Conservation of Columbia Basin Fish

Building a Conceptual Recovery Plan with the Four Hs

Working Paper — November 1999

Introduction

Native salmon and steelhead, and many resident fish species are in decline throughout the Columbia River Basin. Recent analyses indicate that extinction risks for Snake River salmon and steelhead populations are significant. These analyses confirm that major changes must be made in a wide range of activities that cause harm to those stocks if salmon recovery is to be successful. Analyses for the remaining salmon and steelhead populations in the Basin will be completed in a few months. Making changes to recover these fish will require all of the governments and people of the Pacific Northwest to confront tough choices. The success of salmon recovery in the Columbia Basin depends upon the willingness of the Region to make those tough choices.

Certain changes can result in immediate improvements, while others will require more time to show results. Some changes can be implemented using existing authorities and capabilities, but others will require new authorizations and congressional support. Some of these changes are decisions of federal agencies, but others depend largely on state or local commitments.

The Working Paper presents options in each of the Hs, and shows how the options can be combined into integrated alternatives. Both the options and alternatives are simplified examples, intended to represent broad strategic choices. The options are not intended to capture exact prescriptions of actions; the integrated alternatives do not represent the only combinations of options possible. None should be viewed as "preferred." Not all of the options or integrated alternatives may be legally defensible or feasible to implement.

The purpose of this Working Paper is to outline the fundamental choices that face the Region if salmon recovery is to succeed. The objective is to stimulate an honest and constructive debate among the governments and the people of the Region. That honest debate holds the best hope for a durable set of commitments by which to recover salmon stocks and the health of the rivers upon which they depend.

Background

Historically, 10-16 million salmon and steelhead returned each year to spawn, but by the 1960s, that number had dropped to about 5 million. Today, only about a million fish return, and most of them originate from hatcheries, not from the wild. Due to this steep decline, the National Marine Fisheries Service (NMFS) has listed 12 Columbia River Basin salmon and steelhead Evolutionarily Significant Units (ESU) as threatened or endangered under the Endangered Species Act (ESA). The U.S. Fish and Wildlife Service (USFWS) has listed seven resident fish and other aquatic species as threatened or endangered.

The deterioration of the Columbia's once-numerous fish runs can be traced to the economic development of the basin. The human activities that have caused the decline of these fish – often referred to as the "Four Hs" – are habitat, harvest, hatcheries, and hydropower. Forestry, agriculture, mining, and urbanization have altered or destroyed tributary *habitat*. Fishing, or *harvest*, has reduced the number of adult fish that return to spawn. *Hatcheries* have introduced inbreeding and competition, may have been a source of disease for wild fish, and have in some cases induced fisheries to harvest at rates too high for natural stocks. And *hydropower* dams on the Columbia and Snake rivers have blocked and inundated mainstem habitat, altered natural flows, impeded passage of migrating fish, and created a series of pools where fish predators reside.

The people of the Pacific Northwest have made efforts to turn around the salmon and steelhead decline. Fish managers in the basin have dramatically reduced harvest. They have also made substantial progress to address hatchery practices and established programs to improve habitat. Although there have been many improvements at dams and in hydropower operations, the major hydropower dams on the Snake and Columbia rivers continue to be a significant source of mortality for some stocks of migrating fish. In the past, regional debate has focused on the eight federal dams on the Snake and Columbia rivers, the role they have played in fish declines, and whether some of the dams should be removed. Given the impacts of extensive hydropower development on the salmon runs of the Columbia Basin, this focus is entirely understandable and appropriate. At the same time, however, maintaining a broad, more comprehensive focus on other major sources of declines is equally important if recovery efforts are to succeed.

Last year, nine federal agencies formed a *Federal Caucus* to examine opportunities the region has in each of the Hs for recovering listed salmon, steelhead and resident fish. Our intent was to develop a conceptual recovery plan that could guide future federal actions. This Working Paper examines several of the basic options for future management in each of the Four Hs. These options are not intended to be exhaustive. Using these options, the Federal Caucus developed a set of integrated alternatives, or packages of Four-H options, which mix and match the various options. These integrated alternatives are intended to illustrate the type of integrated strategies that will be required

for successful recovery. They are not presented, however, as the exclusive set of packages that are possible.

The goal of the Working Paper, and ultimately the Four H Report, is to stimulate discussion of what the region can do to recover salmon and steelhead and other aquatic species. The Federal Caucus hopes to encourage a constructive debate that is broadly focused and results in a regionally supported comprehensive strategy across the four Hs.

The Working Paper emphasizes that salmon recovery is but one of several environmental challenges facing the governments of the Pacific Northwest. Addressing the extensive loss of water quality throughout the Basin is a complementary objective. Columbia River streams, both mainstem and tributaries, have been designated as polluted, threatened and impaired under the Clean Water Act. The degraded condition of these streams is directly related to declining fish populations throughout the Basin.

Goals and Objectives

The Federal Caucus suggests five goals for a regional fish recovery plan:

- Conserve Species. Avoid extinction and foster long-term survival and recovery of Columbia Basin salmon and steelhead and other aquatic species.
- Conserve Ecosystems. Conserve the ecosystems upon which salmon and steelhead depend.
- Assure Tribal Fishing Rights. Restore salmon and steelhead populations over time to a level that provides a sustainable harvest sufficient to allow for the exercise of tribal fishing rights.
- Balance the Needs of Other Species. Ensure that salmon and steelhead conservation measures are balanced with the needs of other native fish and wildlife species.
- Minimize Adverse Effects on Humans. Implement salmon and steelhead conservation measures in ways that minimize their adverse human effects.

The Options for Each H

The Federal Caucus considered a range of options for each H. There were three purposes in developing these options: to consider solutions or actions that had not yet been explored; to test the sensitivity of different fish populations at various life stages to actions in the different Hs; and to stimulate regional dialogue on the trade-offs and uncertainties involved in selecting a suite of actions to recover salmon and steelhead populations.

The following options are intended to represent broad choices in direction and strategy for each H. They do not represent exact prescriptions of actions and measures that would ultimately be implemented as part of an overall four H recovery plan. Specific actions and measures presented in this paper or in related documents are for illustration purposes only. These options are offered in order to engage the region early in the thinking process of the Federal Caucus.

Habitat Options

The quality and quantity of tributary freshwater and estuary habitat in much of the Columbia River Basin has declined dramatically in the last 100 years. Forestry, farming, grazing, road construction, hydropower development, mining, and urbanization have radically changed the historical habitat conditions of the Columbia River Basin. The lands and waters of the Basin no longer support the array of anadromous fish, resident fish, wildlife, and plant communities that existed prior to European settlement. Habitat conditions on federal land are generally better than conditions on non-federal land. In addition, the habitat programs that are currently in place on federal land are likely in the long term to bring back high-quality habitat on most federal land. Improvement of habitat conditions on non-federal land is less certain. Without substantial improvements in land and water activities, habitat conditions across the basin will continue to erode and undercut progress in salmon recovery efforts in the other Hs. Improvements in habitat for salmon and steelhead have the additional benefit of improving conditions for all other aquatic species, wildlife, and native plant communities in the watershed as well.

The objectives of the habitat options under consideration by the Federal Caucus are to: prevent further degradation of tributary and estuary habitat conditions and water quality; protect existing high-quality habitats; and restore habitats on a priority basis. The primary difference among the habitat options is the level of state and local effort and participation, the level of federal support, and the level of federal regulation. The Caucus does not anticipate that management on federal lands will vary under these options. Under all options, federal land management agencies will continue to pursue their current programs and consult on those programs under the ESA. All options call for substantially increased federal coordination, assessment and planning, and immediate federal actions.

Option 1: Coordinate and Prioritize Federal Actions

- Under this option there would be moderate increases in efforts to protect and restore habitat, a measurable increase in federal action and coordination, and increased habitat assessments and planning efforts using federal funds. Immediate actions would reduce imminent risks and immediately improve survival.

Option 2: Coordinated Regional Plan

- Under this option, state, tribal, local, and federal entities would significantly increase their level of coordination, planning and habitat implementation. There would also be an increase in federal funding for habitat assessments, plans, immediate actions, and monitoring. Initially, there would be an increased allocation of federal funds to assessments and planning that would precede all but immediate actions. Immediate actions would reduce imminent risks and immediately improve survival. One major mechanism for accomplishing this would be a substantial and explicit tie between water quality compliance efforts (already under court orders in the three states) and salmon recovery.

Option 3: Increased Federal Role under Clean Water Act and ESA

- This option has similar components to Option 2, except it includes increased regulation by the federal agencies under the CWA and ESA. This option would be implemented if the region cannot develop a coordinated plan with state and local governments.

Harvest Options

Salmon fishing has been a central feature of Northwest tribal culture, religion, and commerce for generations. Tribal harvest may historically have been as high as 4 to 6 million fish. With the arrival of European settlers and the advent of canning technologies in the late 1800s, commercial fishing developed rapidly. Commercial salmon and steelhead harvest has been as high as 2.1 million fish in 1941 to as low as 68,000 fish in 1995.

To have a sustainable harvest, salmon and steelhead must produce more adults than are needed for spawning. This means enough adults must be allowed to escape the fisheries to spawn and perpetuate the run, and the productive capacity of the habitat must be maintained. Unfortunately, these prerequisites for sustainable harvest have been regularly violated in the past. The lack of coordinated management across jurisdictions, coupled with competitive economic pressures to increase catches or sustain them in periods of lower production, resulted in harvests that were too high, limiting the numbers of adults returning to spawn.

The objectives of the harvest options are to: manage fisheries to prevent overharvest and contribute to recovery; and provide fishing opportunities that comport with trust obligations to the tribes and comply with sustainable fisheries objectives for all citizens. These options presume that the beneficial harvest reforms of recent years will continue. The reforms, along with the dramatic decline in productivity, have already come at great cost to fishing interests in the Pacific Northwest, especially the tribes.

In the long term it is the United States' policy to provide harvest opportunities for the region's Indian tribes. For this reason, the hatchery and harvest options are closely related to provide for increasing the opportunities for harvest, where there will be minimal impacts on depressed stocks of fish.

Option 1: Fishery Benefits During Recovery

- This option implements the recently negotiated Pacific Salmon Treaty (PST) regime in all ocean fisheries and, as contemplated in that agreement, further constrains southern U.S. fisheries in some years if necessary to comply with the ESA. It would apply the constraints currently being developed for upper Willamette and lower Columbia chinook. When abundance of listed stocks are similar to those of 1999, the in-river fisheries would be managed to limit impacts on listed summer chinook to 5 percent or less and on spring chinook to 7 percent or less. In-river fall fisheries would be managed so as not to exceed the 1999 harvest rate limits for Snake River fall chinook and "B" run steelhead. In anticipation of higher abundance in the future, a schedule would be developed that allows harvest rates to increase as abundance increases.

Option 2: Fixed In-river Harvest Rates (1999 levels)

- This option is the same as option 1, except that no stepped in-river harvest rate schedule would be included. In-river fisheries would be managed to limit impacts on listed spring and summer chinook to 7 and 5 percent, respectively, or less, and the fall season fisheries would be managed so as not to exceed the 1999 harvest rate limits for Snake River fall chinook and "B" run steelhead. All of these rates would be frozen until recovery goals are achieved.

Option 3: Conservation Fishery Levels

- This option implements the recently negotiated Pacific Salmon Treaty (PST) regime for Alaskan and Canadian fisheries. It differs from Option 2 in that all other harvest impacts on listed populations would be reduced to conservation crisis levels for a period of years, after which the regime would shift to Option 1 or 2. Conservation crisis levels would be similar to the 1999 harvest rates in the in-river winter/spring/summer fishery.

Hatcheries Options

Hatchery fish represent approximately 80 percent of the annual adult salmon and steelhead returning to the Columbia River Basin. Nearly all hatchery fish programs were intended to compensate for the loss of fish and fish habitat due to construction of the Federal Columbia River Power System. Modern hatchery production peaked in the early 1990s at over 200 million fish annually. There are about 100 anadromous fish hatcheries, including satellite facilities in the Columbia River Basin today, and they produce about 150 million fish annually.

Hatcheries have a long history of providing fish in an efficient manner for harvest and related social purposes. It is not yet clear, however, whether hatcheries are effective in rebuilding self-sustaining, naturally spawning populations over the long term. A

fundamental question is: how can artificial production be applied in a manner that not only avoids harm, but also assists in the conservation and rebuilding of wild runs?

The four objectives for the hatchery options are to: minimize the adverse effects of hatchery production on wild fish; conserve genetic resources; help rebuild natural populations; and use hatcheries creatively to mitigate for lost fishing opportunities resulting from losses of habitat or reduced productivity.

Option 1: Currently Planned Programs

- This option includes currently planned programs to conserve genetic resources and currently planned improvements in mitigation programs.

Option 2: Increase Conservation Programs

- This option would increase programs to conserve genetic resources over the currently planned programs, and have the same currently planned improvements in mitigation programs, with corresponding reductions in overall production.

Option 3: Increase Conservation Programs and Significantly Decrease Mitigation Programs

- This option would increase programs to conserve genetic resources, as described in Option 2, and significantly decrease mitigation programs below currently planned levels.

Hydropower Options

Hydropower development has had profound effects on the Basin's salmon and steelhead runs, resident fish and other aquatic species. Grand Coulee Dam on the Columbia River mainstem and the Hells Canyon Complex on the Snake River blocked passage to over half of the salmon's historic upriver spawning areas. Many smaller dams on the tributaries have also blocked spawning areas. The hydropower system affects fish in other ways as well. The storage reservoirs in the basin alter natural streamflows, and the dams themselves block or delay both upstream and downstream fish migration.

Dam operators have developed several methods for moving migrating fish past the dams and reservoirs, including mechanical bypass systems and transporting juveniles in trucks and barges to release sites below Bonneville Dam. In addition, a flow augmentation program called for under NMFS' 1995 and 1998 Biological Opinions aims to restore more natural flow patterns during the time juvenile and adult salmon and steelhead are migrating. These and other changes have resulted in important survival improvements for migrating fish.

The hydropower options have two objectives: provide adequate survival and maintain healthy adult and juvenile anadromous fish inhabiting and/or migrating through the

hydropower system; and provide instream and reservoir environmental conditions necessary to provide adequate survival of resident fish and other aquatic species.

The options represent the major choices in direction and strategy for the hydropower system. The goal was to try to determine how much improvement the region could realistically expect to see with these substantially different approaches, and how much difference it would make for the fish overall and in combination with actions in the other Hs. The Caucus examined the option of removing Snake River dams, but not Columbia River dams because feasibility work has not been initiated.

We did not examine configuration options for Federal Energy Regulatory Commission (FERC) licensed projects but recognize that changes at these projects may have benefits for fish. Opportunities for fish passage improvements at FERC-licensed projects should be considered during relicensing processes.

Option 1: Current Program

- This option would continue on the present path of ongoing improvements to the system, with roughly the existing annual level of investment continuing into the future.

Option 2: Aggressive Program

- In this option, we assume the current program for improved fish passage facilities, such as surface bypass, will be successful and will be implemented to increase passage survival. The primary difference in configuration measures between this alternative and the present program is that the federal agencies would seek increased funding to pursue more aggressive implementation of measures to improve passage survival. Flow augmentation (especially in the Snake River) and spill will be increased.

Option 3: Breach Lower Snake River Dams

- The final option we considered improves conditions for Snake River stocks by removing the dams that block their passage in the lower Snake River.

Biological Considerations

To construct integrated alternatives, the Federal Caucus considered the available scientific analyses. These include the Cumulative Risk Initiative (CRI), developed by the Northwest Fisheries Science Center of NMFS, and the Plan for Analyzing and Testing Hypotheses (PATH), a collaborative effort of the state fishery agencies, tribes and federal agencies. The CRI has developed quasi-extinction projections in 10 years and 100 years for salmon and steelhead ESUs in the Snake River. The "quasi-extinction" threshold is one fish or fewer in any single year. Analyses for other Basin ESUs will be available by the end of the year. The CRI also examines where in the salmon life cycle opportunities exist to improve survivals and reduce the risk of extinction. This examination is based on theoretical survival improvements in different parts of the fishes' life cycle. Analyses have not yet been completed to determine whether such improvements are feasible, for example, from habitat improvements. We have not attempted to lay out in this review what level of biological risk is "acceptable" in relation to the CRI results (for example, a one in 100 chance of quasi-extinction is acceptable but a 1 in 20 chance is not).

The PATH analyses use life cycle models to project the likelihood that Snake River spring/summer chinook and fall chinook will meet certain abundance goals within 24, 48 and 100 years. As with CRI analyses, the further out the projections go, the less certain the results. The PATH results may be overly optimistic as they do not account for extinction and they assume productivity is density-dependent. PATH models show trends improving regardless of the management actions pursued.

Results of both modeling efforts should be used with caution. Models contain numerous assumptions that might be wrong. The further out the projection, the less certain the results. The 100-year projections should accordingly be viewed as highly uncertain. The information from these analyses is presented below.

Snake River ESUs

Snake River spring/summer chinook. There are seven "index" populations of Snake River spring/summer chinook (of a total of 35-40 populations). Two have a serious risk (1 in 10) of reaching the quasi-extinction threshold in 10 years. All populations have a greater than 30 percent chance of reaching the threshold within 100 years if the current trend in the population's growth continues. CRI modeling suggests that to reduce the short-term risk for these stocks to 1 in 100 would require a significant change in growth rate (e.g., 25 percent for the population in the worst shape). Other populations require a 5-20 percent change in growth rate. There are few immediate actions that can reduce the short-term risk since harvest rates are already very low (5-7 percent). Implementation of hatchery conservation programs will therefore be an important strategy in maintaining these stocks until long-term actions begin to take effect.

Reducing the risk of reaching the quasi-extinction threshold in 100 years to more acceptable levels requires a 12 percent change in growth rate on average across populations. The CRI analysis indicates that removing Snake River dams by itself would

yield little improvement in growth rate, unless there is significant delayed mortality associated with transportation and/or dam passage. Even if downstream survival were 100 percent, the rate of population growth would only increase by 4 percent. Eliminating harvest would change the growth rate by only about 1 percent.

For Snake River spring/summer chinook to survive in the long term will require a combination of improvements in several arenas, including habitat and hatchery actions, unless dams are removed and delayed mortality associated with dam passage is very large. The CRI analyzed the effects of maximizing juvenile fish transportation, theoretically increasing survival in the first year of life by 32 percent (potential habitat improvements and hatchery reforms), and in the estuary and near-shore ocean by 10 percent, and eliminating harvest. All of these actions combined resulted in a 14 percent change in the growth rate. There are two caveats to these results. First, the CRI analysis was a numerical experiment – we do not know, for example, how much first-year survivals might be improved through habitat or hatchery actions. Second, even if survival improvements were possible through habitat actions, it would likely be many years before the benefits of habitat actions would be realized. A second scenario the CRI modeled was eliminating harvest, theoretically increasing estuary survival 10 percent, and breaching Snake River dams. Delayed mortality associated with transportation and/or dam passage was assumed to be low. These actions combined resulted in an increase of 8 percent in the growth rate.

PATH modeling suggests that Snake River spring/summer chinook come close to reaching the survival goal, and have some chance of reaching the recovery goal, if harvest is held to the present low harvest rate as runs rebuild. PATH modeling also suggests that removal of Snake River dams alone can achieve NMFS' survival and recovery goals. PATH models assume a range of values for delayed mortality associated with transportation and/or dam passage. The analyses done by the PATH group show no appreciable benefit from hatchery or habitat actions. PATH modeling shows increasing population trends for all future actions analyzed.

Improvements in all of the Hs will be essential to recover Snake River spring/summer chinook. Survival improvements may be possible through habitat improvements in lower gradient stream reaches. Snake River spring/summer chinook also may be affected by releases of hatchery steelhead in the Snake River, although there is a great deal of uncertainty about this. Unless there are significant benefits that can be obtained from habitat and hatchery improvements, dam removal will be necessary to assist in recovering Snake River spring/summer chinook. Alternatively, if there is significant delayed mortality associated with dam passage, removal of the lower Snake River dams may be sufficient to recover this ESU. With or without dam removal, harvest restrictions may be needed for many years.

Snake River fall chinook have less than a 1 percent likelihood of reaching the quasi-extinction threshold in the short term, but a higher likelihood of reaching that threshold over the long term (6-17 percent). CRI modeling suggests that a modest improvement in growth rate (around 4 percent) may be needed to reduce the long-term probability of extinction to a more acceptable level.

This change in growth rate might be achieved by removing dams or by improving collection efficiency so that more smolts are transported (assuming delayed mortality associated with transportation is not significant). The CRI concluded there was not enough information to model the effects of dam removal, but noted that a 20 percent increase in survival during the first year would be enough to result in a 4 percent change in growth rate. For fall chinook, this first year includes freshwater rearing, migration through the hydropower corridor, residence in the estuary and transition to the ocean. It is not unreasonable to expect a 20 percent increase in first-year survival as a result of removing the lower Snake River dams. In addition, breaching dams would increase available spawning habitat below the Hells Canyon dams (some 90 percent of historical fall chinook spawning habitat was above the Hells Canyon dams).

The needed change in growth rate could also be achieved by reducing the combined ocean and in-river harvest rate by 50 percent, or by reducing either one by 75 percent. Combined harvest rates in recent years both in the ocean and the river have been reduced significantly from a high in the 1980s of about 80 percent to the present level of about 50 percent. Opportunities to improve fall chinook habitat are limited, short of breaching lower Snake River or Hells Canyon dams, although improvements in water quality and quantity from the upper Snake River could benefit fall chinook survival. Fall chinook in the past may have been affected by hatchery fish straying into the Snake River, but that problem has largely been controlled.

PATH modeling suggests that Snake River fall chinook reach recovery goals if harvest is significantly decreased, if dams are removed, or if transportation is stopped (assuming there is significant delayed mortality associated with transportation).

In the long term, either significant improvements in survival in the hydropower corridor or significant reductions in harvest rates may be needed to recover this ESU.

Snake River steelhead have a less than 1 percent likelihood of reaching the quasi-extinction threshold in 10 years , but their rate of decline has been so steep since 1980 that they are projected to have a greater than 90 percent likelihood of reaching that threshold in 100 years.

CRI modeling suggests that reducing the probability of reaching that low threshold in 100 years to a more acceptable level, requires a 10 percent change in growth rate. A long-term reduction in harvest rates to 5-10 percent would provide a sufficient change in growth rate to result in a 1 in 100 probability of reaching the quasi-extinction threshold in 100 years. In other words, a long-term reduction in harvest may be sufficient to recover Snake River steelhead. Harvest rates have been reduced by about half in recent years (from 32 percent to 16 percent) as a result of ESA concerns. Removing dams could change the growth rate by as much as 20 percent, even with no significant delayed mortality associated with transportation and/or dam passage. This also would be sufficient to recover these stocks. PATH did not model Snake River steelhead.

There may be opportunities to improve steelhead habitat, although this would require further investigation. There is a large amount of steelhead hatchery production in the

Snake River that may affect naturally produced steelhead, although there is a great deal of uncertainty about this.

Unless there are significant benefits that can be obtained from habitat and hatchery improvements, either dam removal or long-term reductions in harvest rates may be needed to recover this ESU.

Snake River sockeye cannot be modeled because there are so few of them. They are now kept from extinction by a captive broodstock program. If at some point in the future their numbers increase, it may be possible to analyze them with models. Because Snake River sockeye have a life history similar to Snake River spring/summer chinook, past analyses for chinook have often been applied to sockeye. If this comparison is accurate, Snake River sockeye also have similarly dim prospects of recovery without dramatic improvements in all stages of their life cycle.

Other ESUs

The CRI is continuing model work on additional ESUs. Modeling should be completed for upper Columbia chinook and steelhead by the end of November, and for upper Willamette chinook and steelhead by the end of the year.

Integrated Alternatives

There are a number of ways to combine options from the different Hs to arrive at integrated alternatives. Those displayed below are certainly not an exhaustive enumeration of all the possibilities. The alternatives are all intended to improve survivals of Columbia Basin salmon and steelhead populations over the long term, although some have more certain benefits than others. It was the intention of the Caucus to display possible alternatives that have some likelihood of achieving, or contributing significantly to, recovery of listed populations.

The Alternatives describe broad policy choices for salmon and steelhead recovery, and are intended to stimulate public discussion and allow the public early access to the thinking process within the Federal Caucus. They do not represent the only combinations of options that could provide recovery, nor do they represent preferred federal alternatives. Moreover, the Alternatives have been given a general screen for biological effectiveness but have not been screened for legal defensibility or implementation feasibility.

A fundamental point made by these alternatives is that the Federal Caucus' assessment is that current levels of activities in the four Hs will be inadequate to provide significant confidence in salmon and steelhead recovery. From that basis, packages of measures have been arrayed to begin the discussion about how best to approach salmon recovery. The purpose of the Alternatives is to further discussion and debate of these and other alternative combinations that have significant potential for achieving recovery of salmon and steelhead populations.

Alternative A – Dam Removal

Hydro	**Option 3**	Breach lower Snake River dams
Habitat	**Option 1**	Increased federal programs coordination
Hatcheries	**Option 1**	Currently planned programs
Harvest	**Option 1**	Fisheries benefit during recovery

Under this alternative, the decision is made now to breach Snake River dams and the necessary congressional authorizations are pursued. The primary reliance for recovering Snake River fish is on breaching. There is little increase in effort to improve habitat conditions on non-federal land, as resources would be focused on dam breaching. Because of the expected benefit in fish productivity from breaching, harvest is constrained by weak stocks, but is allowed to increase as runs increase. Since most conservation hatchery programs are aimed at Snake River fish, there is no need to increase the conservation program, and existing resources would be shifted to the Columbia River ESUs. Similarly, the expected increase in productivity of wild Snake River fish means there is less concern about the possible deleterious effects of mitigation hatchery production on wild fish in the Snake River. This alternative does not improve survivals for fish outside of the Snake River beyond those improvements that would result from programs already in place.

Alternative B – Harvest Constraints

Hydro	**Option 1**	Current program
Habitat	**Option 1**	Increased federal programs coordination
Hatcheries	**Option 3**	Increase conservation programs, significantly decrease mitigation programs
Harvest	**Option 3**	Conservation fishery levels

Under Alternative B, the Snake River dams are not breached and the region relies instead on harvest constraints to recover fish runs, along with existing improvements in the hydropower system and improvements on federal habitat. All fisheries are held to conservation levels for a period of time (e.g., 10 years) to "jump start" recovery. Since fisheries are so constrained, it is logical to also reduce the production of mitigation hatchery fish. This reduction may provide further unquantifiable survival benefits to wild fish.

Alternative C – Aggressive Non-Breach

Hydro	**Option 2**	Aggressive program
Habitat	**Option 2**	Coordinated regional effort
Hatcheries	**Option 2**	Increase conservation programs
Harvest	**Option 2**	Fixed In-river harvest rates

Alternative C defers a decision on dam-breaching and allows an interim period to determine whether aggressive actions in all of the Hs (short of breaching) is likely to recover Snake River fish, and to resolve key scientific uncertainties. Hydropower actions include increased flows (especially in the Snake River) and increased spill. State and local governments contribute significantly to habitat protection (improved in-stream flows and water management; irrigation improvements; riparian protections) through state regulatory and voluntary programs. Additional populations are brought into hatchery conservation programs if necessary to prevent extinctions. Harvest is held at a flat rate based on 1999 fishing rates until stocks recover.

Alternative D Maximum Protections

Hydro	**Option 3**	Breach lower Snake River dams
Habitat	**Option 3**	Increased federal regulation (as a default if Option 2 is not implemented)
Hatcheries	**Option 3**	Increase conservation programs, significantly reduce mitigation programs
Harvest	**Option 3**	Conservation fishery levels

Alternative D is the most aggressive scenario, in which all Hs make dramatic contributions in an effort to recover listed stocks throughout the Basin. The most risk-averse option within each H is pursued to maximize efforts to rebuild stocks and improve productivity. In the case of hatcheries, conservation programs would increase outside of the Snake River, and mitigation programs would be reduced Basin-wide.

Other Evaluations

In addition to biological considerations, several important points should be considered in evaluating these – and other – alternatives and their individual components:

- Are the components implementable from a practical perspective, or do they require new authorities or capabilities?

- What entity (or entities) would implement each component, and is that entity willing to make the necessary commitments to do so?
- When will the benefits accrue from each element, and should it be considered part of a short term or longer term strategy for the recovery effort; and
- What is the probability that the alternatives will get the job done, and is that probability acceptable?

PERFORMANCE MEASURES AND STANDARDS

Performance measures and standards are critical underpinnings of any management framework. They define the contribution that is needed at each life-history stage to achieve the overall biological goals and objectives, and they do so in context with the contributions from other life stages. A performance standard is the specific level of achievement that is required in a particular performance measure or metric. Its purpose is to establish the performance objective of a measure or action, achievement of which indicates the action has been successful.

The following principles should be used to guide the development of performance measures and standards:

- Performance measures and standards would be developed with consideration for impacts of habitat, harvest, hatchery, and hydropower actions (the Four Hs), particularly on wild stocks.
- Performance measures and standards would be defined for all Hs.
- Performance standards for actions in each H could be based on the relative contribution to improved survival.
- Performance standards would be adjusted over time to reflect success or failure in achieving recovery.

NEXT STEPS

The Federal Caucus is now talking with key stakeholders about these draft options and alternatives. In the next two months, the draft Four-H report will be readied for public distribution.

In the months to come, the agencies that make up the Federal Caucus will be asking for public comment on the report and the options it presents. Beginning in February 2000, public meetings will be held throughout the region. The Northwest Power Planning

Council has agreed to participate in this public process so that the Multi-Species Framework alternatives may be discussed at the same time. In addition, individual federal agencies will invite comments on other related federal processes including: the Snake River Feasibility Environmental Impact Statement; the Interior Columbia Basin Ecosystem Management Program (ICBEMP) EIS; and NMFS' ESA Section 7 consultation on operation and configuration of the FCRPS and its Draft Biological Assessment.