A Review of Fish Passage Provisions in the License Application for the Hells Canyon Complex

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Prepared For

Idaho Rivers United

And

American Rivers

By

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INTRODUCTION

The purpose of this project is to (1) review fish passage provisions described in the final license application prepared by Idaho Power Company (IPC) for operation of the Hells Canyon Complex (HCC), and (2) report findings to Idaho Rivers United and American Rivers. This report will assess (1) adequacy of the studies, (2) proposed mitigation and passage measures, and (3) information gaps. The assessment is based on the fact that fish passage should be provided at the HCC.

HISTORIC PROSPECTIVE

PASSAGE AT THE HCC

The Federal Power Commission (FPC), which is presently called Federal Energy Regulatory Commission (FERC), authorized construction of the HCC project based on fish passage provisions developed by IPC. Fish passage facilities were constructed by IPC, and the Bureau of Commercial Fisheries (BCF) [until recently the BCF was called the National Marine Fisheries Service (NMFS), but more recently the agency changed its name to NOAA Fisheries] operated the facilities. Fish passage facilities consisted of (1) a trap at the base of Brownlee Dam and later at the base of Oxbow Dam and Hells Canyon Dam to collect upstream migrants, (2) a net strung across the reservoir upstream of Brownlee Dam and associated equipment to collect downstream migrants, and (3) trucks used to move fish upstream and downstream past the project.

Biologists who operated fish collection facilities encountered problems collecting downstream migrating fish, and the collection programs at Brownlee were discontinue in 1964. To mitigate for the loss of anadromous fish, fishery agencies developed a hatchery mitigation program in the Salmon River subbasin to mitigate lost production upstream of HCC. Hatchery mitigation facilities in the Salmon River subbasin are operated by Idaho Department of Fish and Game (IDFG) and funded by IPC.

PROPOSED DOWNSTREAM DAMS

In addition to problems associated with collecting downstream migrants, several other pending actions contributed to the decision to abandon fish passage at Brownlee. Federal agencies and private and public utility companies were proposing construction of hydroelectric dams downstream of the HCC in the Middle Snake River. These dams included High Mountain Sheep, Low Mountain Sheep, Pleasant Valley, and Nez Perce dams which, if any one or a combination of these dams were constructed, would inundate the Snake and would have blocked fish passage to the HCC. The passage of the Hells Canyon National Recreation Area Act (HCNRA) in 1975 and other acts prohibiting construction of dams, including Asotin and China Garden dams, downstream of the Salmon River protected the free-flowing nature of the Snake River from the HCC to Asotin, Washington under provisions of the National Wild and Scenic Rivers Act.

LOWER SNAKE RIVER DAMS

The Federal Government authorized construction of four dams on the lower Snake River in 1945, and the full impact of these dams on fish runs was unknown at the time of fish passage abandonment at Brownlee in 1964. Construction of Ice Harbor Dam was completed in 1961 followed by Lower Monumental in 1969, Little Goose in 1970, and Lower Granite in 1975. In addition, hatchery mitigation for losses of fish caused by construction of dams on the main-stem Columbia River - Bonneville, The Dalles, John Day, and McNary – was placed downstream of Bonneville Dam. The placement of hatchery mitigation facilities downstream of Bonneville Dam was done to maximize harvest opportunities and avoid fish loss caused by the operation of main-stem Columbia River dams.

LOWER SNAKE RIVER COMPENSATION PLAN

After passage of the HCNRA in 1975 and the realization by biologists that anadromous fish would continue to migrate into the Snake River Basin, fishery agencies developed hatchery plans for mitigation of losses of fish resulting from the construction of the four lower Snake River dams. Hatchery mitigation for the lower Snake River dam, unlike mitigation for main-stem Columbia River dams, provided for hatchery fish mitigation “In-Kind and In-Place” under a program called the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP). Congress authorized the LSRCP in 1976. Anadromous fish produced for the LSRCP are not released directly below the HCC, but over 50% of the anadromous fish run in the Snake River basin are produced in LSRCP facilities.

SETTLEMENT AGREEMENT BETWEEN FISHERY AGENCIES AND IPC

In addition to passage of the HCNRA and authorization of the LSRCP, fishery agencies sought additional hatchery fish compensation, fish facilities, and improved flows for fish production from IPC for fish losses not mitigated in the Salmon River. A Settlement Agreement through Court Action was reached between the fishery agencies and IPC in 1980, and IPC now funds the rearing of additional hatchery fish for release below Hells Canyon Dam. Adult broodstock are collected at Hells Canyon Dam to satisfy increased hatchery production provided in the Settlement Agreement program.

ANADROMOUS FISH RUNS IN THE SNAKE RIVER

Anadromous fish continue to migrate to the Snake River Basin, and record runs of anadromous fish have been counted at lower Snake River dams in recent years (Figure 1). Approximately 450,000 salmon and steelhead migrated past Ice Harbor Dam in 2001. Actions by Congress, orders by courts, changes and reductions in harvest allocations, increased hatchery production, protection and enhancement of fish habitat, and improved passage and survival at downstream dams are some, but not all, factors that have helped improve fish runs in the Snake River since 1964 when fish biologist abandoned attempts to pass fish at Brownlee. The re-introduction and production of anadromous fish above man-made barriers, including the HCC, will further improve fish runs in the Columbia River Basin.

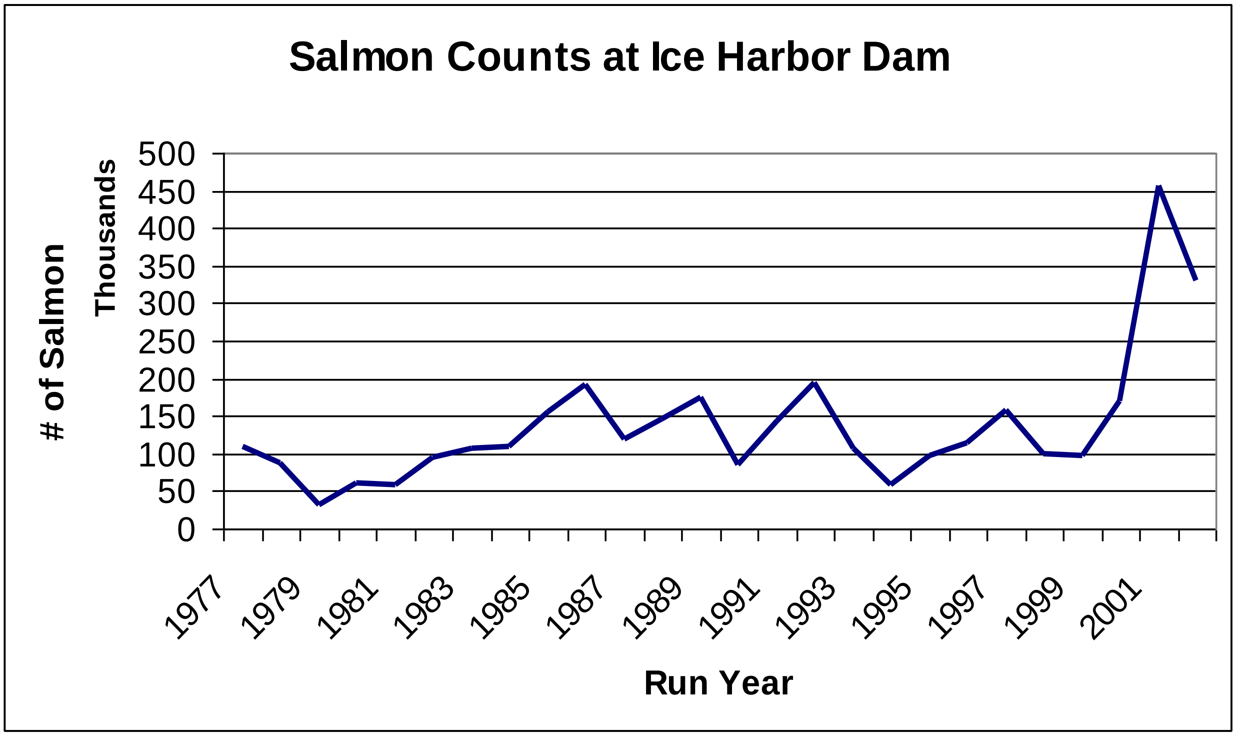


Figure 1. Salmon and steelhead escapement, Lower Snake River at Ice Harbor Dam, 1977 – 2002.

ADEQUACY OF PASSAGE STUDIES

BACKGROUND INFORMATION

Pre-1860, about 1 to 1.7 million adult Pacific salmon and steelhead passed the area now blocked by the construction of the HCC. Private interests, promoting economic gains, were responsible for the displacement and elimination of public owned anadromous fish. The construction of the HCC was one of several private enterprises displacing public fish populations. In recent years, public interest has placed emphasis on restoring, protecting, and conserving public resources including fish.

Once the license was issue for the construction of the HCC, only about 33 months were available to plan and construct fish passage facilities for the HCC. Despite the short period of time allocated for planning, adults were passed successfully around HCC using a trap-and-haul program. However, a barrier net and gulper system, designed to collect downstream migrants in Brownlee reservoir, failed. The inability of fish to find their way through the Brownlee reservoir and mechanical problems associated with the nets and gulper led to an FPC order to abandon passage efforts at HCC and develop a hatchery mitigation program. Contrary to popular belief, I believe early attempts to pass fish at the HCC were "honest", but I do believe that there was a lack of commitment in adjusting the program or "using adaptive management" strategies to make the passage program work.

IPC has identified three primary concerns in their license application which will prevent the successful re-introduction of anadromous fish above the HCC;

(1) lack of fish passage at the HCC,
(2) poor survival of fish through the lower Snake River, and Columbia River, and
(3) tributary dams and over-all poor condition of fish habitat upstream of HCC.

Of the three concerns, IPC can provide fish passage at their dams which include the HCC. Survival of fish in the migration corridor and condition of habitat upstream of the HCC are not the responsibilities of IPC.

Many actions are being taking to improve survival downstream of HCC, and these actions can be sorted under the 4-Hs; Habitat, Hydropower, Hatcheries, and Harvest. It is beyond the scope of this report to identify on-going activities and their impact on the survival of fish downstream of the HCC.

I agree that actions are needed to improve habitat conditions, including passage in tributaries, upstream of the HCC. The re-introduction of anadromous fish and the connection of resident fish above the HCC will be a major action that could be used to encourage and force habitat improvement projects upstream of the HCC.

PASSAGE SCENARIOS

IPC developed 15 passage scenarios (Appendix A. IPC concluded that none of the scenarios proposed allows for any of the species in any of the production areas to return at sufficient levels to maintain populations above HCC. IPC goes on to state that "limited resources for production of fish should be prioritized to the benefit of ecosystem recovery and the protection of the remaining populations before re-introduction be undertaken above the HCC". The option to pass or not pass fish or the determination on how to use resources should not be a decision made, or even recommended, by IPC.

IPC used models to assess the success of their passage scenarios. Models are tools designed to predict risks and results, but models, based on their design and content, tend to reflect desired results. I believe IPC used subjective information, but I do not recommend a challenge of model information. A challenge of the model gives credibility to the model. The better tactic is to provide alternatives to the model, and the best tactic is to use fish, whether it be adult spawning, juvenile production and/or juvenile and adult passage, to validate model information.

<u>Fish Passage Alternatives</u>

IPC Alternatives

Sverdrup Corporation (Chapter 9) provides:

(1) an overview of fish passage options that might be applicable to the HCC (Appendix B),
(2) an order-of-magnitude cost estimate for each option, and
(3) a qualitative assessment of each option's potential for success if implemented at HCC.

Sverdrup Corporation did not examine all of the possible passage options nor did the considered life history characteristics and needs of fish to be passed. None of the alternatives are new or innovative.

The preferred alternative developed by Sverdrup Corporation for downstream passage are diversion screens at both Oxbow and Hells Canyon dams and three floating gulpers with nets at the upper end of Brownlee Reservoir and one gulper with nets at the mouth of the Powder River. The preferred upstream passage alternative is fish traps or fish ladders for all three HCC dams. Trap-and-haul programs would be initiated.

Assessment of problems associated with passage facilities will involve developing a clear definition of the problem in terms of ecosystem function, rather than in terms of preconceived management solutions. A technical team utilizing a structured decision-making process should accomplish problem assessment for the feasibility of fish passage at the HCC

Additional Information Needs: Field tests are needed to validate passage alternatives and model estimates developed by IPC.

Innovative Alternatives

Portland General Electric (PGE) initiated innovative tests designed to learn how to pass fish at the Pelton/Round Butte Complex on the Deschutes during the re-licensing process. It seems prudent that IPC should have also initiated field studies to explore options for fish passage during the re-licensing process. However, IPC did not explore innovative alternatives for fish passage, but rather, they chose to develop models depicting that passage at the HCC is a futile effort. There is no question that the challenge of providing fish passage at HCC is significant, but IPC should be working on the problem.

Additional Information Needs: A panel of fish passage experts should be convened to develop new and innovative fish passage alternatives

Additional Information Needs: A study is needed to develop innovative and alternative passage options at the HCC.

Passage Option

I have developed an option for passage of fish at the HCC. This option is based on collection of juveniles in the tributaries and adult at Hells Canyon Dam. Trap and haul equipment is proposed for passing fish around reservoirs and dams (Table 1). I would use spring Chinook from Rapid River as the stock of choice for the pilot test program.

Table 1. Another approach to re-introducing salmon above the Hells Canyon Complex.

Phase	Description	Product
1	Pilot study strategic development	Initial assessment of study feasibility
2	Pilot study implementation plan development	Final assessment of study feasibility
3	Pilot study implementation	Demonstrated re-introduction of spring Chinook salmon into pilot study area
4	Reconnaissance regarding re-Introduction program alternatives	Evaluation of alternative program options
5	Re-introduction program strategic Plan development	Initial assessment of costs and benefit Identification of priorities
6	Re-introduction program Implementation plan development	Refined cost assessment and schedule
7	Re-introduction program Implementation	Re-introduction of anadromous fishes into all appropriate areas above the Hells Canyon complex.

Project Outline

Objective 1. Examine natural production potential for spring Chinook salmon and select a stream for use as a pilot study area.

I would select Eagle Creek, a tributary of the Powder River located in Oregon, as the pilot study stream. Historically, Eagle Creek was a highly productive spring Chinook salmon stream. Eagle Creek appears to be in fairly good condition for the production of juvenile chinook. In addition, this stream's relatively small size would make the logistics of implementing a trap and haul program more manageable than implementation on a larger stream.

Task 1.1 Determine the historic distribution and habitat requirements for spring Chinook salmon in the area above the Hells Canyon complex through a review of literature regarding historic fish production in that area.

IPC has provided this information.

Task 1.2 Determine which areas are presently suitable for natural production of spring Chinook salmon by means of field surveys.

Clearly, conditions change over time. Areas which were formerly productive for spring Chinook salmon may no longer be usable. A general reconnaissance of potential study areas above the Hells Canyon complex will be conducted to gather information relative to determining the best site for the pilot study.

Activity 1.2.1 Fisheries agencies will obtain required permits, if necessary.

Activity 1.2.2 Contact private landowners and obtain permission for survey activities.

Activity 1.2.3 Conduct habitat surveys following, in general, procedures outlined by Hankin and Reeves (1988).

Activity 1.2.4 Summarize results of survey.

Task. 1.3 Select a pilot study stream for use in testing the hypothesis that spring Chinook salmon can be re-introduced and sustained through natural production

Activity 1.3.1 Formulate criteria for evaluating alternative potential pilot study area. Consider habitat quantity and quality, and consider logistics associated with project implementation and evaluation (e.g. ease of access and availability of sites for production and evaluation facilities.

Activity 1.3.2 Evaluate results from Task 1.2 against criteria developed under Activity 1.3.1 and formulate recommendations.

Activity 1.3.3 Work with appropriate agencies and organization to reach agreement on pilot study area selection.

Objective 2. Determine an appropriate donor stock of spring Chinook salmon for use in the pilot study and describe expected production dynamics associated with its use.

IPC has conducted an assessment for the appropriate donor stock above the HCC, and they conclude that the Rapid River stock is the best donor stock.

Task 2.1 Examine alternative sources of spring Chinook salmon stocks, which could be used considering stock availability, behavioral attributes, and downstream genetic risks associated with use of each available stock. Formulate stock use recommendations.

Task 2.2 Describe the expected production dynamics associated with use of the preferred stock identified in Task 2.1.

Activity 2.2.1 Estimate number of spawners needed for the pilot study based upon habitat quantity and quality as determined under Task 1.2.

Activity 2.2.2 Estimate survival rates associated with use of the preferred stock based upon adult return trends, harvest rates, adult and juvenile passage at dams, and fish health and handling characteristics.

Activity 2.2.3 Outline alternative scenarios that should be evaluated under the pilot re-introduction study for collecting, holding and acclimating, handling and marking, transporting, and releasing juvenile and adult fish.

Activity 2.2.3 Estimate expected productivity, which may be achievable, based upon results from Activities 2.2.1 through 2.2.3.

Task 2.3 Describe potential impacts of interactions with resident fishes, which may result from re-introduction of spring Chinook salmon into the pilot, study area.

Objective 3. Draft a strategic plan, develop an associated implementation planning schedule, and estimate costs for detailed planning of the pilot re-introduction study.

Task 3.1 Draft a strategic plan based on results of Objectives 1 and 2. The strategic plan will outline the steps necessary to develop a detailed pilot study implementation plan. It will provide information necessary to assess whether additional planning for a pilot re-introduction study is feasible. The strategic plan will also include the estimated schedules and budgets described under Tasks 3.2 and 3.3.

Task 3.2 Estimate the schedule for developing a detailed implementation plan based on consideration of schedules for identification of specific facility needs and development of associated conceptual designs, for development of a monitoring and evaluation program, and for conducting required NEPA investigations.

Task 3.3 Estimate costs associated with developing a detailed implementation plan for the pilot re-introduction study.

Additional Information Needs: A pilot project is needed to determine if passage is feasible and will produce satisfactory smolt-to-adult survival rates.

Monitoring and Evaluation

There are different methods to monitor and evaluate passage programs. I suggest that an adaptive management and decision process be adopted to assess field tests. Adaptive management is a formal, systematic, and rigorous approach to learning from the outcomes of actions, accommodating change, and improving management. It involves synthesizing existing knowledge, exploring alternative actions, and making explicit forecasts about their outcomes. Management actions and monitoring programs are carefully designed to generate reliable feedback and clarify the reasons underlying outcomes. Actions and objectives are adjusted based on this feedback and improved understanding. In addition, decisions, actions, and outcomes are carefully documented and communicated to others, so that knowledge gained through experience is passed on, rather than being lost when individuals move or leave the project.

Typically, the implementation of new or reactivated fish passage facilities include the following sequence of events:

- Development of alternatives (IPC has developed alternatives, and they have chosen a preferred alternative. I recommend a review of the alternatives).
- Study of potential success and drawbacks using the appropriate methods and tools.
- Review of alternatives and probable success by a Technical review team.
- Development of a physical model, if needed.
- Development of plans and drawings
- Review of drawing by appropriate agency engineers and the Technical review team.
- Approval from FERC, as appropriate, to construct the new passage facilities.
- Prototype construction and testing, if appropriate.
- Final construction
- Testing and adjusting, if needed
- Evaluation and development of final operation criteria

Performance measures for passage include (1) ecosystem integrity and (2) setting numerical production goals, and (3) developing facility effectiveness goals.

Ecosystem integrity should have three objectives (1) connectivity, (2) biodiversity, and (3) natural production.

- Connectivity: Human alterations to the environment do not impede all movements by fish for the need for fish to connect. Fish should be provided means to migrate upstream or downstream, where and when they attempt to do so. The measurable for this goal is the number of links between distinct habitat areas and potential native fish populations and life history types.
- Biodiversity: The maximum number of native trophic levels and interactions among levels should be achieved. A full complement of native fish species should be developed. All native functional feeding groups should be present. The measurables for this goal are: (1) the proportion of trophic levels represented by native species; (2) the number of trophic levels times the number of native species at each trophic level; and (3) the number of functional feeding groups.
- Natural Production: Re-introduced and resident native fish populations will be fluctuating within natural, sustainable ranges of variability. The maximum number of life histories will be sustained for re-introduced and resident native fish. The measurables for this goal are: (1) population sizes of spawners, juveniles and smolts, and number of life histories: and (2) the number of recruits per spawner, over time.

Numerical production goals should be set for each major life stages of each species of fish. There will be a number of uncertainties and risks leading to the potential success of the passage program. These can be assessed using stochastic, age-structured, life history models prior to each change in the program. The model is designed as a tool to help people reach agreement of the relative importance of risks, possible impact of management activities, and prioritization of research and habitat improvement efforts.

Recognizing that there are a number of factors outside the control of the fish passage effort, it is possible to set target goals for passage facilities at the HCC based on what has been accomplished at other fish passage and handling facilities and actions that have been taken to improve passage at the HCC.

Additional Information Needs: There is need for a detailed monitoring and evaluation program using an adaptive management plan to measure the success of the passage program.

UPSTREAM PRODUCTION POTENTIAL

Anadromous Smolt Production Potential

Main-stem Fall Chinook Smolt Production Potential

There are three reaches of the main-stem Snake River upstream of Brownlee Reservoir, which have potential to produce fall Chinook salmon if passage were provided at the HCC. The reaches are Brownlee to Swan Falls Dam, Swan Falls Dam to C.J. Strike Dam, and C.J. Strike Dam to Bliss Dam. There does not appear to be fall Chinook production areas above Bliss Dam. Figure 2 shows relative fall Chinook smolt production potential in five reaches of the main-stem Snake River upstream of Brownlee.

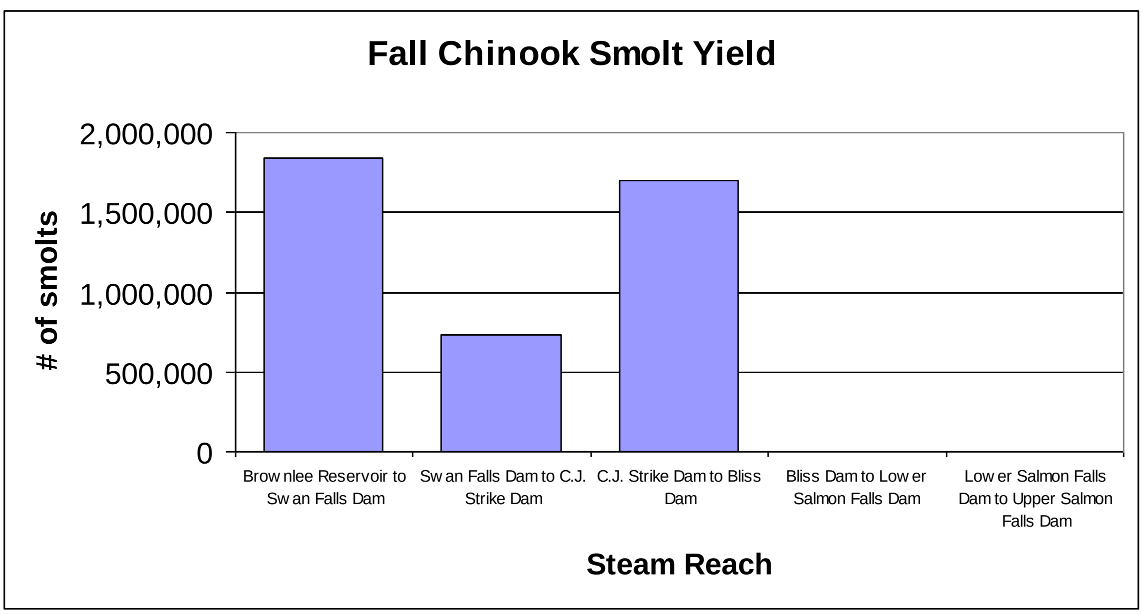
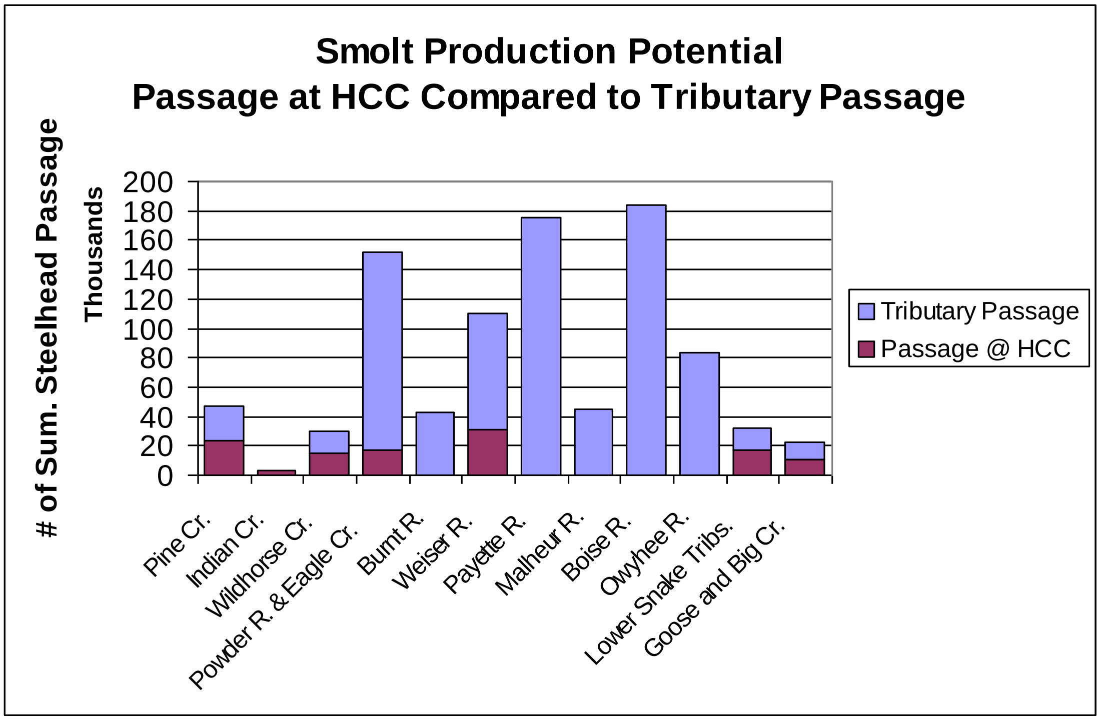


Figure 2. Fall Chinook smolt production potential in five reaches of the main-stem Snake River upstream of Brownlee.

Petrosky (1990) believes that the natural production potential for fall Chinook in the main-stem from Homedale to Swan Falls Dam is similar to what existed before construction of the HCC. Some 17,800 adults could spawn upstream of Givens Hot Springs. Additional passage at Swan Falls Dam would permit fall Chinook to spawn in the main-stem Snake River up to C.J. Strike Dam. The reach from C.J. Strike dam to Bliss dam has two distinct habitat types with habitat characterized by relatively low gradient and braided channel and the second type with higher gradient and fast, deep turbulent runs and rapids and small stretches of spawning habitat. The reach above Bliss dam has high gradients with many rapids and few main-stem gravel bars. The reach from lower Salmon Falls Dam to Upper Salmon Falls Dam is impounded and has no production potential for fall Chinook salmon. The area upstream of Upper Salmon Falls Dam is plagued with low flows caused by irrigation withdrawals, high nutrient loads, and heavy aquatic macrophyte growth.

Tributary Spring/Summer Chinook and Steelhead Smolt Production Potential

Habitat remaining in tributaries upstream of the HCC is predominately upstream of tributary dams. Tributary dams currently block approximately 68 to 74% of the areas that could be used by anadromous fish (Figure 3).



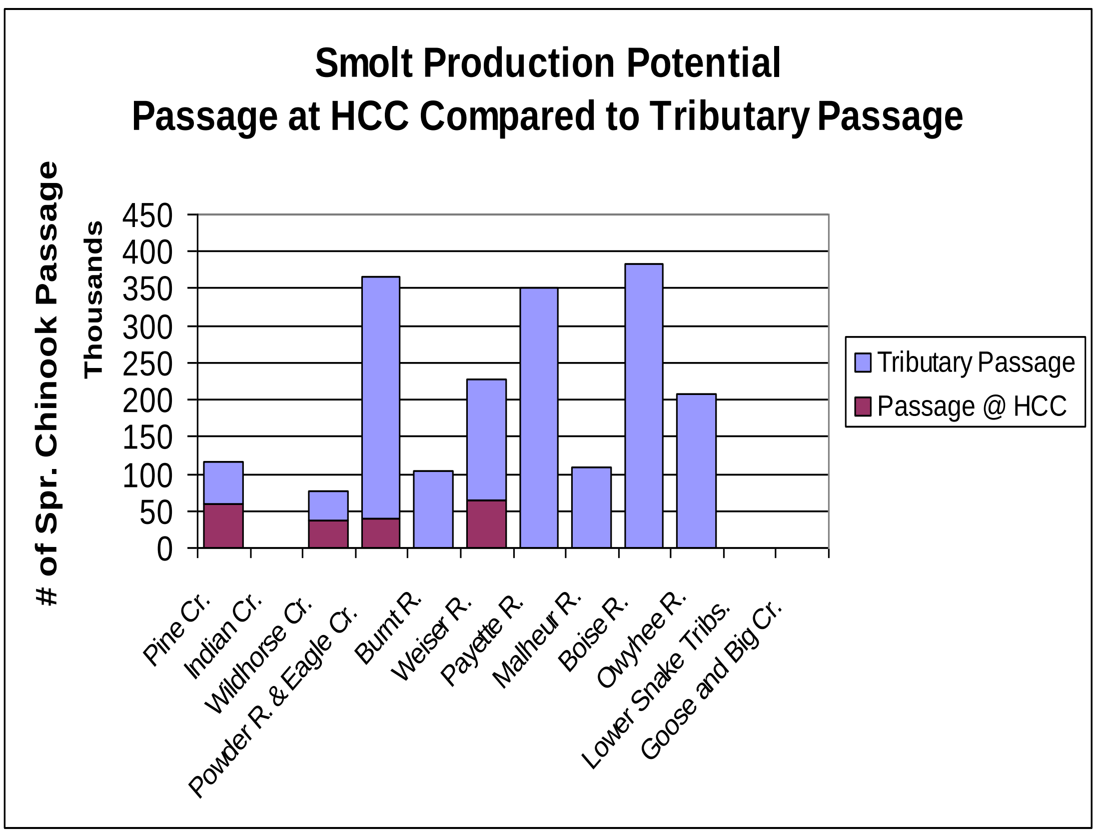


Figure 3. Salmon smolt production potential based on models produced by IPC with and without tributary passage, upstream of the HCC

IPC developed models to project smolt yield for three options:

(1) passage at all IPC's main stem Snake River dams,
(2) passage at all IPC dams as well as at all other manmade obstacles, and
(3) passage at IPC dams with no passage at other manmade dams.

With passage at all IPC dams, the greatest potential for anadromous fish production is the Bruneau River. However, if passage were provided at the HCC and at tributary dams between HCC and Swan Fall Dam, the Payette and Boise rivers appear to have the greatest smolt production potential.

The Payette River, in addition to having production potential for spring/summer Chinook and steelhead, could provide a migratory corridor for sockeye salmon to Big Payette Lake where these highly prized fish were once common. Chapman and Chandler (2001) estimate that Big Payette Lake could produce approximately 48,000 sockeye smolts.

It is my professional judgment that the smolt production model used by IPC tends to over-estimate smolt production potential in poor habitat and under-estimate production in good habitat. Based on professional judgment, Pine Creek, Eagle Creek, and the Weiser River have the highest smolt production potential if passage were provided only at HCC. The Payette River has the greatest smolt production potential if smolt passage were provided at HCC and in all tributaries of the Payette River to Big Payette Lake.

Additional Information Needs: Field tests, using fish, are needed to validate model results.

Additional Information Needs: Considering smolt-to-adult survival and adult escapement into in the Snake River subbasin in 2001 and 2002, would any of the scenarios developed by IPC produce sustained runs of salmon in the Payette River if passage were provided at the HCC and all dams in the Payette subbasin, irrigation diversions were screened, and riparian habitat were improved in the Payette River?

Quantification of Habitat for Anadromous Fish above HCC

Habitat quantity and quality available for anadromous fish above the HCC is a critical uncertainty in the evaluation of the feasibility of fish passage. IPC used a very crude method to estimate smolt production potential. We do not argue with their findings, but we know that better methods are available to estimate smolt production potential if habitat quantity and quality information is available. There are critical gaps in the habitat quantity and quality information.

Additional Information Needs: A study is needed to measure the quantity and quality of habitat for fish production upstream of the HCC.

Additional Information Needs: Habitat surveys are needed to assess fish production potential in test areas.

DOWNSTREAM SURVIVAL

Survival at Dams

IPC provides information (Chapter 11) to show that any passage program at HCC is doomed because of poor smolt-to-adult survival (SAR's) downstream of the HCC. We do not believe IPC considered improved passage at downstream dams.

We do not, in this assessment, support or reject the existence of main-stem dams downstream of the HCC, but we present information to show that SARs have improved at main stem dams. Appendix D of the Biological Opinion (BiOp) for operation of main-stem hydroelectric projects describes facilities and their operation to protect listed species of fish. This information is available at (http://www.nwr.noaa.gov/1hydrop/hydroweb/docs/Final/2000Biop.html).

SAR's at main-stem dams have improved. Figure 4 depicts in-river survival developed by the NMFS 1973 through 2002 (graph obtained from J. McKern, retired USACE biologist, Walla Walla, Washington).

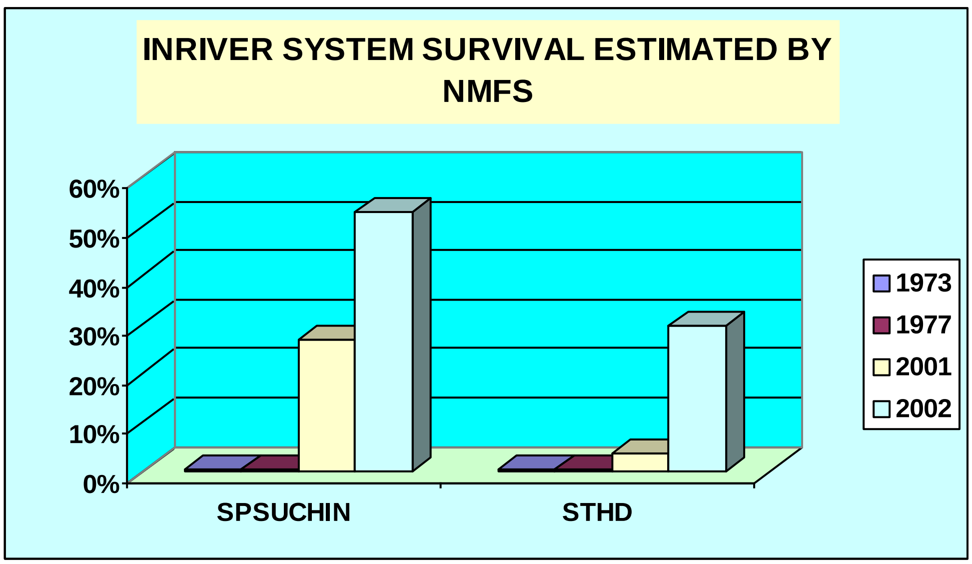


Figure 4. In-river survival developed by the NMFS 1973 through 2002.

The Raised Spillway Weir (RSW) is the latest, innovative, technology being developed by the U.S. Army Corps of Engineers (USACE) to improve survival of downstream migrant fish around main-stem dams. The RSW is being tested at Lower Granite Dam. The value of the RSW in passing juvenile fish and improving SAR's was not considered by IPC because adults survival has not been determined when the IPC application was prepared.

The function of the RSW is to raise the crest of the spillway bay to allow surface bypass of juvenile fish. The flow is 10 to 15 feet deep over the RSW. The purpose for raising the crest of the spillway is to remove the 50 or so feet of head (Figure 5). In a normal spillway bay, the water jets out from under the spillway gate at about 60 miles per hour with an instantaneous release of about two atmospheres of pressure. In the RSW, the spillway gate is lifted clear of the water so the flow over the RSW is completely unpressurized.

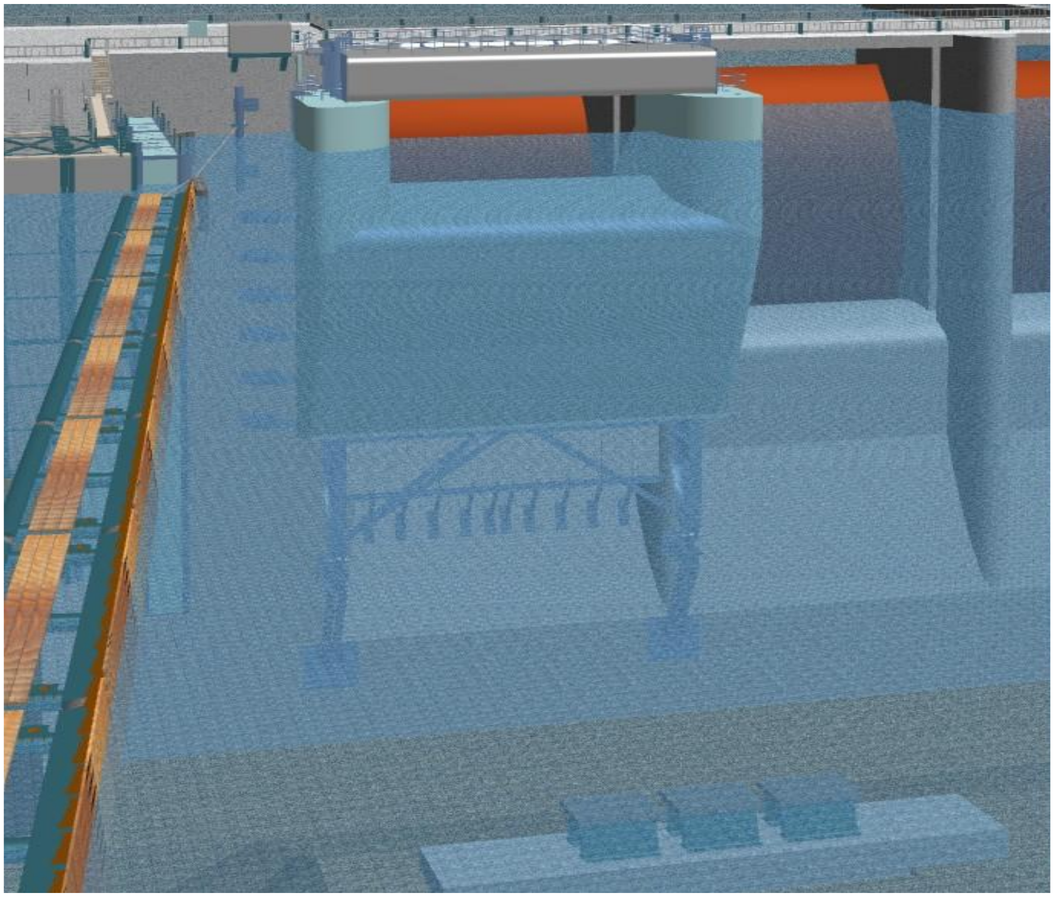


Figure 5. Raised Spillway Weir (RSW) is a new devise designed to provide safe bypass for fish around main-stem dams.

The behavioral guidance structure (BGS) and surface bypass collector (SBC), and to a lesser extent, the trash shear boom, guide fish from the powerhouse approach to the RSW (Figure 6). The BGS and SBC are being used to block fish from entering the powerhouse intakes and to shunt them to the RSW for dam bypass. The BGS showed over 80% guidance of fish away from the powerhouse. Preliminary results show that fish are being not only guided to the RSW, but attracted to it by the flow net in the reservoir caused by the surface spill over the RSW. In comparisons with the RSW open and closed, the fish move over the RSW in half the time it takes them to pass the normal spillway gates. In 2002, the RSW guided up to 7 times as many fish per unit of spill compared to a standard spill bay. Fish tended to move over the RSW more readily, and when the RSW was in operation, the majority of fish passing the dam chose that route.

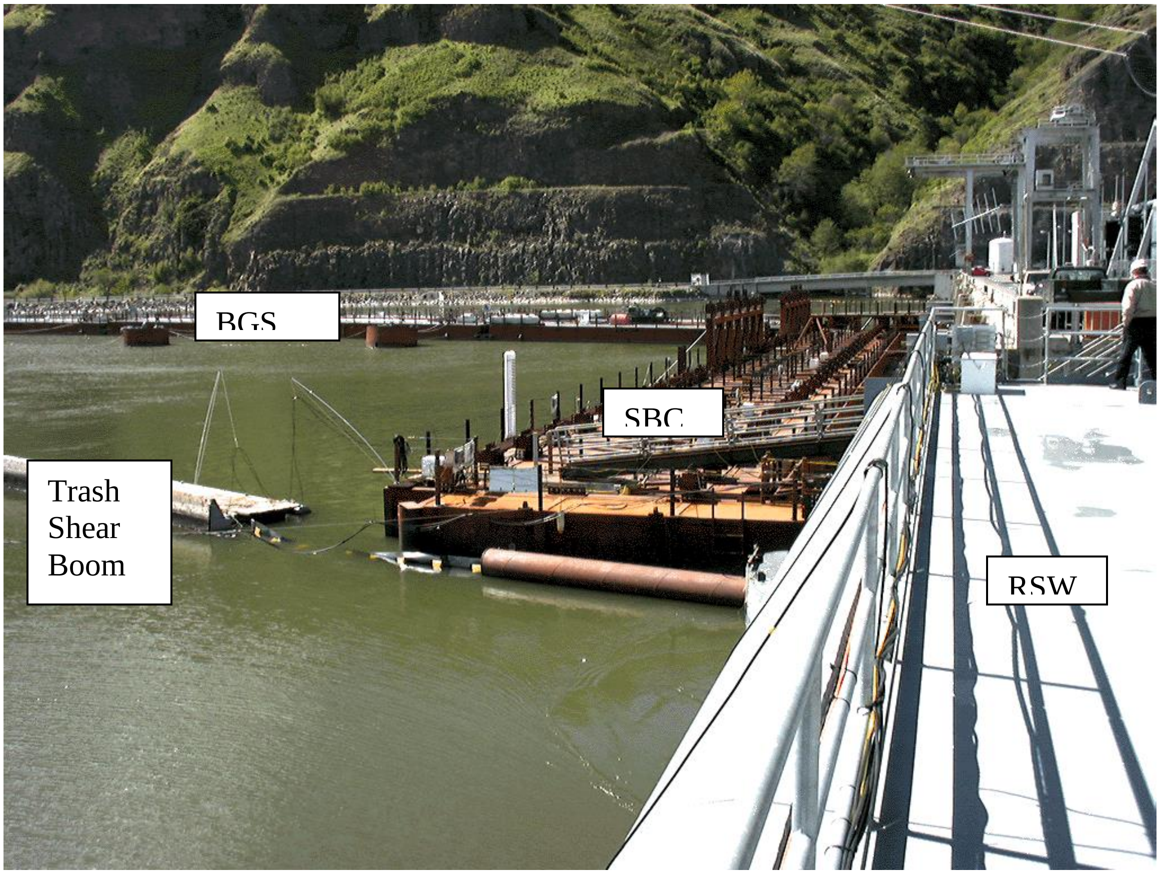


Figure 6. Raised spillway weir (RSW) with behavioral guidance structure (BGS) and surface bypass collector (SBC), and trash shear boom used to guide fish to spillway, Lower Granite Dam

Additional Information Needs: An independent study is needed to assess the value of main-stem passage facilities and how these facilities might affect SARs at the HCC.

Mixed-Stock Fisheries Impacts

IPC briefly notes adverse impacts of mixed-stock fisheries on the success to a program to re-introduce anadromous fish above the HCC. In recent years, harvest managers have minimized kill of protected fish, but kill fisheries persist for anadromous fish. If wild/natural stocks in the Snake River basin, including stocks upstream of the HCC, are to sustain themselves, harvest managers must devise ways to release alive most all upriver wild/natural stocks. There are techniques to protect stocks of fish in harvest allocations, and all these techniques need to be evaluated. A revision of the Columbia River Fish Management Plan (U.S. vs. Oregon) will be needed to provide escapement of anadromous fish above the HCC.

Additional Information Needs: An independent study is needed to determine ways to manage mixed-stock fisheries to protect stocks of fish allocated for re-introduction and natural production above the HCC.

RELATIONSHIP BETWEEN IPC HATCHERY AND PASSAGE PROGRAMS

IPC did not identify the need to change their hatchery program to accommodate fish passage at the HCC. The IPC hatchery program should be an integral part of the passage program at HCC. Presently, the IPC hatchery program is designed to provide fish for harvest augmentation and hatchery broodstock. Changes will be required in the hatchery programs to accommodate passage and supplementation activities. NOAA Fisheries have developed criteria for conservation hatcheries, and these criteria should be identified and used for the IPC hatchery program. It is beyond the scope of this report to define activities involved in a Conservation Hatchery Program, but the changes will be substantial.

During the initial phase of the field studies to pass fish at the HCC, adults should be collected, held, spawned and sampled for disease at hatcheries. The testing for pathogens will be a major activity (Chapter 10). I anticipate that fish production during the first 10 to 12 years of the initial passage program will remain essentially at current levels. As the passage program develops, the hatchery program could be phased down, when appropriate, to complement the success of the passage effort and numbers of naturally spawned salmon.

Additional Information Needs: Identify actions needed to change IPC hatcheries from harvest augmentation to conservation hatcheries.

FISH STOCKS

Suitable and Available Stocks

IPC identified anadromous fish stocks suitable and availably that could be used for reintroductions above HCC. These stocks include those with characteristics close to the original stocks above the HCC. The candidates are steelhead from Oxbow Hatchery, spring Chinook from Rapid River Hatchery, and fall Chinook from Lyons Ferry Hatchery. I agree with IPC that sockeye salmon stocks suitable and available for Payette Lake would require further research. I agree with the stock assessment provided by IPC, but I am concerned about the use of "listed" stocks for re-introduction purposes. IPC should have initiated a formal request for use of listed stock with appropriate federal agencies during the re-licensing process.

Stocks identified as suitable and available for re-introduction above the HCC include Snake River summer steelhead and fall Chinook; stock listed under ESA. IPC or a fish agency will need to initiate a request for re-introduction of listed species. I suggest that request be based on experimental population designations. The purpose for establishing an experimental population is to further the conservation of the species through the ESA process.

Use of Listed Species

The designation of a population as experimental increases flexibility and discretion in managing reintroduced listed species. The federal agency responsible for the listed species must establish an experimental population by regulation, and the effects of such a regulation must be evaluated pursuant to the National Environmental Policy Act.

The criteria for a designation fish as experimental populations are:

1. Section 10(j)(2) of the ESA requires that an experimental population can only be designated if it "… is wholly separate geographically from non-experimental populations of the same species."

2. Section 10(j)(2)(A) states that the Secretary can designate an experimental population "… outside the current range of such species if the Secretary determines that such a release will further the conservation of such species."

3. Section 10(j)(2)(C)(i) allows the Secretary to treat each member of an experimental population "… as a species proposed to be listed under section 4 if the Secretary has determined by regulation that the experimental population is "… not essential to the continued existence of a species…"

4. Section 10(j)(2)(C)(ii) requires that "critical habitat shall not be designated under this Act for any experimental population…"

Federal agencies must treat experimental populations "… as if they are species proposed for listing." In such cases:

> "Section 7 provisions for Federal agency coordination have limited application to nonessential experimental populations. The two provisions that apply are: (1) Section 7(a)(1), which requires all Federal agencies to use their authority to conserve listed species; and (2) section 7(a)(4), which requires other Federal agencies to confer with the responsible agency on actions that are likely to jeopardize the continued existence of a proposed species throughout its range. Section 7 of the Act does not affect activities undertaken on private lands unless they are authorized, funded, or carried out by a Federal agency."

The "take" prohibitions applied in an Experimental Population Area can be designated in the specific regulation to accomplish the purposes for the specie's reintroduction, the needed management flexibility and discretion, and to achieve local support for the reintroduction.

Re-introducing listed summer steelhead and fall chinook into the Snake River Basin above HCC could further the conservation of the species by 1) increasing the abundance of listed species, 2) increasing the population structure of the listed species, and 3) improving the genetic integrity of the listed species.

The experimental population could be established by the NMFS who would need to informally review the policy and scientific issues applicable to such a designation pursuant to its ESA, tribal trust, and sustainable fisheries mandates. A NMFS Recovery Plan should not be necessary to proceed with a reintroduction. Upon a positive conclusion, a detailed Hatchery & Genetic Management Plan (HGMP) for a reintroduction would need to be prepared by the applicant. The HGMP would provide the plan for the reintroduction. Upon a positive, informal review of the

HGMP, NMFS would proceed to draft a section 10(j) regulation and then a final regulation. NEPA coverage would be required on the final regulation.

Of interest, listed summer steelhead and unlisted spring Chinook have been out-plated in the Hells Canyon Reservoir and unlisted spring Chinook have been out-planted in the Boise River for harvest augmentation purposes. It is unclear to me how the out-planting of listed steelhead for harvest augmentation is allowed under the ESA.

Additional Information Needs: While not the responsibility of IPC, what stocks of sockeye are suitable and available for reintroduction of sockeye into Payette Lake?

Additional Information Needs: What actions must be taken by IPC and fishery agencies to gain authorization to re-introduce listed species of fish above the HCC? What role will IPC play in gaining authorization to pass listed species at the HCC?

Additional Information Needs: What authorization allows the out-planting of listed fish for harvest augmentation in the HCC.

PRESENCE OF COHO SALMON

IPC argues that coho salmon were not historically present in the Snake River subbasin above the HCC even though coho salmon were captured during passage studies in the late 1950s. An analysis of habitat upstream of the HCC will reveal the presence or absence of suitable habitat for coho salmon. I recommend that IPC fund physical and biological surveys for all endemic and potential endemic species of fish above the HCC.

Additional Information Needs: Physical and biological surveys are needed for all water upstream of the HCC to determine the potential to re-introduce all species of fish extirpated, including species of fish which may or may not have been present at the time of construction of the HCC.

CONNECTIVITY OF BULL TROUT, WHITE STURGEON, AND OTHER ENDEMIC SPECIES OF FISH

Bull Trout

IPC notes the presents of listed bull trout at, above and below the HCC, but no mention or recommendation is made to connect these populations. I recommend that passage facilities be designed to capture bull trout and other endemic species of fish, and the populations be connected if disease clearance allows the passage of these fish.

Additional Information Needs: A study is needed to determine how to connect and pass bull trout at the HCC?

White Sturgeon

IPC notes the presence of white sturgeon in the project area at the time the HCC was constructed. IPC does not, however, provide information describing how they would connect or provide passage for white sturgeon.

Additional Information Needs: A study is needed to determine how to connect white sturgeon populations and pass white sturgeon at the HCC.

Additional Information Needs: A study is needed to determine which life history characteristics were likely eliminated as a result of the construction of the HCC and the failure to pass white sturgeon.

Endemic Species of Fish

Several endemic species of fish including redband trout, white fish, cottids, and sculpin were present at the time of the construction of the HCC. The populations of these fish were affected and there life history patterns disconnected when the HCC was constructed.

Additional Information Needs: IPC should conduct a viability analysis of endemic species of fish affected by the construction and operation of the HCC.

PATHOGEN AND INTRA-SPECIFIC INTERACTION CONCERNS

IPC identifies the potential for introducing pathogens and creating intra-specific competition to resident fish if a passage program is implemented at the HCC. We would expect IPC to conduct a risk assessment based on field trials for their license application, but they chose to not conduct the risk assessment.

Pathogens

Little is known about the distribution of pathogens within natural fish populations above HCC, but hatchery resident fish and salmon out-plants as described above have been released above HCC. The release of hatchery resident fish and salmon out-plants has the potential to spread pathogens and cause intra-specific competition. Re-introduction of extirpated salmon does not necessarily imply that an adverse effect will occur. It is important, I believe, to understand that resident populations of fish above the HCC evolved in the presence of anadromous fish, and we anticipate that resident fish will benefit with the re-introductions of anadromous fish. Certainly, steelhead provides additional life history patterns for resident redbands, which provide additional survival advantages.

A pathogen risk assessment conducted by fish pathologists would be required for each area in which re-introduction is pursued. The best method to assess competition is to monitor fish populations before and after re-introductions.

Additional Information Needs: A study is needed to assess risks associated with potential pathogen transfer with fish passage at the HCC.

Intra-specific Interaction

IPC notes that intra-specific interactions, which could be detrimental to endemic populations of fish, might occur if salmon and lamprey were re-introduced above the HCC. Endemic species of fish evolved in the presence of anadromous forms of fish, and more likely, endemic species of fish suffered from the loss of intra-specific interactions/

Additional Information Needs: A study is needed to assess risks associated with potential intra/inter-specific interactions with fish passage at the HCC.

PACIFIC LAMPREY PASSAGE

IPC notes the presence of Pacific lamprey above the HCC at time of construction of the HCC. Information regarding run size, distribution in the basin, genetics, and disease for Pacific lamprey in the Snake River Basin above the HCC is scarce. However, IPC does not provide means for passage of Pacific lamprey. Passage scenarios developed for the HCC should include options for Pacific lamprey passage.

Since Pacific lamprey have been extirpated above the HCC, stock selection could be critical to their successful re-introduction. Stock selection should be based upon similarity of basin type, proximity of basins, exhibition of an inland life history pattern, its ability to adapt to local environmental conditions, and genetic relatedness to indigenous stocks.

The literature is vague on Pacific lamprey homing. It is possible that juvenile Pacific lamprey (ammocoetes) could be collected from a nearby basin for reintroduction above the HCC. I do not recommend a timeline for the reintroduction of lamprey above the HCC because there are many questions to answer including, but not limited to, an examination for disease occurrence and clearance prior to their passage.

Additional Information Needs: A study is needed to develop plans for the reintroduction and passage of Pacific lamprey upstream at the HCC.

Additional Information Needs: A study is needed to analyze and recommend stocks of Pacific lamprey for re-introduction above the HCC.

MEASURE OF SUCCESS

I have given considerable thought to a method(s) to measure success of a fish passage program at the HCC. Measuring success is important, but I am not sure how Idaho Rivers United and American River will measure success. This said, IPC will oppose fish passage at the HCC, and they will ask FERC for the authority to continue hatchery mitigation activities. FERC must determine that IPC should fund passage programs and associated studies. Fishery agencies and tribes, with guidance, should implement the passage program and conduct the studies. So the first measure of success for Idaho Rivers United and American Rivers may be the requirement that IPC fund activities associated with fish passage programs at the HCC. The second measure of success could be implementation of a pilot passage program and associated studies. The third measure of success could be re-introduction and connection of fishes into all appropriate areas above the HCC.

Additional Information Needs: An independent study is needed to develop ways to measure the success of the fish passage program at the HCC.

ADDITIONAL INFORMATION REQUESTS

ANADROMOUS FISH PASSAGE AT THE HCC

Background Information

Pre-1860, about 1 to 1.7 million adult Pacific salmon and steelhead passed the area now blocked by the construction and operation criteria of the HCC. In a speech at Ice Harbor Dam on the lower Snake River August 22, 2003 President Bush commented, “We can have good, clean hydro-electric power and salmon restoration going on at the same time.” Salmon restoration includes passage of fish at the HCC. The challenge is to develop methods to safely pass anadromous salmon, native resident fish, white sturgeon and Pacific lamprey at the HCC while, at the same time, producing “good, clean hydro-electric power.”

IPC developed 15 passage scenarios (Appendix A), but IPC concluded that none of the 15 scenarios allows for any of the species of fish in any of the production areas to return at sufficient levels to maintain sustained natural populations above HCC. IPC identified three primary concerns which will prevent the successful re-introduction of anadromous fish above the HCC;

(1) lack of fish passage at the HCC,
(2) poor survival of fish through the lower Snake River and Columbia River, and
(3) tributary dams and over-all poor condition of fish habitat upstream of HCC.

In keeping with comments made by President Bush, salmon restoration should continue. A study is needed to determine if (1) passage of anadromous fish is feasible at the HCC and if (2) the conclusions developed by IPC are an accurate representation of the situation.

The Recommended Study

Studies, including field tests, are needed to validate passage alternatives and model results developed by IPC. The studies and field tests should include proven passage options and innovative alternatives. The studies should evaluate passage options for juvenile and adult anadromous fish within and upstream of the HCC.

Basis for this Information Request

There is considerable potential for the production of anadromous fish upstream of the HCC (see Figures 2 and 3). Assessment of problems associated with passage will involve developing a clear definition of problems in terms of ecosystem function, rather than in terms of preconceived management solutions.

Who Should Conduct and Participate in the Study

A team of IPC, federal, state and tribal fish biologists and engineers will be needed to develop passage criteria and alternatives, design and operate facilities, and conduct a monitoring and evaluation program. The team should adopt an adaptive management and decision process on which to evaluate success of the program. Organization and selection of the team should be done by IPC, state, federal, and tribal agencies. The core group should consist of no more that nine representatives with an elected leader.

Objectives and Methodologies for the Study

The objective of the study and field tests is to develop methods and implement a process to provide anadromous fish passage at the HCC. Performance measures for passage should include (1) ecosystem integrity, (2) setting numerical production goals, and (3) developing facility effectiveness goals. The study will involve synthesizing existing knowledge, exploring alternative actions, and making explicit forecast about their outcomes. Management actions and monitoring programs need to be designed to generate reliable feedback and clarify the reasons underlying outcomes.

Typically, the implementation of new or reactivated fish passage facilities include the following sequence of events:

- Development of alternative,
- Study of potential success and drawbacks using the appropriate methods and tools,
- Review of alternatives and probably success by a technical review team,
- Development of physical model, if needed,
- Development of plans and drawings,
- Review of drawing by appropriate agency engineers and the technical review team,
- Approval from FERC, as appropriate, to construct the new passage facilities,
- Prototype construction and testing, if appropriate,
- Final construction,
- Testing and adjusting, if needed,
- Evaluation and development of final operation criteria.

Acceptance by the Scientific Community

The scientific community will support the passage of anadromous fish at the HCC, but the scientific community will have concerns about pathogen transfer, intra-specific interactions, selection and availability of stocks, impacts on harvest opportunities, and sustaining natural smolt production. All of these concerns, and any other concerns that may arise, should be addressed by the core groups of scientists.

How will the Information be Useful in Furthering Resource Goals

The goal is to increase production of anadromous fish by allowing them passage at the HCC. The studies and field tests will be designed to provide information showing that passage is feasible, pathogens can be managed, interactions between resident and anadromous fish is healthy, stocks are available, harvest can be managed to provide fish for passage, and areas are available for the production of anadromous fish, and more area will be made available for the production of anadromous fish above the HCC.

Length of Study

Fish passage has been blocked at the HCC for over 40 years, and the process to re-introduce anadromous fish could require 40 years.

Why Study Objectives Cannot be Achieved with Available Data

Except for the development of model information showing smolt production potential and identifying potential methods to pass fish at the HCC, IPC has taken no action to pass anadromous fish at the HCC. New and innovative passage techniques, including tests at the Pelton/Round Butte Project on the Deschutes River, have been successful in demonstrating methods to pass fish at hydroelectric projects. Studies and field tests at the HCC should be designed to implement proven as well as innovative passage alternatives. In addition to studies to pass fish, studies are also being conducted at other facilities to assess pathogen transfer, interactions between resident and anadromous fish, stock suitability and availability, harvest management, and smolt production potential. Studies conducted at the HCC will add to the base of information to help make decisions for passage of fish at all man-made obstructions, including the HCC, in the Columbia Basin.

HABITAT SURVEYS FOR PRODUCTION OF COHO SALMON

Background Information

The historic presence of coho salmon is unknown within and upstream of the HCC. However, about 200 adult coho returned to the HCC in the fall of 1965. Origin of these fish is unknown since there were not marked. The adults returned mostly in November and a few in early December. The Nez Perce Tribe and the Oregon Department of Fish and Wildlife have documented the presence of coho in the Clearwater and Grande Ronde subbasins, respectively, so the presence of coho in the Snake River subbasin has been documented. A study is needed to determine the presence and abundance of coho habitat in tributaries upstream of the HCC with the understanding that coho salmon may be re-introduced upstream of the HCC if suitable habitat is found there.

The Recommended Study

A study is needed to assess the potential for the production of coho salmon upstream of the HCC. The study will involve habitat surveys. If suitable habitat is found for the production of coho salmon, plans will be made for the re-introduction of this species upstream of the HCC.

Basis for this Information Request

Natural populations of coho salmon were extirpated from the Snake River subbasin in the 1970's. Recently, coho salmon were re-introduced into the Clearwater subbasin and plans are being developed to re-introduce coho salmon into the Grande Ronde subbasin. If coho salmon were present upstream of the HCC, plans should be made for their re-introduction. The re-establishment of species native to area is important to maintaining ecosystem health.

Who Should Conduct and Participate in the Study

We recommend that the study be funded by IPC and the habitat inventory be conducted by a fishery agency, tribe, or by private consultants familiar with habitat survey techniques.

Objectives and Methodologies for the Study

The objective of the study is to locate and measure habitat for the production of coho salmon upstream of the HCC. There are several methods that could be used to inventory habitat. We recommend that a committee of fishery biologists represented by IPC, state, federal and tribal select a method to conduct the habitat surveys.

Acceptance by the Scientific Community

Habitat surveys, whether conducted by state, federal, tribal or consultant biologists, are a commonly accepted technique to assess the potential for salmonid production and re-introductions. Reports prepared by IPC to project the production potential of juvenile salmonids upstream of the HCC noted the absence and need for habitat information.

How the Information will be Useful in Furthering Resource Goals

Habitat surveys, whether conducted for the re-introducing coho salmon or other species of fish, are a valuable tool for estimating smolt production potential. Without habitat surveys, wild guesses are made to estimate juvenile production potential.

Length of the Study

Habitat surveys should be divided into reaches. The highest priority for habitat surveys is the core area of the HCC followed by surveys in tributaries upstream of the core area. The habitat surveys could require 100 to 200 man-months.

Why Study Objectives Cannot be Achieved with Available Data

Habitat inventories to assess production potential for coho salmon have not been made in any tributaries upstream of the HCC.

CONNECTING ENDEMIC RESIDENT FISH POPULATIONS

Background Information

Populations of resident native fish, including listed bull trout and redband trout, have been disconnected as a result of the construction and operation criteria of the HCC. The primary effects of disconnection on fish populations are interrupted movement patterns, altered genetic integrity, and altered life history structure. Studies are needed to develop options to connect native populations of resident fish affected by the construction and operation criteria of the HCC.

The Recommended Study

The studies are needed to develop alternatives to connect and recover populations of native populations of fish. The study plans should recommend actions to recover and restore resident native fish by connecting populations downstream, upstream and within the HCC.

Basis for this Information Request

A plan to connect and recover native fish is intended to mitigate and enhance populations of native resident fish upstream and downstream of the HCC. Specific measures in the native fish restoration plan should include pathogen surveys, design and construction of traps for resident fish passage, enhancement of tributary habitats, survey of resident fish populations, and long-term monitoring and evaluations programs. None of this information is available at the present time.

Who Should Conduct and Participate in the Study

The plan to connect resident fish populations should be developed by team of IPC, federal, state and tribal biologists. The study should be funded by IPC. The team of biologists would design studies to determine the impact of transferring pathogens, conduct habitat surveys, inventory resident fish populations, and develop a long-term monitoring and evaluation program associated with connecting resident fish populations. A technical team of biologists and engineers will assist the core group in utilizing a structured decision-making process, probably adaptive management, in the development of facilities to accomplish the task.

Objectives and Methodologies for the Study

The objective of this study is to connect and restore resident populations of native fish. The methodology for conducting the study will be based on determining the viability of resident fish populations, and developing methods to connect populations including their anadromous forms. The study should be defined in terms of ecosystem function, rather than in terms of preconceived management solutions.

The core group of fish biologists will make recommendations and direct methodologies to conduct the studies. Pathologists will develop and implement plans to study potential transfer of disease, management biologists will develop plans and conduct habitat surveys and fish inventories, and research biologists will develop and implement monitoring and evaluation studies.

Acceptance by the Scientific Community

The scientific community accepts the concept of connecting fish populations, but they recognize risks associated with connecting resident fish populations. The scientific community will request studies to identify and evaluate risks associated with connecting resident fish populations.

How will the Information be Useful in Furthering Resource Goals

Fish passage and connecting resident fish populations are resource goals at the HCC. The studies will provide information useful in understanding the importance of connecting resident populations of fish, and the information will be useful in describing risks associated with connecting resident fish populations at other man-made fish passage obstacles.

Length of Study

The studies needed to connect fish populations will require two years. The studies to understand risks and assess population structure and habitat availability will require more than five years.

Why the Study Objectives Cannot be Achieved with Available Data

At the present time, methods and facilities are unavailable to connect resident populations of fish at the HCC. Data is also unavailable to assess risks of transferring pathogens, assess resident fish populations and assess habitat available for resident fish.

CONNECTING AND RESTORING POPULATIONS OF WHITE STURGEON

Background Information

White sturgeon are present downstream, upstream, and in the project area. The abundance of the populations is unknown, but biologists believe that the white sturgeon population in and above the project area has decreased since construction of the HCC. Restrictive harvest measures have been implemented to protect the remaining white sturgeon.

The HCC has disconnected the white sturgeon population and blocked their food source, salmon and Pacific lamprey, upstream of the project. The abundance, productivity, growth, life history characteristics, and genetic integrity of white sturgeon has been adversely impacted as a result of the construction and operation criteria of the HCC, but the impact of the HCC on white sturgeon abundance, productivity, growth, life history characteristics and genetic integrity is mostly unknown. There is a need for information to assess the abundance, productivity, growth, life history characteristics and genetic integrity of white sturgeon in and upstream of the HCC. The study should be designed to assess the loss of natural food on these biological parameters.

The Recommended Study

Studies are recommended to determine the impacts of the HCC on white sturgeon. The studies would include a survey of changes in abundance of white sturgeon in and upstream of the HCC, their reproductive success, growth, life history characteristics, and genetic integrity. An important phase of the study would include an assessment of their abundance, productivity, and growth with and without the presence of salmon and Pacific lamprey. Another important phase of the study would determine how the presence of the HCC affects life history characteristics and genetic integrity of white sturgeon.

Basis for this Information Request

White sturgeon are an important component of the main-stem Snake River ecosystem. The importance of their presence is unknown, but there is little question that the HCC affected life history patterns, populations, abundance, growth, and probably genetic integrity of white sturgeon.

Who Should Conduct and Participate in the Study

The studies should be directed by IPC, federal, state and tribal biologists, and there are several agencies, tribes and universities who could conduct the studies. The directors of the study should decide who should conduct and participated in each individual study.

Objectives and Methodologies of the Studies

The objectives of the studies are to learn how the HCC affected white sturgeon populations and develop methods to mitigate for these impacts. The directors of the study will develop study designs. Some parts of the studies are ongoing, but a key component, absence of important natural food, needs to be determined.

Acceptance of the Scientific Community

There is some scientific knowledge concerning the impacts of hydroelectric projects on reproductive success, health, and genetic integrity of white sturgeon. Since the historic distribution of white sturgeon is known and some of these prehistoric fish still present, there is an opportunity to understand impacts and mitigate losses at the HCC. The acceptance of the scientific community will depend on how the studies are defined.

How the Information will be Useful in Furthering Resource Goals

The goals are to return white sturgeon to pre-project abundance, reproductive success, health, growth, and genetic integrity. The information collected during studies will be used to accomplish these goals.

Length of Studies

The studies may last 10 years, but monitoring and evaluation activities may last 40 years.

Why Study Objectives Cannot be Achieved with Available Data

There is a basic lack of information describing the (1) loss of natural food on sturgeon populations, and (2) how the disconnect of sturgeon populations affect their life history patterns and genetic integrity. This study will be designed, among other things, to understand how the disconnection of sturgeon populations and their food source affect the health of the white sturgeon population.

CONNECTING AND RESTORING POPULATIONS OF PACIFIC LAMPREY

Background

IPC notes the presence of Pacific lamprey in and above the HCC at the time of the HCC construction. The HCC blocked passage and extirpated Pacific lamprey above the HCC. Information is lacking regarding run size, timing, productivity, distribution, genetics, and pathogens of Pacific lamprey in and upstream of the HCC.

Because Pacific lamprey have been extirpated above the HCC, stock selection could be critical to their successful re-introduction. Studies are recommended to select stock for re-introduction and design facilities to pass Pacific lamprey at the HCC.

The Recommended Study

Studies are needed to determine stock and its availability for re-introductions of Pacific lamprey above the HCC, studies are needed to develop procedures for passing Pacific lamprey at the HCC, and studies are needed to assess the impacts, including disease and intra-specific interactions, of Pacific lamprey on fish upstream of the HCC.

Basis for this Information Request

Historically, Pacific lamprey migrated through the area impacted by the HCC, and they were a natural component of the ecosystem above the HCC. They probably played an important ecological role in the development of fishes in the area. In addition, Pacific lamprey were an important food item for Native Americans. The intent of the studies is to understand the role of Pacific lamprey in the ecosystem through their successful re-introduction.

Who Should Conduct and Participate in the Studies

IPC, federal, state and tribal biologists should direct studies designed to re-introduce Pacific lamprey above the HCC. The studies could be conducted by any of these agencies and tribes or by universities or private consultants.

Objectives and Methodologies for the Studies

The objective of the studies is to re-introduce and provide safe passage for Pacific lamprey through the HCC. The methodology for studies is to determine the best stocks and their availability for re-introductions, develop procedures for passing Pacific lamprey at the HCC, and design studies to assess the impact, including disease and intra-specific interactions, of Pacific lamprey on fish upstream of the HCC.

Acceptance by the Scientific Community

In the past, the scientific community found little or no value in the presence of Pacific lamprey, and actions were taken to eliminate these fish from the ecosystem. In recent years this attitude has changed, and scientists now believe that fish communities evolved with the entire ecosystem in place. The scientific community will support studies designed to re-introduce Pacific lamprey above the HCC. The scientific community may argue study design, but there will agree that studies should be conducted.

How the Information will be useful in Furthering Resource Goals

The resource goal is to re-introduce all the natural components, including Pacific lamprey, in the ecosystem. The studies will provide assess stock and stock availability, design and construct facilities for passage, determine intra-specific interactions, and assess if pathogen transfer is an important consideration upstream of the HCC.

Length of the Studies

The studies may require 5 to 10 years depending upon progress of other studies to provide fish passage at the HCC.

Why Study Objectives Cannot be Achieved with Available Data

Data is not available to determine stocks and their availability for re-introduction above the HCC, facilities and methods to passage at the HCC, potential intra-specific interactions, and pathogen transfer.

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APPENDIX A

Passage Scenarios Developed by IPC

Scenario 1: Free-flowing river for downstream passage, in-river passage for adults.

Scenario 2: Bypass smolts at Oxbow and Hells Canyon dams, in-river passage for adults.

Scenario 3A: Brownlee Reservoir 89-ft maximum drawdown, no smolt bypass facilities at Brownlee Dam, in-river passage for adults.

Scenario 3B: Brownlee Reservoir 21-ft maximum drawdown, no smolt bypass facilities at Brownlee Dam, in-river passage for adults.

Scenario 4: Brownlee Reservoir 21-ft maximum drawdown, no smolt bypass facilities at Brownlee Dam, in-river passage for adults.

Scenario 5A: Brownlee Reservoir 89-feet maximum drawdown, collection facility at Brownlee Dam with 80% efficiency and transport to the Hells Canyon Dam tailrace, in-river passage for adults. Collection of juveniles at Brownlee Dam.

Scenario 5B: Brownlee Reservoir 21-ft maximum drawdown, collection facility at Brownlee Dam with 80% efficiency and transport to the Hells Canyon Dam tailrace, in-river passage for adults.

Scenario 6A: Smolt bypass facilities at C.J. Strike Dam, collection facility at Swan Falls Dam with 80% efficiency and transport to the Hells Canyon dam tailrace, in-river passage for adults.

Scenario 6B: Smolt bypass facilities at C.J. Strike Dam, collection facility at Swan Falls Dam with 80% efficiency and transport to the Hells Canyon Dam tailrace, Brownlee Reservoir 21-ft maximum drawdown, no smolt bypass facility at Brownlee Dam, in-river passage for adults.

Scenario 7A: Smolt bypass facilities at C.J. Strike Dam, collection facility at Swan Falls Dam with 80% efficiency and transport to the Hells Canyon Dam tailrace, Brownlee Reservoir 89- feet maximum drawdown, collection facility at Brownlee Dam with 80% efficiency and transport, in river passage for adults.

Scenario 7B: Smolt bypass facilities at C.J. Strike Dam, collection facility at Swan Falls Dam with 80% efficiency and transport to the Hells Canyon Dam tailrace, Brownlee Reservoir 24-foot maximum drawdown, collection facility at Brownlee Dam with 80% efficiency and transport, in-river passage for adults.

Scenario 8A: Smolt bypass at all projects, Brownlee Reservoir 89-ft maximum drawdown, 100% bypass at Brownlee Dam.

Scenario 8B: Smolt bypass at all projects, Brownlee Reservoir 21-ft maximum drawdown, 100 % bypass at Brownlee Dam.

Scenario 9A: Collection facility at C.J. Strike Dam with 80% efficiency and transport to the Hells Canyon Dam tailrace, bypass facilities at all projects, Brownlee Reservoir 89-ft maximum drawdown, 100% bypass at Brownlee Dam.

Scenario 9B: Collection facility at C.J. Strike Dam with 80% efficiency and transport to the Hells Canyon Dam tailrace, bypass facilities at all projects, Brownlee Reservoir 21-ft maximum drawdown, 100% bypass at Brownlee Dam.

APPENDIX B

Summary of Passage Alternatives

A. Brownlee

1. Downstream Passage

a. At Dam

Forebay Gulper
Eicher Screens
Inclined Screen
Intake Diversion Screen
Spillway Release
Behavioral Guidance Structure
Turbine Passage

b. Upper Reservoir Collection

Portable Floating Traps
a. Oneida Floating Trap
b. Merwin Foating Trap
Fixed Structure - Wolfe Trap
a. Wolfe Trap
b. Rubber Dam
Portable Screens
Louver Screens

Transportation

Truck
Barge

Canal
Pressure Pipe
In Reservoir Flexible Conduit
Floating Flume
Upstream Passage
Fish Ladder
Fish Locks
Fish Elevator
Trap and Haul
Recommended Alternatives
Downstream Passage
Brownlee
Portable Upper Reservoir Collection with Floating Gulper
Oxbow
Intake diversion Screen
Hells Canyon Dam
Either Spillway Release, or Intake Diversion Screens or MIS Units
Upstream Passage
Hells Canyon Dam
Trap and Haul
Oxbow
Trap and Haul
Brownlee Dam
Trap and Haul