

Appendix A: The Columbia River Basin Fish and Wildlife Program

The 2000 Fish and Wildlife Program is the fifth revision of the Columbia River Basin Fish and Wildlife Program since the NPCC adopted its first program in November 1982. This time, as in the series of program amendments between 1991 and 1995, the program is being revised in phases. Unlike past versions of the program, which were criticized by scientists for consisting primarily of a number of measures that called for specific actions without a clear, program-wide foundation of scientific principles, the 2000 version of the program expresses goals and objectives for the entire basin based on a scientific foundation of ecological principles.

The 2000 NPCC Fish and Wildlife Program marks a significant departure from past versions, which consisted primarily of a collection of measures directing specific activities. The 2000 Program establishes a basin-wide vision for fish and wildlife — the intended outcome of the program — along with biological objectives and action strategies that are consistent with the vision. Ultimately, the program will be implemented through subbasin plans (including this Intermountain Province subbasin plan) developed locally in the more than 50 tributary subbasins of the Columbia and amended into the program by the NPCC. Those plans will be consistent with the basin-wide vision and objectives in the program, and its underlying foundation of ecological science.

Vision for the Columbia River Basin

The vision is the outcome intended for this program. Actions taken at the basin, province, and subbasin levels should be consistent with, and designed to fulfill, this vision. Thus, this vision guides the choice of biological objectives and, in turn, the selection of strategies.

The Overall Vision for the Fish and Wildlife Program

The vision for this program is a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects to fish and wildlife caused by the development and operation of the Federal Columbia River Power System (FCRPS) and providing the benefits from fish and wildlife valued by the people of the region.

This ecosystem should provide abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest. The Plan should enhance the conditions that allow for the recovery of the fish and wildlife affected by the operation of the hydrosystem and listed under the Endangered Species Act.

Wherever feasible, this program will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin. In those places where existing development make this locally feasible, other methods that are compatible with naturally reproducing fish and wildlife populations will be used. Where impacts have irrevocably changed the ecosystem, the program will

protect and enhance the habitat and species assemblages compatible with the altered ecosystem. Actions taken under this program must be cost-effective and consistent with an adequate, efficient, economical and reliable electrical power supply as defined by the Northwest Power Act.

Specific Planning Assumptions

As part of this vision, the NPCC also adopts the following policy judgments and planning assumptions for the fish and wildlife program.

- No single activity is sufficient to recover and rebuild fish and wildlife species in the Columbia River Basin. Successful protection, mitigation, and recovery efforts must involve a broad range of strategies for habitat protection and improvement, hydrosystem reform, artificial production, and harvest management.
- The Bonneville Power Administration should make available sufficient funds to implement measures in the program in a timely fashion.
- This is a habitat-based program, rebuilding healthy, naturally producing fish and wildlife populations by protecting, mitigating, and restoring habitats and the biological systems within them, including anadromous fish migration corridors. Artificial production and other non-natural interventions should be consistent with the central effort to protect and restore habitat and avoid adverse impacts to native fish and wildlife species.
- Management actions must be taken in an adaptive, experimental manner because ecosystems are inherently variable and highly complex. This includes using experimental designs and techniques as part of management actions, and integrating monitoring and research with those management actions to evaluate their effects on the ecosystem.
- Actions to improve juvenile and adult fish passage through mainstem dams, including fish transportation actions and capital improvement measures, should protect biological diversity by benefiting the range of species, stocks and life-history types in the river, and should favor solutions that best fit natural behavior patterns and river processes, while maximizing fish survival through the projects. Survival in the natural river should be the baseline against which to measure the effectiveness of other passage methods.
- For the purpose of planning for this fish and wildlife program, and particularly the hydrosystem portion of the program, the NPCC assumes that, in the near term, the breaching of the four federal dams on the lower Snake River will not occur. However, the NPCC is obliged under law to revise its fish and wildlife program every five years, at a minimum. If, within that five-year period, the status of the lower Snake River dams or any other major component of the Federal Columbia River Power System has changed, the NPCC can take that into account as part of the review process.
- Mainstem hydrosystem operations and fish passage efforts should be directed at re-establishing natural river processes where feasible and consistent with the NPCC's responsibility for maintaining an adequate, efficient, economical, and reliable power supply.

- The effect of ocean habitat on salmonid species should be considered in evaluating freshwater habitat management to understand all stages of the salmon and steelhead life cycle.
- Systemwide water management, including flow augmentation from storage reservoirs, should balance the needs of anadromous species with those of resident fish species in upstream storage reservoirs so that actions taken to advance one species do not unnecessarily come at the expense of other species.
- There is an obligation to provide fish and wildlife mitigation where habitat has been permanently lost due to hydroelectric development. Artificial production of fish may be used to replace capacity, bolster productivity, and alleviate harvest pressure on weak, naturally spawning resident and anadromous fish populations. Restoration of anadromous fish into areas blocked by dams should be actively pursued where feasible.
- Artificial production actions must have an experimental, adaptive management design. This design will allow the region to evaluate benefits, address scientific uncertainties, and improve hatchery survival while minimizing the impact on, and if possible benefiting, fish that spawn naturally.
- Harvest can provide significant cultural and economic benefits to the region, and the program should seek to increase harvest opportunities consistent with sound biological management practices. Harvest rates should be based on population-specific adult escapement objectives designed to protect and recover naturally spawning populations.
- Achieving the vision requires that habitat, artificial production, harvest, and hydrosystem actions are thoughtfully coordinated with one another. There also must be coordination among actions taken at the subbasin, province, and basin levels, including actions not funded under this program. Accordingly, creating an appropriate structure for planning and coordination is a vital part of this program.

Scientific Foundation and Principles

The scientific foundation reflects the best available scientific knowledge. The scientific principles summarize this knowledge at a broad level. The actions taken at the basin, province, and subbasin levels to fulfill the vision should be consistent with, and based upon, these principles.

Purpose of the Scientific Foundation

In developing a program to fulfill the vision statement above, the NPCC is relying on the best available scientific knowledge. While the vision is a policy choice about what the program should accomplish, the scientific foundation describes our best understanding of the biological realities that will govern how this is accomplished. The program can succeed only as it recognizes these realities and builds upon them.

Thus, the scientific foundation is the basis for the working hypotheses that underlie this program. It also provides specific guidance for program measures. For example, the strategies for the use of artificial production are an application of the scientific foundation to the use of hatcheries for raising fish within the Columbia River Basin.

The scientific foundation consists of the scientific principles, a detailed discussion of those principles, the geographic structure of the program, and a set of more specific scientific rules and hypotheses. Only the scientific principles and the geographic structure appear in this volume of the program; the remainder of the foundation is in the Technical Appendix for the 2000 Fish and Wildlife program.

The rules and hypotheses in the Technical Appendix will change over time in response to new scientific information. These rules and hypotheses will continue to be evaluated as the program is implemented and will be revised as needed.

In contrast, the scientific principles below are intended to be relatively fixed points of reference. Although scientific knowledge will improve over time, modification of the principles should occur only after due scientific deliberation. The NPCC charges the Independent Scientific Advisory Board with the primary role in reviewing and recommending modifications to the scientific principles in the future prior to any major revision of this program.

Scientific Principles

As part of the scientific foundation, the program recognizes eight principles of general application. It is intended that all actions taken to implement this program be consistent with these principles.

The scientific principles are grounded in established scientific literature to provide a stable foundation for the NPCC's program. A more detailed discussion of the implications of these principles, together with citations to the supporting references, is included in the Technical Appendix of the 2000 Fish and Wildlife Program.

Principle 1. The abundance, productivity and diversity of organisms are integrally linked to the characteristics of their ecosystems. The physical and biological components of ecosystems together produce the diversity, abundance and productivity of plant and animal species, including humans. The combination of suitable habitats and necessary ecological functions forms the ecosystem structure and conditions needed to provide the desired abundance and productivity of specific species.

Principle 2. Ecosystems are dynamic, resilient and develop over time. Although ecosystems have definable structures and characteristics, their behavior is highly dynamic, changing in response to internal and external factors. The system we see today is the product of its biological, human and geological legacy. Natural disturbance and change are normal ecological processes and are essential to the structure and maintenance of habitats.

Principle 3. Biological systems operate on various spatial and time scales that can be organized hierarchically. Ecosystems, landscapes, communities and populations are usefully described as hierarchies of nested components distinguished by their appropriate spatial and time scales. Higher-level ecological patterns and processes constrain, and in turn reflect, localized patterns and processes. There is no single, intrinsically correct

description of an ecosystem, only one that is useful to management or scientific research. The hierarchy should clarify the higher-level constraints as well as the localized mechanisms behind the problem.

Principle 4. Habitats develop, and are maintained, by physical and biological processes. Habitats are created, altered and maintained by processes that operate over a range of scales. Locally observed conditions often reflect more expansive or non-local processes and influences, including human actions. The presence of essential habitat features created by these processes determines the abundance, productivity and diversity of species and communities. Habitat restoration actions are most effective when undertaken with an understanding and appreciation of the underlying habitat-forming processes.

Principle 5. Species play key roles in developing and maintaining ecological conditions. Each species has one or more ecological functions that may be key to the development and maintenance of ecological conditions. Species, in effect, have a distinct job or occupation that is essential to the structure, sustainability and productivity of the ecosystem over time. The existence, productivity and abundance of specific species depend on these functions. In turn, loss of species and their functions lessens the ability of the ecosystem to withstand disturbance and change.

Principle 6. Biological diversity allows ecosystems to persist in the face of environmental variation. The diversity of species, traits and life histories within biological communities contributes to ecological stability in the face of disturbance and environmental change. Loss of species and their ecological functions can decrease ecological stability and resilience. It is not simply that more diversity is always good; introduction of non-native species, for example, can increase diversity but disrupt ecological structure. Diversity within a species presents a greater range of possible solutions to environmental variation and change. Maintaining the ability of the ecosystem to express its own species composition and diversity allows the system to remain productive in the face of environmental variation.

Principle 7. Ecological management is adaptive and experimental. The dynamic nature, diversity, and complexity of ecological systems routinely disable attempts to command and control the environment. Adaptive management — the use of management experiments to investigate biological problems and to test the efficacy of management programs — provides a model for experimental management of ecosystems. Experimental management does not mean passive "learning by doing," but rather a directed program aimed at understanding key ecosystem dynamics and the impacts of human actions using scientific experimentation and inquiry.

Principle 8. Ecosystem function, habitat structure and biological performance are affected by human actions. As humans, we often view ourselves as separate and distinct from the natural world. However, we are integral parts of ecosystems. Our actions have a pervasive impact on the structure and function of ecosystems, while at the same time, our health and well-being are tied to these conditions. These actions must be managed in ways that protect and restore ecosystem structures and conditions necessary for the

survival and recovery of fish and wildlife in the basin. Success depends on the extent to which we choose to control our impacts so as to balance the various services potentially provided by the Columbia River Basin.

Biological Objectives

The biological objectives describe the conditions that are needed to reach the vision, consistent with the scientific principles. The program fulfills the vision by achieving these objectives.

Basin Level Biological Objectives

Biological objectives describe physical and biological changes needed to achieve the vision, based on the information we now have and thereby fulfill the vision. Biological objectives have two components: (1) biological performance, describing responses of populations to habitat conditions, described in terms of capacity, abundance, productivity and life history diversity, and (2) environmental characteristics, which describe the environmental conditions or changes sought to achieve the desired population characteristics. Where possible, biological objectives are intended to be empirically measurable and based on an explicit scientific rationale. Objectives at the basin level are more qualitative, but objectives should become increasingly quantitative and measurable at the province and subbasin levels. These basin-wide objectives will help determine the amount of change needed across the basin to fulfill the vision. They will also help determine the cost effectiveness of program strategies, and provide a basis for monitoring, evaluation and accountability.

The NPCC will establish specific biological objectives at the province level and in subbasin plans identifying the changes needed in characteristics of the environment and target populations. The program provides the following biological objectives at the basin level.

Objectives for Biological Performance

The NPCC recognizes that significant losses of anadromous fish, resident fish, and wildlife and their habitats have occurred as a result of the development and operation of the hydrosystem. To be consistent with the Power Act, these losses establish the underlying basis for population objectives for the program as a whole. Collectively, specific biological objectives should represent what is considered to be mitigation for losses under the program.

Anadromous Fish Losses

The NPCC recognizes that the scientific basis for biological objectives is not certain and will shift over time as our knowledge improves. Further, we expect to learn a great deal through the process of developing subbasin plans. The NPCC intends to review, and if necessary, revise these objectives in the course of adopting subbasin plans in a subsequent amendment process. On an interim basis, until subbasin plans identify actual targets, the NPCC adopts the following regional objectives for anadromous fish:

Halt declining trends in salmon and steelhead populations above Bonneville Dam by 2005. Obtain the information necessary to begin restoring the characteristics of healthy lamprey populations.

Restore the widest possible set of healthy naturally reproducing populations of salmon and steelhead in each relevant province by 2012. Healthy populations are defined as having an 80 percent probability of maintaining themselves for 200 years at a level that can support harvest rates of at least 30 percent.

Increase total adult salmon and steelhead runs above Bonneville Dam by 2025 to an average of 5 million annually in a manner that supports tribal and non-tribal harvest. Within 100 years achieve population characteristics that, while fluctuating due to natural variability, represent on average full mitigation for losses of anadromous fish.

Substitution for Anadromous Fish Losses

Part of the anadromous fish losses has occurred in the blocked areas. (The Intermountain Province is wholly within the blocked areas). A corresponding part of the mitigation for these losses must occur in those areas. The program has a "Resident Fish Substitution Policy" for areas in which anadromous fish have been extirpated.

Given the large anadromous fish losses in the blocked areas, these actions have not mitigated these losses. The following objectives address anadromous fish losses and mitigation requirements in all blocked areas:

Restore native resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where original habitat conditions exist and where habitats can be feasibly restored.

Take action to reintroduce anadromous fish into blocked areas, where feasible.

Administer and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery-reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near historic abundance (includes intensive fisheries within closed or isolated systems).

Resident Fish Losses

The development and operation of the hydrosystem has also resulted in losses of numbers and diversity of native resident fish, such as bull trout, cutthroat trout, kokanee, white sturgeon and other species. The following objectives address resident fish losses:

Complete assessments of resident fish losses throughout the basin resulting from the hydrosystem, expressed in terms of the various critical population characteristics of key resident fish species.

Maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystem elements to ensure the continued persistence, health and diversity of all species including game fish species, non-game fish species, and other organisms.

Protect and expand habitat and ecosystem functions as the means to significantly increase the abundance, productivity, and life history diversity of resident fish at least to the extent that they have been affected by the development and operation of the hydrosystem.

Achieve population characteristics of these species within 100 years that, while fluctuating due to natural variability, represent on average full mitigation for losses of resident fish.

Wildlife Losses

Development and operation of the hydrosystem also resulted in wildlife losses through construction and inundation losses, direct operational losses or through secondary losses. The program has included measures and implemented projects to obtain and protect habitat units in mitigation for these calculated construction/inundation losses. Operational and secondary losses have not been estimated or addressed. The program includes a commitment to mitigate for these losses. More specific wildlife objectives are:

Quantify wildlife losses caused by the construction, inundation, and operation of the hydropower projects.

Develop and implement habitat acquisition and enhancement projects to fully mitigate for identified losses. Coordinate mitigation activities throughout the basin and with fish mitigation and restoration efforts, specifically by coordinating habitat restoration and acquisition with aquatic habitats to promote connectivity of terrestrial and aquatic areas.

Maintain existing and created habitat values.

Monitor and evaluate habitat and species responses to mitigation actions.

Objectives for Environmental Characteristics

Basin level environmental characteristics describe the kinds of changes that are needed across the Columbia Basin to achieve the changes in biological performance described earlier. Again, the intent is to achieve the vision and allow for mitigation under the Power Act for the fish and wildlife losses resulting from the development and operation of the hydrosystem. The NPCC is including in the Appendix of this program a provisional set of environmental characteristic objectives for the basin level.

The NPCC directs the Independent Scientific Advisory Board to review the basin level environmental characteristics in the Appendix by June 2001. The Independent Scientific Advisory Board should report to the NPCC on the scientific soundness and basin-wide applicability of the environmental characteristics, as well as their utility for further defining biological objectives at the province and subbasin levels. As part of its review,

the Independent Scientific Advisory Board should consider and report to the NPCC on the applicability of these objectives in the most altered areas of the basin, the blocked areas.

The NPCC will make the Independent Scientific Advisory Board's report publicly available and seek views and comment from interested parties. The NPCC will consider the report of the Independent Scientific Advisory Board and the views and comments of others on the report, and will confirm or revise these basin level objectives for environmental characteristics for purposes of providing guidance for subbasin level planning and further program amendments.

Further Development of Biological Objectives at the Basin Level

Biological objectives, comprising both biological performance and environmental characteristic standards, will be established at the province level and subbasin level (in subbasin plans) in subsequent program amendments. However, the efforts at assessment and planning that will precede the formal adoption of province and subbasin level biological objectives may further inform the basin level objectives adopted here.

This is possible in two primary ways. First, assessment and planning at these levels should test the validity of the general basin level biological objectives, as previously described. Second, assessment and planning at these levels may identify more specific, quantified biological objectives for the program as a whole. Examples might include abundance and performance objectives for fish populations that transcend more than one province, specific program-wide objectives for improvement in certain habitat types, and specific objectives for water management and coordinated operation of the hydrosystem to benefit fish and wildlife.

More specific basin-wide objectives could help determine the amount of change needed across the basin to fulfill the vision. They will also help determine the cost-effectiveness of program strategies and provide a basis for monitoring, evaluation, and accountability. These more specific objectives will be considered as guidance for subbasin planning, and for adoption when the NPCC considers adoption of province level biological objectives and subbasin plans.

Significance of Objectives and Strategies

These objectives and the strategies that follow are to be used as guidance for developing province and subbasin plans, as the basis for development of more specific objectives, and as a basis for NPCC recommendations to the Bonneville Power Administration regarding project funding. Proposed measures will be evaluated for consistency with these objectives and strategies. A primary function of the monitoring and evaluation components of this program is to measure progress toward achieving these objectives. All province and subbasin plans must be consistent with these objectives.

Strategies

Strategies are plans of action to accomplish the biological objectives. In developing strategies, the program takes into account not only the desired outcomes, but also the physical and biological realities expressed in the scientific foundation.

This program anticipates that detailed plans, consistent with the biological objectives, will be developed locally for each of the more than 50 subbasins in the Columbia River Basin. This Intermountain Province Plan covers six of these subbasins. Because most of the specific actions will be addressed at the province and subbasin levels, most of the strategies will be developed in subbasin plans such as this one. At the subbasin level, "strategies" will include the particular measures to be implemented within a given subbasin.

Thus, at the basin level, most of the strategies are guidelines for implementation at other levels of the program. However, these strategies also include specific measures for subjects that transcend one or more of the provinces, such as data management, research, monitoring and evaluations.

In general, the purpose of the strategies at the basin level is to allow maximum local flexibility while assuring that subbasin plans follow the best available scientific knowledge, are consistent with one another, and together, form a well-integrated, well-organized, and comprehensive fish and wildlife program.

These strategies are presumed to be applicable to all subbasin plans and projects proposed for funding. This presumption may be overcome by showing, to the satisfaction of the NPCC, compelling reasons why the particular action proposed will be a greater benefit to fish and wildlife than one that is in accordance with these strategies. In addition, in the case of subbasin plans, when a plan proposed for adoption is not consistent with these strategies, the proponent may also propose that these strategies be amended so that the plan will be in compliance. Again, such amendments will require a showing of compelling reasons why the amendment will result in greater benefit to fish and wildlife.

Linkage of General Biological Objectives with Strategies

Because this is a habitat-based program, implementation strategies will vary depending on the current condition and the restoration potential of the habitat for the species and life stages of interest. For example, with regard to fish spawning and rearing in either the mainstem or tributaries, the first consideration in any particular area is the current condition of the habitat for spawning and rearing and the potential for protection or restoration of that habitat for natural production. If the potential for restoring the natural production of the habitat is low, or the biological potential of the target population is low because of survival problems elsewhere in its life cycle, the area may become a candidate for certain types of artificial production.

Intact habitat: Where the habitat for a target population is largely intact, then the biological objectives for that habitat will be to preserve the habitat and restore the

population of the target species up to the sustainable capacity of the habitat. When the biological potential of a target population is high, biological risk should be avoided and restoration should be by means of natural spawning and rearing. When the biological potential of the target population is limited by external factors, such as the presence of mainstem dams or other factors, supplementation is a possible policy choice to augment natural capacity and productivity, in a limited fashion that ensures that the majority of production will be the result of natural spawning.

Restorable habitat: Where the habitat for a target population is absent or severely diminished, but can be restored through conventional techniques and approaches, then the biological objective for that habitat will be to restore the habitat with the degree of restoration depending on the biological potential of the target population. Where the target population has high biological potential, the objective will be to restore the habitat to intact condition, and restore the population up to the sustainable capacity of the habitat. In this situation, if the target population had been severely reduced or eliminated as a result of the habitat deterioration, the use of artificial production in an interim way is a possible policy choice to hasten rebuilding of naturally spawning populations after restoration of the habitat. Where the target population has low biological potential — for example, when downstream rearing conditions severely limit the survival of juveniles from a given spawning area — the objective will be to restore the habitat to intact condition and consider sustained but limited supplementation as a possible policy choice.

Compromised habitat: Where the habitat for a target population is absent or substantially diminished and cannot reasonably be fully restored, then the biological objective for that habitat will depend on the biological potential of the target species. Where the target species has high biological potential, the objective will be to restore the habitat up to the point that the sustainable capacity of the habitat is no longer a significant limiting factor for that population. The objective also is to restore the population of the target species up to the sustainable capacity of the restored habitat. Sustained supplementation in a limited fashion is a possible policy choice in this instance. Where the target species has low biological potential, the objective will be to restore the habitat up to the point that the sustainable capacity of that habitat is no longer a significant limiting factor for that population. In this instance, a possible policy choice is expanded artificial production that utilizes the natural selection capabilities of the natural habitat to maintain fitness of both natural and artificial production.

Eliminated habitat: Where habitat for a target population is irreversibly altered or blocked, and therefore there are no opportunities to rebuild the target population by improving its opportunities for growth and survival in other parts of its life history, then the biological objective will be to provide a substitute. In the case of wildlife, where the habitat is inundated, substitute habitat would include setting aside and protecting land elsewhere that is home to a similar ecological community. For fish, substitution would include an alternative source of harvest (such as a hatchery stock) or a substitution of a resident fish species as a replacement for an anadromous species.

Basin-wide Strategies

The 2000 Fish and Wildlife Program identifies specific strategies to be applied in the Columbia River basin. For more detailed information, see the 2000 Fish and Wildlife Program. The following are the primary strategies that are identified:

Primary Habitat Strategy: Identify the current condition and biological potential of the habitat, and then protect or restore it to the extent described in the biological objectives.

This NPCC Fish and Wildlife program relies heavily on protection of, and improvements to, inland habitat as the most effective means of restoring and sustaining fish and wildlife populations. However, it also recognizes that depending on the condition of the habitat and the target species, certain categories of mitigation investments are likely to be more effective than others. Thus, an important function of this strategy is to direct investments to their most productive applications.

Because some of the greatest opportunities for improvement lie outside the immediate area of the hydrosystem — in the tributaries and subbasins off the mainstem of the Columbia and Snake Rivers — this program seeks habitat improvements outside the hydrosystem as a means of off-setting some of the impacts of the hydrosystem. In addition, protection and restoration of mainstem habitat conditions must be a critical piece of this habitat-based program.

The following principles should be followed:

- Efforts to improve the status of fish and wildlife populations in the basin should protect habitat that supports existing populations that are relatively healthy and productive. Next, we should expand adjacent habitats that have been historically productive or have a likelihood of sustaining healthy populations by reconnecting or improving habitat.
- Restoration efforts must focus on restoring habitats and developing ecosystem conditions and functions that will allow for expanding and maintaining a diversity within, and among, species in order to sustain a system of robust populations in the face of environmental variation.
- Even in degraded or altered environments, native species in native habitats provide the best starting point and direction for needed biological conditions in most cases. Where a species native to that particular habitat cannot be restored, then another species native to the Columbia River Basin should be used. Any proposal to produce or release non-native species must overcome this strong presumption in favor of native species and habitats and be designed to avoid adverse impacts on native species.
- Mitigation in areas blocked to salmon and steelhead by the development and operation of the hydropower system is appropriate, and flexibility in approach is needed to develop a program that provides resident fish substitutions for lost salmon and steelhead where in-kind mitigation cannot occur.

- The estuary is an important ecological feature that is negatively affected by upriver management actions and local habitat change. The estuary will be included as one of the planning units for this program.
- Ecosystem restoration efforts should address transboundary stocks of fish and wildlife and transboundary habitats.

Primary Artificial Production strategy: Artificial production can be used, under the proper conditions, to 1) complement habitat improvements by supplementing native fish populations up to the sustainable carrying capacity of the habitat with fish that are as similar as possible, in genetics and behavior, to wild native fish, and 2) replace lost salmon and steelhead in blocked areas.

The critical issue that the region faces on artificial production is whether artificial production activities can play a role in providing significant harvest opportunities throughout the basin while also acting to protect and even rebuild naturally spawning populations. The NPCC and the region's fish and wildlife managers recently completed a multiyear review of artificial production in the Columbia River Basin. This review established a set of standards to be applied in all artificial production programs in the Columbia River Basin, and this program incorporates these standards as minimum standards for all artificial production projects. The full description of these standards is in the Artificial Production Review section of the Appendix to the 2000 Fish and Wildlife Program. In summary, the policies are:

- The purpose and use of artificial production must be considered in the context of the ecological environment in which it will be used.
- Artificial production must be implemented within an experimental, adaptive management design that includes an aggressive program to evaluate the risks and benefits and address scientific uncertainties.
- Hatcheries must be operated in a manner that recognizes that they exist within ecological systems whose behavior is constrained by larger-scale basin, regional and global factors.
- A diversity of life history types and species needs to be maintained in order to sustain a system of populations in the face of environmental variation.
- Naturally selected populations should provide the model for successful artificially reared populations, in regard to population structure, mating protocol, behavior, growth, morphology, nutrient cycling, and other biological characteristics.
- The entities authorizing or managing an artificial production facility or program should explicitly identify whether the artificial propagation product is intended for the purpose of augmentation, mitigation, restoration, preservation, research, or some combination of those purposes for each population of fish addressed.
- Decisions on the use of the artificial production tool need to be made in the context of deciding on fish and wildlife goals, objectives and strategies at the subbasin and province levels.
- Appropriate risk management needs to be maintained in using the tool of artificial propagation.

- Production for harvest is a legitimate management objective of artificial production, but to minimize adverse impacts on natural populations associated with harvest management of artificially produced populations, harvest rates and practices must be dictated by the requirements to sustain naturally spawning populations.
- Federal and other legal mandates and obligations for fish protection, mitigation, and enhancement must be fully addressed.

Where the critical habitat is largely intact, artificial production is not currently occurring, and the fish population has good potential, then no artificial production should be used.

Hatcheries intended solely to produce fish for harvest may be used to create a replacement for the lost or diminished harvest. The hatchery must be located and operated in a manner that does not lead to adverse effects on other stocks through excessive straying or excessive take of weak stocks in a mixed-stock fishery.

Except for wild salmon refuges or areas where the habitat is blocked or eliminated, supplementation of natural runs with artificially produced fish may be used for the purpose of rebuilding the natural runs, although the decision of whether to employ supplementation for this purpose is one that should be made locally, as part of the subbasin plan. The object of such supplementation is to restore and maintain healthy fish populations, with sufficient genetic and life history diversity to ensure that eventually, after appropriate habitat improvements, they will become self-sustaining.

In recognition of the risk and uncertainty associated with artificial production, each artificial production activity must be approached experimentally with a plan detailing the purpose and method of operation, the relationship to other elements of the subbasin plan, including associated habitat and other projects within the subbasin plan, specific measurable objectives for the activity, and a regular cycle of evaluation and reporting of results.

Over the next three years, every artificial production program and facility in the basin, federal and nonfederal, should undergo a review to determine its consistency with these strategies, scientific principles, and policies. These evaluations will be a prerequisite for seeking continued funding and/or adopting a subbasin plan into the program in the next phase of the amendment process.

After five years, the NPCC, other regional decision-makers and Congress should assess whether existing review, funding and planning processes are successful in implementing needed reforms in artificial production practices. In the interim, the entities responsible for artificial production programs should issue annual reports on their progress in achieving the policies and standards called for in the Artificial Production Review. The NPCC will act as a clearinghouse to obtain, compile, and distribute these annual reports for review by decision-makers and the public.

In order to achieve a regional perspective and a unified approach to artificial production reform, an advisory committee to the NPCC will be created. The advisory committee will

be tasked with reporting quarterly on implementation of artificial production reforms across the basin in a consistent, coordinated and efficient manner.

Harvest strategy: Assure that subbasin plans are consistent with harvest management practices and increase opportunities for harvest wherever feasible.

The NPCC makes no claim to regulatory authority over harvest of fish and wildlife. It recognizes and affirms the fish and wildlife managers' legal jurisdiction and tribal trust and treaty rights. However, there is little point in recommending funding for implementation of a subbasin plan when the objectives for the plan cannot be reached under current harvest regimes. On the other hand, there is also no advantage to increasing fish populations in the interest of greater harvest if the anticipated harvest regimes will not allow that harvest to take place.

Each subbasin plan and hatchery management plan must explicitly describe the expected contribution to harvest for each of the harvested stocks or species. In the case of wildlife, the plan must indicate the area in which the wildlife will be harvested. In the case of fish, the plan must indicate the expected contribution to specific fisheries.

Each subbasin plan and hatchery management plan must state the likelihood that adequate numbers of adults will remain or return to the subbasin to assure reproductive success and meet subbasin goals for the next generation.

Artificially produced fish created for harvest should not be produced unless they can be effectively harvested in a fishery or provide other significant benefits.

Each subbasin plan and hatchery management plan should identify (a) where there is an opportunity for a terminal fishery and (b) any instance in which increased harvest is possible but will not occur under the existing harvest regime, and the changes that would be necessary to allow the harvest to occur.

The NPCC recommends the following practices in harvest management, and will seek to encourage the region's fish and wildlife managers to adopt them:

- Maintain an open and public process, allowing public observation of harvest and allocation discussions and timely dissemination of harvest-related information in a publicly accessible manner.
- Integrate harvest management to assure that conservation efforts made in one fishery can be passed through subsequent fisheries.
- Manage harvest to ensure the risk of imprecision and error in predicted run size does not threaten the survival and recovery of naturally spawning populations.
- Monitor in-river and ocean fisheries and routinely estimate stock composition and stock-specific abundance, escapement, catch, and age distribution. Expand

monitoring programs as necessary to reduce critical uncertainties. Manage data so that it can be easily integrated and readily available in real time.

- Manage harvest consistent with the protection and recovery of naturally spawning populations.
- Biennially, solicit scientific peer review of harvest management plans and analyses, starting in January 2002.

Primary Hydrosystem Passage and Operations strategy: Provide conditions within the hydrosystem for adult and juvenile fish that most closely approximate the natural physical and biological conditions, provide adequate levels of survival to support fish population recovery based in subbasin plans, support expression of life history diversity, and assure that flow and spill operations are optimized to produce the greatest biological benefits with the least adverse effects on resident fish while assuring an adequate, efficient, economical, and reliable power supply.

In April 2003 the NPCC adopted the 2003 Mainstem Amendments to the Columbia Basin Fish and Wildlife Program (Mainstem Plan). The Mainstem Plan contains visions, objectives, and strategies for mainstem hydrosystem operations. The Mainstem Plan vision statement is as follows:

Hydrosystem operations, fish passage efforts, habitat improvement investments and other actions in the mainstem should be directed toward protecting, enhancing, restoring and connecting natural river processes and habitats, especially spawning, rearing, resting and migration habitats for salmon, steelhead, sturgeon and important resident fish populations. This will allow for abundant, productive and diverse fish and wildlife populations. The vision includes providing conditions within the hydrosystem for adult and juvenile fish that: 1) most closely approximate natural physical and biological conditions; 2) support the expression of life history diversity; 3) allow for adequate levels of mainstem survival to support fish population recovery in the subbasins; and 4) ensure that water management operations are optimized to meet the needs of anadromous and resident fish species, including those in upstream storage reservoirs, with the least cost so that actions taken maximize benefits to all species while ensuring an adequate, efficient, economical and reliable power supply. Any system changes needed to achieve these goals must be implemented in such a way and over a sufficient time period to allow the region to make whatever power system adaptations are needed, if any, to maintain an adequate, efficient, economical and reliable power supply.

The biological objectives stated in the 2003 Mainstem Plan are intended to be based on, and consistent with, the biological objectives stated in the 2000 Fish and Wildlife Program.

One of the overarching biological objectives for the program is the recovery of ESA-listed anadromous and resident fish affected by development and operation of the hydrosystem. Federal hydrosystem operations to benefit fish now are focused on listed populations through the 2000 Biological Opinions on the Operation of the Federal

Columbia River Power System from NOAA Fisheries for salmon and steelhead and the U.S. Fish and Wildlife Service for Kootenai white sturgeon and bull trout. Achieving these biological performance standards for listed species as stated in the biological opinions is a key biological objective of the NPCC's program and this mainstem plan.

Under the Northwest Power Act, however, the NPCC has an obligation to protect, mitigate and enhance all of the fish and wildlife of the Columbia Basin affected by the development, operation and management of the hydrosystem. Concern over the listed populations is only one part of the NPCC's broader mandate. And so a goal of the program, as also stated in the overarching objectives of the program framework, is to provide habitat conditions that sustain abundant, productive, and diverse fish and wildlife populations that support the recovery of listed species and abundant opportunities for tribal trust and treaty-right harvest and non-tribal harvest. In addition, the science relating to the rebuilding of Pacific salmon, as incorporated into the objectives and habitat strategies in the 2000 Fish and Wildlife Program, indicates that success in protecting and enhancing abundant and diverse naturally spawning populations of salmon and steelhead and other native fish requires an emphasis on protecting, enhancing, connecting, and restoring habitats and populations that are relatively productive. This is a priority for actions that should be equal to protecting migration and spawning conditions for ESA-listed populations.

Accordingly, the Mainstem Plan emphasizes protecting and restoring mainstem spawning and rearing habitats and populations.

The Mainstem Plan lists detailed program objectives and strategies. For more information about these objectives and strategies, the information is available at <http://www.nwcouncil.org/library/2003/2003-4.htm>

Primary Wildlife strategy: Complete the current mitigation program for construction and inundation losses and include wildlife mitigation for all operational losses as an integrated part of habitat protection and restoration. Primary Ocean Conditions strategy: Identify the effects of ocean conditions on anadromous fish and use this information to evaluate and adjust inland actions.

Some previous versions of this fish and wildlife program have treated wildlife mitigation measures as separate from fish mitigation measures. In the 2000 program, the NPCC has revised its approach, treating a given habitat as an ecosystem that includes both fish and wildlife.

The 1994-1995 Program called upon the fish and wildlife managers and Bonneville to use Table 11-4 from the 1994 – 195 Program as the starting point for wildlife mitigation measures and short- and long-term mitigation agreements. The program also called upon these parties to reach agreement on how wildlife mitigation projects and fish mitigation projects should be credited toward identified losses. A portion of the habitat units identified in Table 11-4 have been acquired in the wildlife mitigation projects to date, and some mitigation project agreements establish the basis on which the project will be credited toward these losses. However, no agreement has been reached on the full extent

of wildlife losses due to the operations of the hydrosystem, nor has there been agreement on how to credit wildlife benefits resulting from riparian habitat improvements undertaken to benefit fish.

The extent of the wildlife mitigation is of particular importance to agencies and tribes in the so-called “blocked” areas, including the IMP, where anadromous fish runs once existed but were blocked by development of the hydrosystem. While there are limited opportunities for improving resident fish in those areas, resident fish substitution alone seldom is an adequate mitigation the NPCC believes that the wildlife mitigation projects should be integrated with the fish mitigation projects.

To provide an orderly transition between the past fish and wildlife program and this program, the NPCC is asking Bonneville and the fish and wildlife managers to complete mitigation agreements for the remaining habitat units. These agreements should equal 200 percent of the habitat units (2:1 ratio) identified as unannualized losses of wildlife habitat from construction and inundation of the federal hydropower system as identified in Table 11-4, which is included in Appendix C of the 2000 Fish and Wildlife Program. This mitigation is presumed to cover all construction and inundation losses, including annualized losses. In addition, for each wildlife agreement that does not already provide for long-term maintenance of the habitat, Bonneville and the applicable management agency shall propose for NPCC consideration and recommendation a maintenance agreement adequate to sustain the minimum credited habitat values for the life of the project.

Habitat acquired as mitigation for lost habitat units identified in Table 11-4 must be acquired in the subbasin in which the lost units were located unless otherwise agreed by the fish and wildlife agencies and tribes in that subbasin.

Habitat enhancement credits should be provided to Bonneville when habitat management activities funded by Bonneville lead to a net increase in habitat value when compared to the level identified in the baseline habitat inventory and subsequent habitat inventories. This determination should be made through the periodic monitoring of the project site using the Habitat Evaluation Procedure (HEP) methodology.

Bonneville should be credited for habitat enhancement efforts at a ratio of one habitat unit credited for every habitat unit gained.

An assessment should be conducted of direct operational impacts on wildlife habitat. Subbasin plans will serve as the vehicle to provide mitigation for direct operational losses and secondary losses. Annualization will not be used in determining the mitigation due for these losses. However, where operational or secondary losses have already been addressed in an existing wildlife mitigation agreement, the terms of that agreement will apply.

Project selection will be guided by subbasin plans incorporating wildlife elements. The subbasin plans will reflect the current basin-wide vision, biological objectives and strategies, and will also outline more specific short-term objectives and strategies for

achieving specific wildlife mitigation goals. The plans will act as work plans for the fish and wildlife managers and tribes, with an emphasis on fully mitigating the construction and inundation and direct operational losses by a time certain, and will be revisited regularly as part of the provincial review cycle. Mitigation programs should provide protection of habitat through fee-title acquisition, conservation easement, lease, or management plans for the life of the project.

Ocean conditions primary strategy: Identify the effects of ocean conditions on anadromous fish and use this information to evaluate and adjust inland actions.

Research, Monitoring, and Evaluation Primary strategies: 1) Identify and resolve key uncertainties for the program; 2) monitor, evaluate, and apply results; and 3) make information from this program readily available.

The intention of the NPCC — and the Northwest Power Act — is for the region to make the best possible choice of actions based on the available information. Thus, lack of perfect information is not grounds for inaction.

The NPCC will establish a basin-wide research plan, similar to the subbasin plans, which identify key uncertainties for this program and its biological objectives and the steps needed to resolve them. The plan will identify major research topics, including ocean research, and establish priorities for research funding.

The research plan will be coordinated with the research elements of the mainstem plan and the subbasin plans. The process for developing the plan and associated budgets will ensure independent scientific review, input from fish and wildlife agencies and tribes, independent scientists, and other interested parties in the region.

All completed research funded by Bonneville will be made readily available to all interested parties through the Internet and a library open to the public.

The NPCC will implement projects to review the current state of the science in key research areas.

The NPCC will initiate a process involving all interested parties in the region to establish guidelines appropriate for the collection and reporting of data in the Columbia River Basin.

Except where these criteria are clearly inapplicable, each project proposed for funding under this program must satisfy the following monitoring and evaluation criteria:

- The project must have measurable, quantitative biological objectives. (Related projects may rely on a single set of biological objectives.)
- The project must either collect or identify data that are appropriate for measuring the biological outcomes identified in the objectives.

- Projects that collect their own data for evaluation must make this data and accompanying metadata available to the region in electronic form. Data and reports developed with Bonneville funds should be considered in the public domain. Data and metadata must be submitted within six months of their collection.
- The methods and protocols used in data collection must be consistent with guidelines approved by the NPCC. Bonneville, in its contracting process, should ensure that each project satisfies these four criteria.

Subbasin plans will contain biological objectives as well as a plan for monitoring and evaluation to assess whether the projects implemented under the subbasin plan are achieving the objectives. The monitoring and evaluation portion of a subbasin plan should 1) identify the monitoring and evaluation tasks related to the objectives; 2) identify who will do the evaluation and on what schedule; 3) explain what kind of independent review will be incorporated if the main part of the monitoring and evaluation will be done by a main participant in the plan implementation; and 4) provide a budget for the monitoring and evaluation work. The project-specific monitoring and evaluation described above should feed information into the subbasin level evaluation.

Program implementation must also include as a system-wide project a program to evaluate whether the individual actions in the various subbasins are achieving the objectives of the program stated at the basin and province levels. The NPCC will work with other relevant parties in the basin to design this program –level monitoring and evaluation program, including describing the evaluation tasks, who will do the work, the possible budget, and the possible use of the independent science panels in assisting with this evaluation effort. The goal should be for the NPCC to produce an annual evaluation report of the success of the program in meeting its objectives.

The NPCC will initiate a process for identifying data needs in the basin, surveying available data, and filling any data gaps. The NPCC will initiate a process for establishing an Internet-based system for the efficient dissemination of data for the Columbia Basin. This system will be based on a network of data sites, such as Streamnet, Northwest Habitat Institute, Fish Passage Center, Columbia River Data Access in Real Time (DART), and others, linked by Internet technology. The functions of each data site, or module, will be clearly articulated and defined.