported above the dam if their purpose is to establish a reproducing, naturally adapted population?**

WDFW strives to balance competing needs and interests for fisheries resources throughout the state and comply with established policy guidelines. Recreational fisheries are allowed to target only marked hatchery origin adults in the upper watershed. The only significant recreational fishery to date is that on adult coho and we have instituted a creel effort to estimate harvest and monitor angler activities. A goal of the re-introduction plan was to “Provide a sustainable fishery for anadromous and resident fish” (GAIA 1994). The reintroduction program and its goals are widely supported by many resource user groups in the watershed.

**Isn't the harvest of NOR adults particularly detrimental to the strategy?**

Yes, the harvest of natural origin adults is not desirable. Harvest regulations allow harvest of only marked hatchery adults. Efforts are made to publicize the regulations along with enforcement activities to ensure compliance.

**What is the experimental design for estimating the proportion that fall back below the dam?**

The goal of the radio telemetry fallback estimates is to improve the accuracy of spawning escapement used to estimate egg-to-smolt survival of transported adults. Known number of adults is transported and from this we subtract fallback over the dam. Our experimental design is to study one species per year using 50 radio tags per year. These fish will be released in groups of 10 released at intervals throughout the peak transportation times and released into Lake Scanewa. Detection of tagged fish would be in the forebay and tailrace of Cowlitz Falls Dam. USGS-BRD personnel will loan and set up the

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necessary equipment. Other data recorded would be Cowlitz Falls Dam flows through turbines and spill ways. Fallback rates will be calculated for all fish released and fish entering the forebay. The variance between the five release groups will be used to provide confidence intervals around the fall back rate estimate.

**What will be the power to estimate the loss rate of the single-season-per-species telemetry studies?**

No major study has been conducted to date to measure loss rate of adults released in the upper watershed and the associated statistical parameters for any species to date. We feel a group size of 50 tagged fish is justified in both tag costs and impact on fish. This sample size has a potential for wide confidence intervals around our point estimates if release groups act differently throughout the season. However, even if we obtain wide confidence intervals, the high fall back periods could be examined for dam operations that seem to increase fallback rates.

**One of the goals is to establish index sites for estimating spawning escapements, particularly of steelhead and coho; why wouldn't a random sampling scheme (e.g. EMAP) provide a more accurate estimate of spawning escapements?**

Total escapement is the obtained from the number of adults transported and released in the upper watershed. The establishment and use of index sites is a tool to estimate relative spawning escapements and distribution throughout different reaches in the watershed. The plan is to use these sites to index juvenile production from adult spawning.

We will investigate random sampling schemes (eg.EMAP) to see if this provides a better tool to assess spawner distribution throughout different watershed reaches. A random sampling scheme may prove difficult simply from difficulties in access to all reaches where spawning occurs.

**“Another strategy for establishing salmon above the dam is to transport fry and fingerling produced in a hatchery above the dam, a version of supplementation strategies in other parts of the basin. These HOR salmon may, probably do, interact detrimentally with NOR fry and parr above the dam.” What is the rationale for inducing these detrimental interactions?**

The reintroduction program essentially started from ground zero with no or very few adults available in 1994 and was therefore based on hatchery juveniles releases. The rational for using hatchery juvenile plants is to jumpstart the reintroduction and provide a reasonable population that would utilize a significant portion of the available habitat. Because hatchery juveniles are of the same stock, they should be genetically similar to the naturally produced juveniles. The exception is that they will be slightly larger due the hatchery conditions. This can be avoided by using hatchery adults to seed the upper watershed. With the improved coho returns the past three years, coho fry releases have ceased. Hatchery late winter steelhead smolts releases have been increased and should, combined with program returns, allow us to discontinue or reduce hatchery steelhead

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juvenile plants with in few years. Until project or hatchery spring chinook adults begin to return, some level of fry supplementation will be needed to produce smolts needed for fish collection efficiency research. Sea-run coastal cutthroat trout populations in the upper watershed are entirely natural origin because we had a large enough native population to work with.

**What is the extent of these interactions?**

At this time we really don't know. We have not been able to obtain funding to look at interactions and the potential impacts. We assume that intraspecific interactions will be minimized by using hatchery origin adults in place of hatchery origin fry when possible.

**How is the continued introduction of HOR fry and parr justified when NOR salmon are present?**

Presently, hatchery origin fry and fingerling releases of spring chinook and late winter steelhead still provide our best tool to utilize as much of the available habitat as possible to produce smolts for the reintroduction program and evaluation. We have ceased releasing coho fry in the upper watershed. Given adequate numbers of adults spawning in the upper watershed, no hatchery juveniles would be released in the upper watershed. As the numbers of adults available for the reintroduction program increases we would scale back juvenile releases. Both naturally spawned and hatchery origin groups originated from the indigenous stocks maintained and propagated at the Cowlitz Hatchery Complex and thus have essentially the same genetic background. However fry and fingerlings from the hatchery complex do have an initial size advantage over some of their naturally produced counterparts and we therefor prefer to use adults, naturally produced or hatchery origin, to seed the upper watershed when sufficient number are available.

**"The following comment applies to projects 31005 and 31017 and a joint response is likely warranted. A response is requested on how the Anadromous Fish Reintroduction Program is being evaluated. This project could potentially be very worthwhile but its value needs to be assessed within the context of the evaluation, what are the objectives of the evaluation, what are the results of the evaluation to date? "**

Please see response to these questions on pages one and two.

**"The ISRP would strongly recommend the development of an experimental design to utilize this unique opportunity."**

Please see response to this question on page five..



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