

Chapter 3

Defining and Deciding on the Alternatives

Description of the Policy Direction Alternatives

Comparing the Policy Directions

Tailoring a Policy Direction

Sample Implementation Actions

CHAPTER 3 — COMPARISON OF ALTERNATIVES

- **Explains how the five alternative Policy Directions were developed** and how decisions on those alternatives can be made.
 - **Identifies the key regional issues** that help to determine the scope of any Policy Direction.
 - **Describes and compares the Policy Directions**, which are based on the many options being discussed and processes underway in the Columbia River Basin. The Policy Directions are compared against the Status Quo (No Action). The comparison is based on the more detailed discussion and analysis in Chapter 5 (Environmental Consequences). **Provides ways for the public and the decisionmaker to tailor Policy Directions** to meet particular needs or desired ends, and to determine potential consequences of those changes.
 - **Provides tables of sample implementation actions** for each Policy Direction.
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Refresher: *The items below are summarized from Chapters 1 and 2 to provide an instant reference for the reader as he or she moves through this important chapter.*

1. *Many Northwest residents appear to support the concept of diverse and healthy populations of fish and wildlife and other valued natural resources. However, regional decisionmakers have been unable to reach agreement on a plan to protect the environment and under which they can all act consistently to implement its measures.*
2. *Conflicting laws and legal mandates have caused inconsistencies in the efforts to take actions to protect and enhance fish and wildlife recovery in the region. The resulting mitigation and recovery policy has not been as coordinated and consistent as BPA needs.*
3. *A unified planning approach appears to be needed, but it is not yet clear what it should or will look like. Many different approaches (including the work on the NMFS and USFWS BiOps) are possible. The resolution lies in the broad acceptance of a comprehensive, consistent, and workable plan more likely to be implemented than other plans at this time.*
4. *Several regional plans and processes are under development to address fish and wildlife mitigation and recovery efforts. These include the following:*
 - *the Council's Multi-Species Framework and Fish and Wildlife Program Amendment Process, which focuses on long-term river management options and conservation of multiple species;*

- *the Federal Caucus and the Conservation of Columbia Basin Fish: Final Basin-wide Salmon Recovery Strategy (Basin-wide Strategy), which will guide those federal actions and interactions with state and local governments and tribes that relate to anadromous fish;*
- *NMFS and USFWS Biological Opinions for fish and wildlife issued under the ESA that will be guided by the Strategy;*
- *salmon (and other species) plans that contribute to these two major processes and that were crafted by the four Northwest states and several of the region's Native American tribes;*
- *the “Recommendations for the Protection and Restoration of Fish in the Columbia River Basin”¹ from the Governors of Idaho, Montana, Oregon, and Washington, which advocates a healthy, functioning ecosystem while preserving a sound economy in the Pacific Northwest.*

The scope of each of these plans and processes as they relate to each other and to this DEIS is shown in Figure 1-3.

5. *BPA, as well as other Federal, State, and local entities, is responsible for funding certain fish and wildlife mitigation actions and recovery efforts that are determined by regional policy decisions.*
6. *BPA is preparing this DEIS now because (a) many stocks of fish and wildlife are already in serious condition and (b) BPA wants to be ready to implement future fish and wildlife mitigation and recovery efforts without delay when a Policy Direction is chosen or changed. This document will provide the necessary NEPA documentation to inform policy-makers and the public of the potential consequences of their choices.*
7. *Now, and in the future, BPA must be prepared to answer specific questions about its actions, compare them against the regional policy decisions, and then determine whether the proposed actions are consistent with the regional Policy Direction being implemented. BPA will proceed with its mission to implement and fund its portion of the fish and wildlife mitigation and recovery effort when it has fully examined these considerations.*
8. *The Federal Caucus, Council, tribal and state plans, and other related processes will help BPA to make a decision. However, these processes did not provide NEPA environmental documentation or process for the full range of alternatives as required by law. Selection of a Policy Direction to begin implementing actions will lead to environmental consequences that must be documented and to potential mitigation for adverse effects that must be discussed. This document intends to provide NEPA coverage for a broad range of possible Policy Directions.*

¹ Governors (2000).

3.1 DEFINING AND DECIDING ON THE ALTERNATIVES

- **This section tells you how we studied the many regional processes and ideas on fish and wildlife recovery efforts, how we defined a range of alternatives as a result, and how we used a qualitative or “relationship” analysis (not specific numbers) to help us compare the alternatives in terms of environmental consequences.**

The action alternatives in this DEIS are framed as *Policy Directions*: unified regional planning approaches that focus on different themes. Themes are characterized by commonly held philosophies, values, and key issues. (One of the alternatives, which represents the existing policy approach [No Action, or Status Quo], does not operate as a unified planning approach).

Policy Direction: *the overarching theme that guides and shapes the decisions made by governments, agencies, or other public bodies regarding fish and wildlife mitigation and recovery efforts, applied through a series of actions that form an implementing plan.*

Each Policy Direction represents a shift toward one of the themes with more actions and more intensive actions taken consistent with that theme, but fewer and less intensive actions not consistent with that theme. The exact actions taken under each Policy Direction, and the precise intensity of those actions, are generally not established at this time. Rather, existing actions not consistent with the Policy Direction, especially those in conflict with the new Direction, would likely be scaled back or eliminated. Actions consistent with the Policy Direction would be specified and analyzed in greater detail before being implemented, as appropriate. Sample Implementation Actions are shown in Section 3A.

There are ethical, political, environmental, legal, and scientific implications to and trade-offs in selecting a particular regional unified planning approach (i.e., Policy Direction) for fish and wildlife recovery. Many questions must be considered: How expensive will our energy be? Where will we be able to live, work and play? Who will have the right to fish? What will happen to our jobs? Science can help evaluate the consequences of different Policy Directions—but resource management issues are ultimately issues of law, policy, and public choice. The question is: how best to arrive at that choice?

It is important to bear in mind that there is no one "best" Policy Direction. “Best” is a value judgment, ultimately a matter of personal preference. However, one may evaluate whether certain actions are more or less likely to bring about certain ends. For instance, if a goal is to improve habitat for fish, then keeping human and animal activity away from a section of riverbank will help riparian vegetation to resprout, will slow erosion into the stream, and will improve the quality of the water in which the fish live. On the other hand, if the goal is to improve the lives of people in the region, there may be

unavoidable trade-offs among groups of people that cannot be reconciled on the basis of factual information alone. Some factual matters can be evaluated where personal values cannot. This DEIS tries to emphasize factual matters, while revealing trade-offs between different resource users.

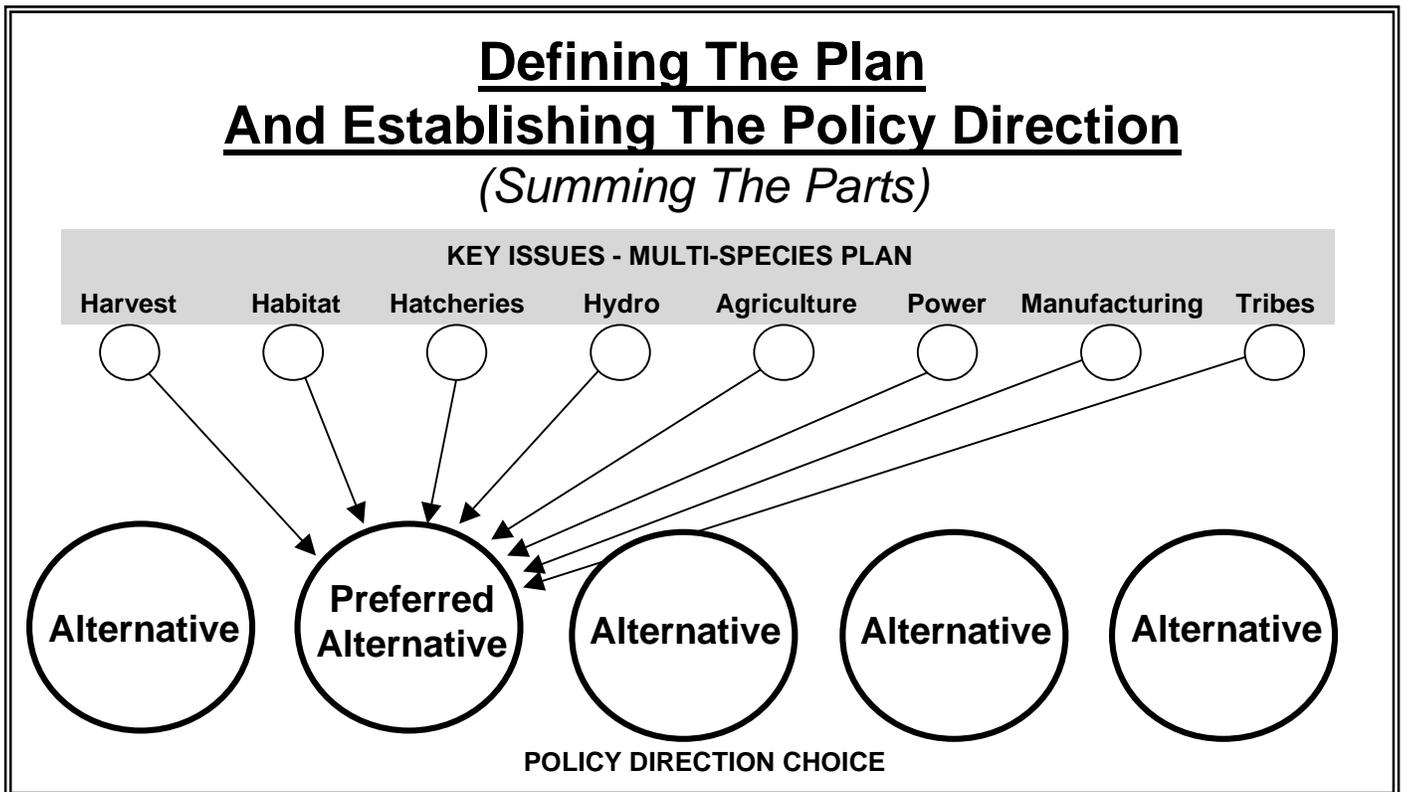
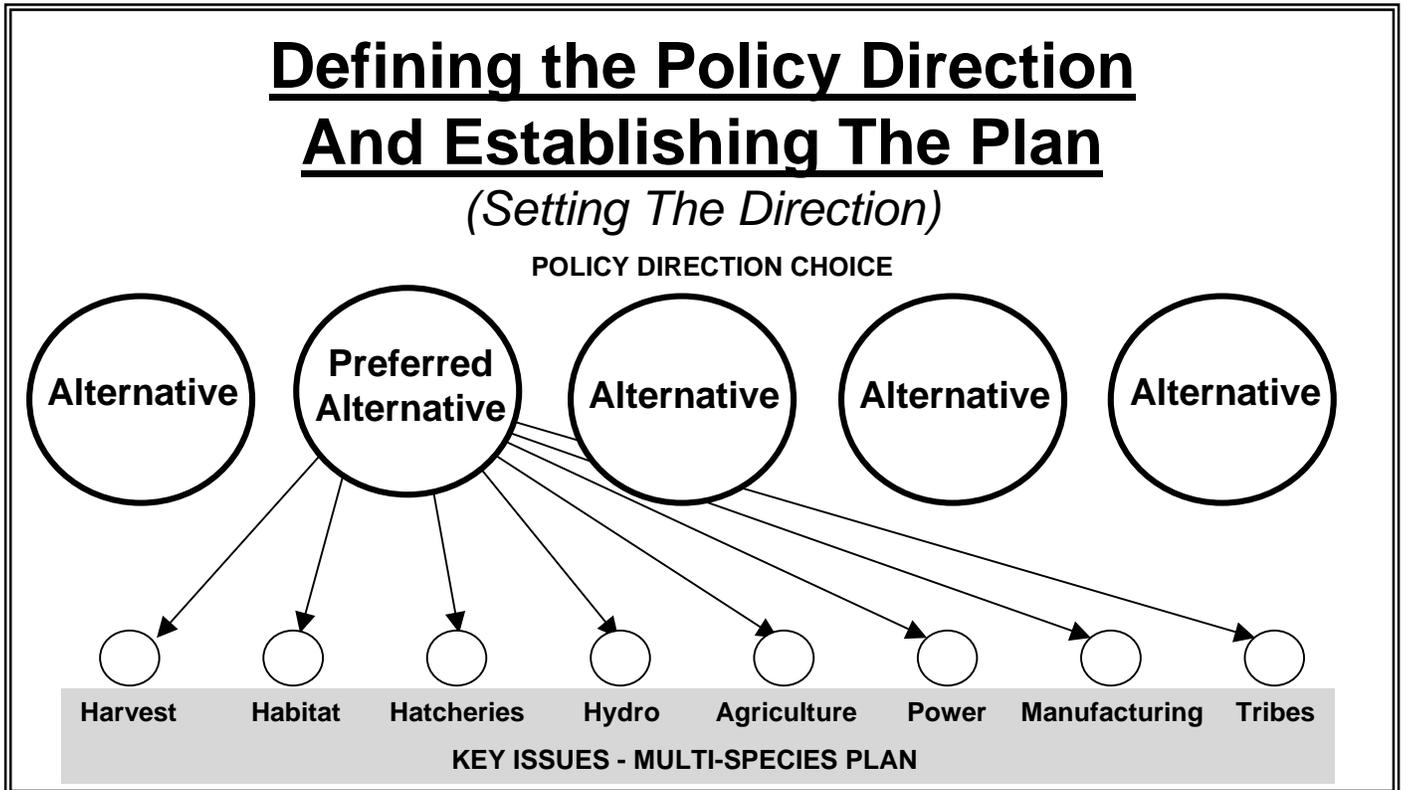
One constraint, however, is legal. There are certain laws that an alternative must meet to be viable. These laws include the ESA, the Regional Act, tribal trust and treaty responsibilities, and the CWA. But this is a forward looking policy-level DEIS. As such, BPA has not limited the analysis to existing conditions or legal authorities. Through scoping, we found many suggestions for alternatives that would require BPA (or others) to receive new legal authority to implement them. If scoping provided suggestions for an alternative that reflected a reasonable, focused, clearly articulated rationale, then we incorporated either that alternative or its actions into this DEIS. Consequently, not all of the alternatives examined are within BPA's current authority to implement. However, this could change if, over time, the applicable laws were to change.

3.1.1 Defining Regional Public Policy

There are two basic ways to define a regional Policy Direction for fish and wildlife recovery efforts: begin with a policy and define the actions to carry it out (policy first) or define the actions and then decide what policy they imply (actions first). Figure 3-1 shows how this would work. For this DEIS, we have identified five broad Policy Directions, plus the Status Quo, that cover the possible Policy Directions from which decisionmakers could choose.

- **Define the Policy First:** One may choose to define the policy first (set the direction), and then use that policy as guidance in setting up an implementation plan of actions to carry it out. This approach would be more likely to achieve consistency among different activities because everyone has to reach agreement on the Policy Direction *first*. Individual groups would have more control over their programs and decisions and the freedom to implement their own action plans as long as those plans are consistent with the overall Policy Direction selected. Only in those less frequent cases when specific group actions came into conflict would coordination with other regional groups be necessary. This would be done only to avoid conflicts and achieve consistency in policy implementation.
- **Define the Actions First:** One may choose to develop a set plan of actions, and then sum up its "parts" to arrive at the Policy Direction. This approach might appear more flexible in terms of accommodating individual efforts now underway. However, it would not have the necessary coordination up front to assure consistency. Groups could tie up a lot of time trying to coordinate very specific, individual decisions; they might end in unresolved conflicts over implementation because so many people with different authorities and perspectives are involved at the action plan level. In fact, the implementing actions could end up at cross-purposes.

Figure 3-1: Different Ways to Establish Policy Direction



This DEIS uses the "policy-first" approach because a coherent, unifying policy is needed to avoid inconsistent sets of actions. Also, the policy-first approach allows the reader to review the large number of possible implementing action plans through a reasonable and manageable number of Policy Directions.

We recognize that regional decisionmakers may not be able to agree upon a unified planning approach: they may instead choose to implement actions independently. By comparing the region's implementation actions with the sample implementation actions (see Section 3A), the Administrator and others may determine *which* of the five Policy Directions (or combinations of Policy Directions) the regional actions most closely resemble. The relationship analysis used in this DEIS (see Section 3.1.6, below) will permit the BPA Administrator to evaluate that Direction and understand the overall environmental consequences of funding and implementing it. Then, BPA can implement a consistent, comprehensive, long-term fish and wildlife program.

EIS alternatives sometimes change unexpectedly as the process is underway or as new information or ideas are presented. This EIS structure allows BPA to address the broadest possible range of alternatives so as to be able to assess the effects of such changes. Such an approach also anticipates changes over time and extends the usefulness of the EIS. (See Chapter 4.)

3.1.2 Source for the Alternatives

To help define the alternative Policy Directions in this DEIS, the many regional processes already underway were evaluated. We closely read the proposals submitted (see Section 1.3.3 and **Appendix D**) by all the major participants (Section 1.3.1), studied the many processes underway (Section 1.3.2) and the key issues, and grouped ideas together by their overall theme. "Sorting" the proposals in this way makes it easier to understand how the different regional processes fit together. Although each regional proposal may represent a unique set of actions, almost all can be categorized as falling generally under one or more major Policy Direction(s) regarding fish and wildlife recovery efforts.

Key issues identify resources and human activities of concern that need to be addressed in considering both actions and environmental consequences. They help to identify both the implementation actions that could be taken under each of the Policy Direction alternatives described in Section 3.2 and the environmental consequences that may result (Section 3.3).

The key issues, which help to determine the questions being addressed by the processes and the shape of the alternative Policy Directions in this DEIS, were first identified during one of these major initial regional processes in November 1998. The Multi-Species Framework held a three-day workshop, meeting with numerous groups from throughout the region to consider fish and wildlife recovery efforts. Participants included representatives from the tribes and from state and federal government, as well as from commercial interests, private interests, and environmental groups. These participants identified numerous key issues as critical for resolution.

Fish and Wildlife Implementation Plan DEIS
Chapter 3: Comparison of Alternatives

As the Framework process continued and the Federal Caucus was formed, more key issues surfaced and the categories were combined and refined. The more-than-three-dozen key regional issues are listed in the table below, divided by area of focus. The issues have been numbered for convenient cross-reference with Section 3A (sample implementation actions) of this chapter.

This EIS is intended to guide implementation and funding of the region's fish and wildlife recovery efforts. Therefore, the actions listed here focus on fish and wildlife. However, these tables also highlight issues unique to commercial groups and tribes. Commercial interests, like federal and state agencies, may take actions in fish and wildlife mitigation and recovery but must also reconcile these efforts with the need to respond to market constraints and pressures. Thus, commercial interests face issues not shared by other participants in fish and wildlife recovery and mitigation efforts. The region's tribes also take actions in fish and wildlife recovery and mitigation, and participate in commercial activities where they face the same economic pressures as non-tribal commercial interests. In addition, tribes ascribe a spiritual significance to fish and wildlife that must be factored into policy decisions by federal and state agencies and commercial interests. Tribal concerns about culture, history, health and sovereignty are directly connected to the condition of the region's fish and wildlife—a relationship unique to tribes and which may generate actions not performed by other groups.

Table 3.2-1: Key Regional Issues

Key Regional Issues		
1 Habitat	4 Hydro	7 Transportation
1-1 Anadromous Fish	4-1 Dam Modifications and Facilities	7-1 Navigation
1-2 Resident Fish	4-2 Hydro Operations	7-2 Trucking, Railroads and Infrastructure
1-3 Introduced Species	4-3 Spill	8 Agriculture
1-4 Wildlife	4-4 Flow	8-1 Irrigation
1-5 Predators of Anadromous Fish	4-5 Reservoir Levels	8-2 Pesticides and Agricultural Practices
1-6 Watersheds	4-6 Water Quality	8-3 Grazing
1-7 Tributaries	4-7 Juvenile Fish Migration and Transport	8-4 Forestry
1-8 Mainstem Columbia	4-8 Adult Fish Passage	9 Commercial Fishing
1-9 Reservoirs	4-9 Flood Control	10 Residential and Commercial Development
1-10 Estuaries	5 Power	11 Recreation
1-11 Water Quality	5-1 Existing Generation	12 Tribes
2 Harvest	5-2 New Energy Resources	12-1 Tribal Harvest
2-1 Anadromous Fish	5-3 Transmission Reliability	12-2 Tradition, Culture, Spirituality

Key Regional Issues		
2-2 Resident Fish	6 Industry	
2-3 Wildlife	6-1 Industrial Development	
3 Hatcheries	6-2 Aluminum and Chemical	
3-1 Anadromous Fish	6-3 Mining	
3-2 Resident Fish	6-4 Pulp and Paper	

3.1.3 Correlating the Alternatives and the Regional Processes

The work of reviewing and extracting from the regional processes and key issues resulted in defining the Status Quo and a range of five alternative Policy Directions along the entire spectrum of potential variations. Such a wide range would ensure a thorough analysis of BPA's fish and wildlife obligations, and would permit BPA and others to act quickly in performing the necessary actions to try to recover fish and wildlife in the region.

Two tests of the usefulness of the five Policy Directions defined for this DEIS are their **comprehensiveness** and **flexibility**.

The alternatives are comprehensive. The Council's Approach, the Multi-Species Framework alternatives and Concept Papers, the Federal Caucus' Conceptual Plan and Basin-wide Strategy, the 2000 Amendments to the Council's Fish and Wildlife Program, the Federal Caucus Options, the 2000 Biological Opinions, the System Operation Review, the Governors' Recommendations, and the tribal and regional plans form an essential and comprehensive database of information and ideas that fed into defining the range of Policy Direction alternatives for this DEIS. Additionally, the more-than-2000 sample implementation actions that accompany each Policy Direction were assembled directly from the proposals and plans generated by the regional processes. Section 3A, at the end of this chapter, shows the actions that might be taken under each of the Policy Directions in this DEIS.

The alternatives are flexible. The Policy Directions and sample implementation actions were designed to be broad enough to accommodate current and future possibilities for fish and wildlife recovery efforts within the Columbia River Basin (including the BPA service territory), across a wide spectrum of issues.

Other ways to approach the analysis could have been selected. However, given the thousands of potential alternative plans for action, we believe that the selected approach and the associated analysis are the most understandable, practical, and reasonable means to accomplish the task.

Figure 3-2 illustrates the general grouping of the major current regional proposals under the Status Quo and each of the five Policy Directions. Note that some proposals may fit under more than one Policy Direction. For more detail on the "shorthand" references in the Figure, please see Section 3A at the end of this Chapter, and **Appendix I**.

3.1.4 Integrating BPA's Decisionmaking Process with the Regional Processes

As noted above, data and information from a wide range of regional plans and processes have been integrated into this analysis and have helped to define the range of Policy directions in this DEIS. Ultimately, BPA will decide which alternative will guide the implementation and funding of its fish and wildlife mitigation and recovery efforts. However, this decision will not be made in a vacuum. Comments and guidance from other federal and state agencies, tribes, interest groups and the general public will be critical in this process. (Figure 3-3 shows how BPA's decisionmaking is integrated into regional processes.) A fundamental purpose for selecting one of the new policy directions is to promote coordinated, efficient and consistent fish and wildlife mitigation and recovery efforts by considering potential actions in relationship to an overarching policy. Nevertheless, the Status Quo alternative approach remains a reasonable alternative.

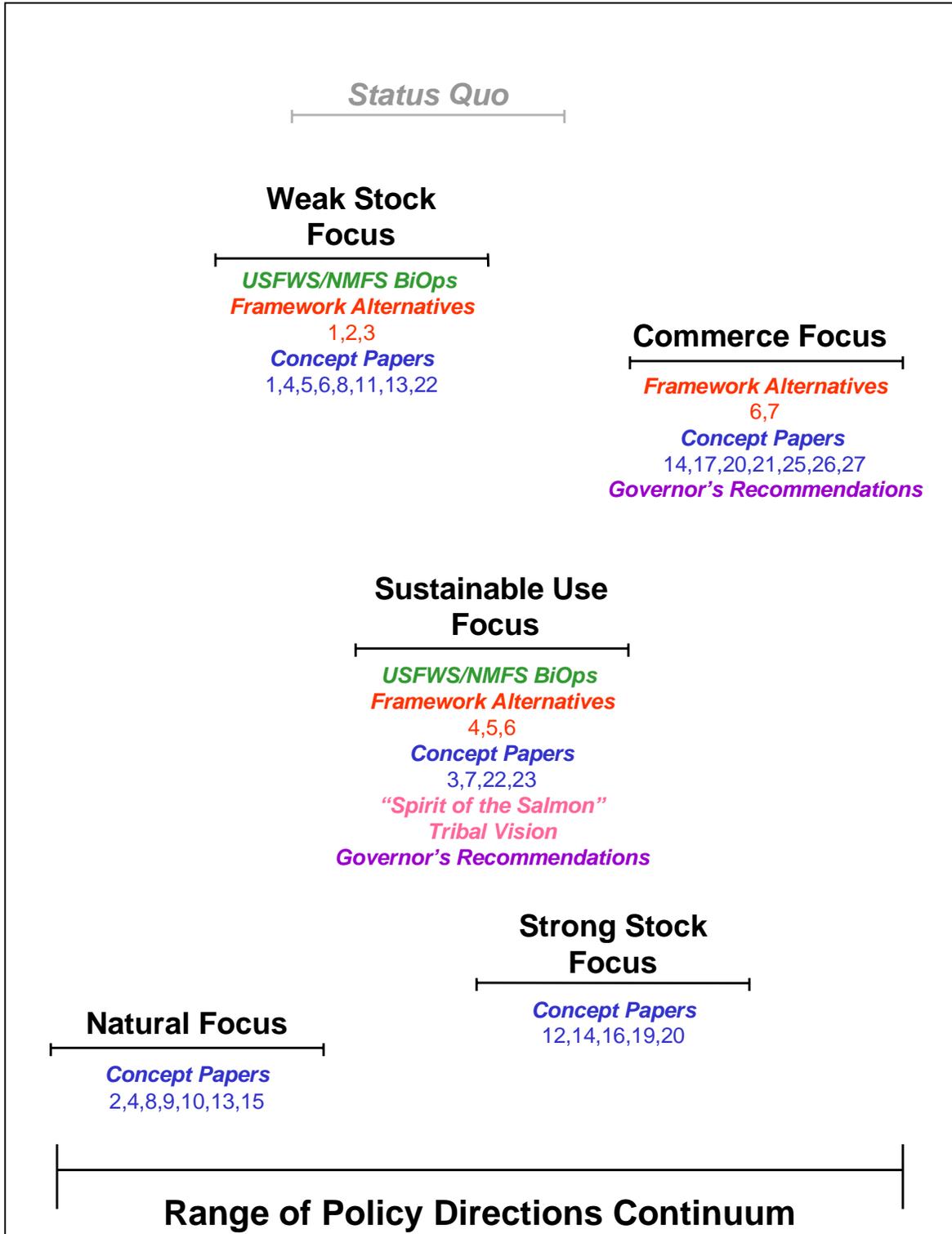
The draft EIS does not propose a preferred alternative because BPA wants to present all options equally at this time to promote creative public discourse on each of the Policy Directions. BPA is seeking suggestions for new alternatives or alternatives blended from the five Policy Directions that the reader thinks may better meet our needs. The Administrator will consider the blended options and reflect on these alternatives when making the initial policy level decision and in any future decision-making process. Obviously, the need to avoid jeopardizing listed species is critical, as is mitigating for fish and wildlife losses in a manner consistent with the Council's program. This DEIS demonstrates, however, that there are many other highly important resources affected by any Policy Direction BPA might take. Choosing a preferred alternative at this time could dampen or skew the dialogue that BPA desires in order to make a fully informed decision at the conclusion of this NEPA process. Therefore, BPA will not identify a preferred alternative until it prepares the final EIS.

3.1.5 From Definition to Comparison

There are many ways to characterize and compare alternative Policy Directions. The end goal is to be able to compare the environmental consequences associated with each (Chapter 5), and to see how each alternative matches up with the purposes (Chapter 1). Figure 3-4 shows how we went through each step, from analyzing the regional ideas to generating the alternatives to comparing and evaluating them (reading left to right):

- First, we synthesized the Status Quo and five broad Policy Direction themes from the key issues and proposals in regional processes, such as the Multi-Species Framework Alternatives and the Federal Caucus Options (see Table 3.2-1 and Section 3.12).
- Then, we developed a set of sample implementation actions from the many regional proposals that matched the theme for each Policy Direction (see Section 3A, which follows this chapter).
- Next, we assessed these actions to determine the environmental consequences that might result from their implementation. We compared each Policy Direction to

Figure 3-2: Illustration of Integrating Major Focus of Regional Alternatives and Policy Directions



NOTE: The positions of the different Policy directions is illustrative only. The intent of this diagram is to help people understand that each Policy Direction is not just a point on a continuum, but rather just a smaller continuum of more focused actions that may overlap other Policy Directions in some cases.

Figure 3-3: Understanding the Integration of BPA Decisions In the Regional Policy and Decision Making

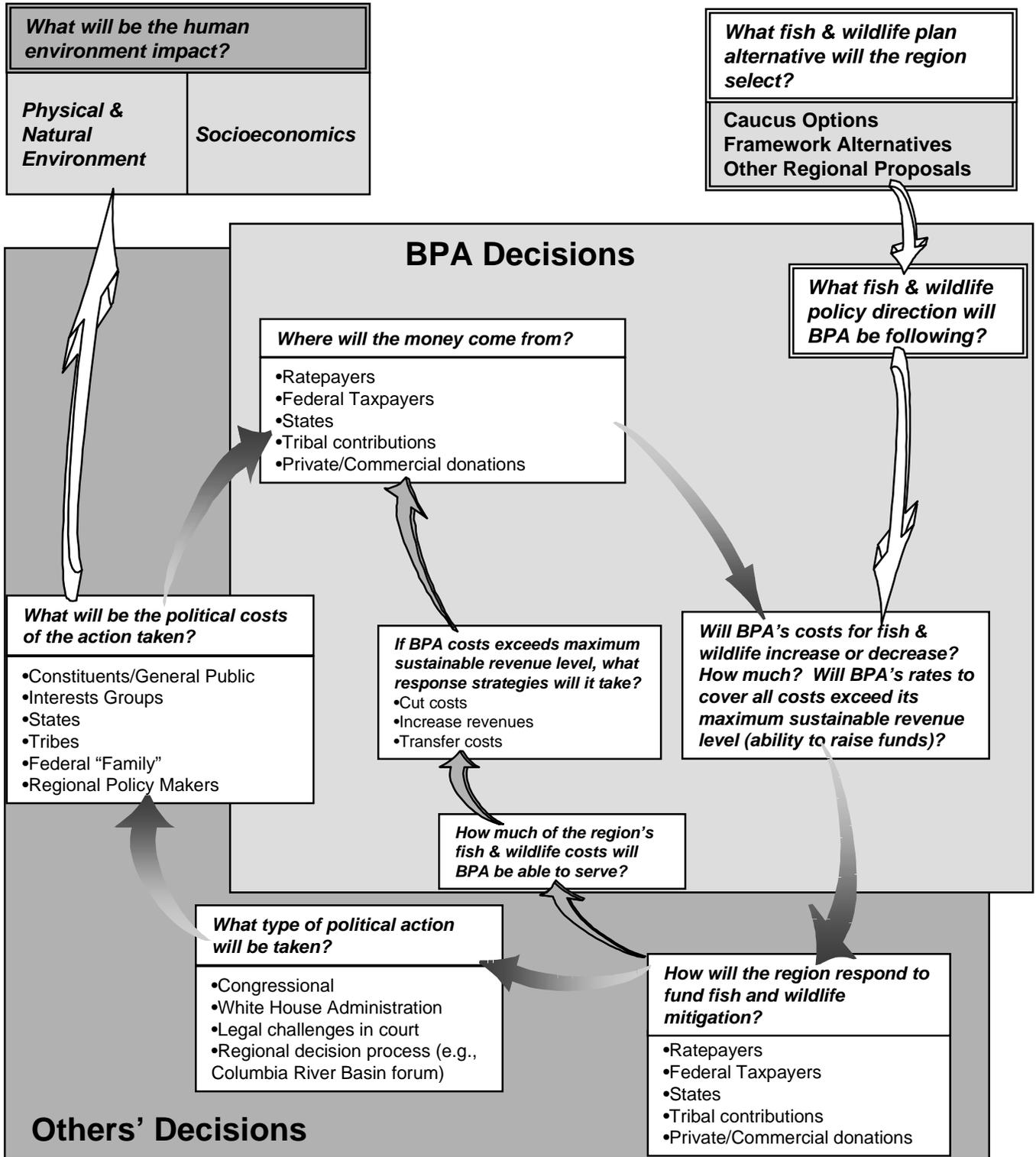
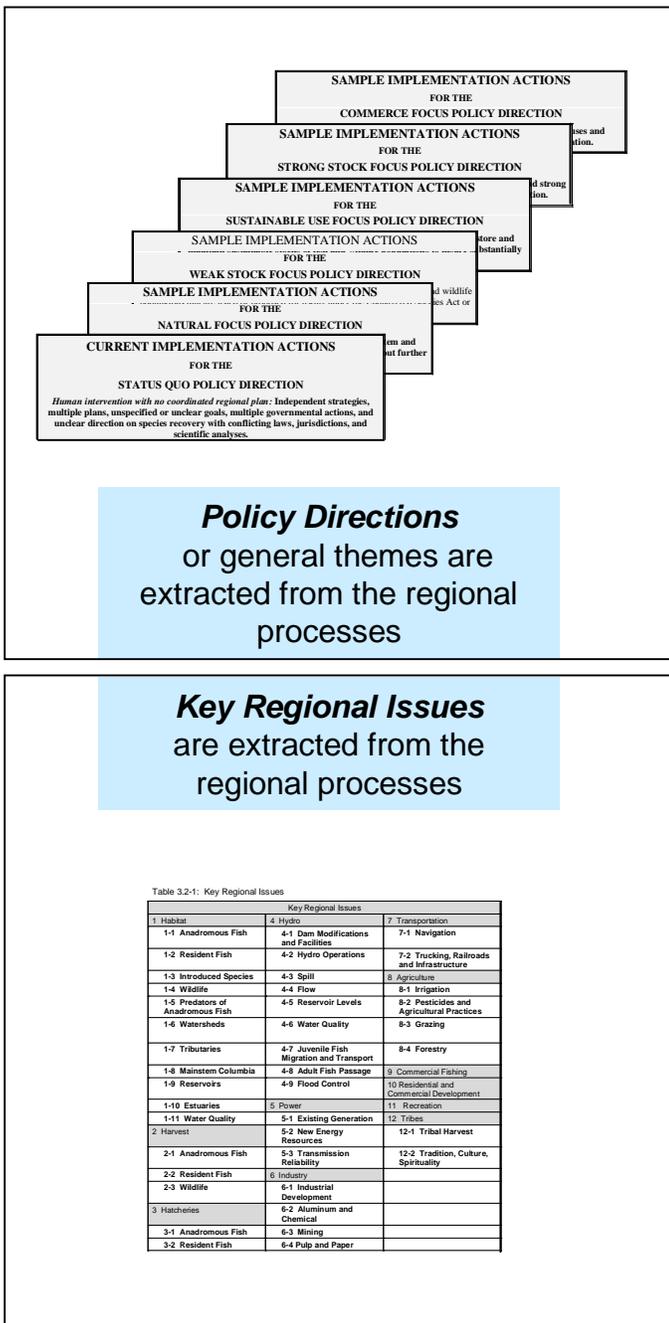


Figure 3-4: Development of Environmental Consequences



SAMPLE IMPLEMENTING ACTIONS TABLES

SAMPLE IMPLEMENTING ACTIONS TABLES

STATUS QUO POLICY DIRECTION
Human intervention with no coordinated regional plan: Independent strategies, multiple plans, unspecified or unclear goals, multiple governmental actions, and unclear direction on species recovery with conflicting laws, jurisdictions, and scientific analyses.

FISH & WILDLIFE

HABITAT

Under the Northwest Power Act, Bonneville is required to protect, mitigate and enhance the fish and wildlife affected by the development and operation of the federal hydro-power projects on the Columbia River and its tributaries. The agency is obligated to provide treatment for fish and wildlife that is compatible with other project purposes. Bonneville must take into account, to the extent fully practicable, the Fish and Wildlife Program that the Northwest Power Planning Council adopts and recommends. Tribal, state, and federal fish and wildlife resources agencies, local governments, universities, watershed councils, and individuals recommend the Fish and Wildlife Program actions.

The budget for the Program (about \$1.7 billion annually) is divided into three general categories: anadromous fish projects (approximately 70 percent of the budget); resident fish and wildlife projects (about 15 percent of the annual budget); and anadromous fish habitat work (about 15 percent of the budget).

Projects funded by the Program address the array of possible mitigation actions, including:

- Research projects, marking and tagging projects, monitoring and evaluation projects, and projects that develop new technology useful for monitoring and evaluation.
- A wide array of habitat improvement projects, including screening water diversions, replacing temporary irrigation dams with alternative fish friendly structures, fencing projects, water development projects, vegetative planting and plant control, and environmental monitoring, and evaluation projects.
- Land and water acquisitions, conservation easements, minimum groupings improvements, predator control actions, facilities construction and operations and maintenance (O&M) actions, and watershed coordination.
- Special provisions are applied for the protection and management of critical habitat supporting species listed under the ESA.
- Enforcement of existing laws that provide for the protection of fish and wildlife and their habitat.

While different federal agencies administer different lands, and federal lands are subject to multiple mandates and demands, the fact that they are owned by a single entity means that federal lands can be more amenable to integrated habitat management. Particularly since 1993, when the Northwest Forest Plan was adopted, federal agencies have taken important steps toward a common vision of land management. Habitat management has emerged as a shared landscape, and watershed-level approaches that address broad ecosystem issues in the Basin, including the decline of salmon and other species, poor forest health leading to catastrophic fires, and the expansion of invasive weeds on degraded riparianity.

The tribal viewpoint encompasses the need to take actions that restore habitat to levels that support not only the listing of species under the ESA, but also the maintenance of sustainable, harvestable fish runs and wildlife throughout widespread areas of the basin.

On non-federal lands, there are a number of federal and state programs that provide incentives, particularly financial and technical assistance, to help land and water users protect and restore aquatic and terrestrial habitat.

Sample implementing actions are given for each of the Key Issues to illustrate the Policy Direction theme. See Chapter 3, Section 3A

Figure 3-4: Development of Environmental Consequences (cont.)

Sample Implementing Actions to
**ENVIRONMENTAL
CONSEQUENCES**
TABLE

Environmental
Consequences

Table 5.3-1B: Air Effects across the Policy Directions (Detail)

EFFECT AREA: AIR (POLLUTION) More pollution = worse	
Existing Conditions	Existing conditions of concern are mostly by-products of combustion engines used for transportation and thermal resources (e.g., coal and combustion turbines) used for power generation. Elements of major concern are carbon monoxide (CO), carbon dioxide (CO ₂), nitrogen (NO _x), particulate matter (PM ₁₀), and sulfur dioxide (SO _x).
POLICY DIRECTION	
Status Quo	Relative to existing air conditions, the Status Quo Policy Direction is expected to include some increase in air pollutants associated with additional economic growth. The increase will be dampened by existing pollution abatement programs and technological improvements. New combustion turbines will be built to meet demand, causing air emissions to increase some in the long term.
Effect in Comparison to the Status Quo Condition:	
Natural Focus	Requires a large increase in replacement of hydropower from breaching or drawdown of up to six dams, mainly from new combustion turbines and prolonged use of existing coal facilities over Status Quo. Air pollutants would increase substantially under this Policy Direction. Increased coal generation would increase PM ₁₀ , CO, CO ₂ , SO _x and NO _x emissions. Additional combustion turbine plants would add to these emissions, just at a much lower rate per unit of energy. In addition, emissions would increase considerably from the new truck and train traffic needed to replace current barging. Dam deconstruction would result in more airborne particulate matter, and as reservoirs empty, dust would rise from newly exposed land. As new vegetation then covers the land, dust would decrease, so those effects would be temporary.
Weak Stock Focus	There would be a sizable increase in replacement of hydropower depending on how many dams are breached (from 0 to 4 dams). The replacement power would noticeably increase air emissions from new combustion turbines and prolonged use of existing coal facilities over Status Quo. Increased coal generation increase PM ₁₀ , CO, CO ₂ , SO _x and NO _x emissions. Additional combustion turbine plants would add to these emissions, just at a much lower rate per unit of energy. Emissions would also increase from the increased truck/train traffic replacing barging. Deconstruction would result in more particulate matter, and as reservoirs empty, dust would rise from newly exposed land. As new vegetation then covers the land, dust would decrease, so those effects would be temporary.
Sustained Use Focus	Air emissions may increase from operation changes, causing the need for additional combustion turbines to replace any lost peaking capability. The long-term change in air emissions could be sizable if breaching or drawdown increases the need for replacement hydropower and prolonged operation of existing thermal resources. With breaching or drawdown, effects would be like those of Weak Stock Focus.
Strong Stock Focus	Restricts hydro operations less than under Status Quo; delays the need for replacement power and related air emissions.
Commerce Focus	Maximizes use of existing hydro system, indefinitely delays the need for replacement resources beyond Status Quo. Regional commercial competitiveness, however, could attract new industry, increasing PM ₁₀ and CO ₂ air emissions slightly. Overall, air emissions are likely less than under Status Quo.

Policy Directions

Environmental Consequences

COMPARISON
(CONSUMER REPORT) TABLE
Policy Directions

Table 3.3-1: Comparison of the Alternatives Against Baseline Conditions* and Summary of Effects

Effect Category	Status Quo*	Natural Focus	Weak Stocks	Sustainable Use	Strong Stocks	Com. Focus
NATURAL ENVIRONMENT						
Land Habitat						
Upland						
Riparian/Wetland						
Water Habitat:						
Nitrogen Supersaturation						
Non-Thermal Pollution						
Sedimentation						
Temperature/Dissolved Gas						
In-Stream Water Quality						
Amount River Habitat						
Reservoir Habitat						
Fish & Wildlife						
Anadromous Fish**						
Resident Fish**						
Wildlife						
Air Quality						
SOCIAL and ECONOMIC						
Commerce						
Commercial Interests						
Recreation (including fishing & hunting)						
Economic Development						
Tribes						
Fishing Harvest						
Health, Spirituality, & Tradition						
Costs and Funding						
Cultural/Historical Resources						
Aesthetics						

* Status Quo = Baseline conditions. For more information on existing conditions, please see Section 2.4.

** Although anadromous fish for Natural Focus and Commerce Focus appear the same, there are sharp differences between numbers of hatchery and naturally produced fish. For resident fish, the two Policy Directions differ substantially in numbers of native and non-native fish. See Chapter 5, Section 5.3.



The sample implementing actions are assessed for their changes in environmental consequences from the Status Quo. See Chapter 5, Sections 5.3

See Chapter 3 for the summarized version and Chapter 5 for the detailed breakdown and explanations

Status Quo (which includes the existing environmental conditions: the current state of the natural environment elements and the socioeconomic elements; see Section 2.4), and the likely circumstances of taking no action to change current actions. Chapter 5 contains the figures and tables that show how the natural and socioeconomic environment would be affected under each Policy Direction.

- This Chapter (3) contains a more concise summary of environmental consequences, consolidated to help decisionmakers readily compare effects and likely outcomes, in the form of a comparative analysis table. The information can also be used to develop and evaluate the effects of additional proposals for combining the Policy Directions. This policy-level table is presented in Section 3.3.2.

This methodology will also be used by the BPA Administrator to evaluate the environmental consequences of future proposals, just as it allows others to develop their own proposed combination of Policy Directions and subsequent environmental consequences described above. By assembling and condensing the information in this manner, decisionmakers can more readily compare effects and likely outcomes/consequences.

3.1.6 Relationship Analysis: The Methodology behind the Decision

Implementing and funding each of the alternative Policy Directions has environmental consequences. Before a choice can be made among the five alternatives, it is important to understand how those consequences are characterized. This DEIS uses a qualitative or "relationship analysis" to provide the decisionmaker with the needed background to make a choice among Policy Directions. The relationship analysis is characterized by qualitative description of effects rather than numerical analysis. Relationship analysis homes in on understanding the interplay of the factors that may be used in models, rather than trying to choose precise numbers for each factor and relying on the specific numerical outcomes to dictate the decision.

In fish and wildlife mitigation and recovery efforts, where there are still many biological and political unknowns, it is better to be generally correct than precisely wrong. Relationship analysis is the best choice in this circumstance. Experience has shown that quantitative analysis suggests a precision and accuracy that can be misleading. Scales and intensity may vary, future environmental and economic conditions are unpredictable, and quantitative models have unknown errors and assumptions. This is why BPA's DEIS is focusing broadly, on the more dependable *interactions of relationships between people and their environment*. Relationship analysis is less precise, but it operates at a level that more reliably indicates future effects when reviewing regionwide policy.

For this policy-level analysis, the extensive regional database of fish and wildlife recovery actions has been used to establish an appropriate understanding about the relationships between actions and effects. Once established, these relationships can be used as a foundation to understand the possible effects associated with a broad spectrum of fish and wildlife Policy Directions, and can serve to aid in future fish and wildlife

decisions for BPA, other decisionmaking bodies, and the public. In fact, in the future it will be possible to work from this point and to look at the more specific analysis once specific actions are considered under the chosen Policy Direction and link them directly back to the broader relationship analysis. Please see Figure 1-6.

3.2 DESCRIPTION OF THE POLICY DIRECTION ALTERNATIVES

- **This section describes the Status Quo and five Policy Direction alternatives, the philosophy behind them, and their likely components (focuses).**

This DEIS examines several Policy Directions. Each Direction represents a shift toward a focus or theme. More actions and more intensive actions consistent with that theme would be taken, but existing actions not consistent with the Policy Direction, especially those in conflict with the new Direction, would likely be scaled back or eliminated. The exact actions taken under each Policy Direction, and the intensity of those actions, are generally not established at this time. Rather, actions consistent with the Policy Direction would be specified and analyzed in greater detail before being implemented, as appropriate.

The Policy Directions are based completely on ideas set forth in the existing regional processes on fish and wildlife recovery efforts, and they encompass the range of possible actions assessed within regional processes over the last 10 years. All regional concepts have been considered, even where some may prove infeasible under current law or impractical for other reasons, or may appear to be less effective.

We have named the Policy Directions as follows:

<i>Status Quo</i>	Weak Stock Focus
Natural Focus	Strong Stock Focus
Sustainable Use Focus	Commerce Focus

Each of the Policy Directions summarized below is based on a concept for fish and wildlife policy developed or proposed by some persons in the region. None of the Policy Directions is intended to represent a value judgment by BPA or any particular group's values. The Policy Directions are intended for guidance only, and the quotations used to characterize them are not meant to indicate the views or opinions of their success. Individual readers may assert the values they find the Policy Directions represent for them.

Before going further, it is important to understand the distinction between *Status Quo* and the *current implementation actions*.

Status Quo represents a continuation of the policy direction that the region appears to be following at the present time.

*The **current implementation actions** represent a snapshot view of those actions currently being taken to implement Status Quo.*

It is also important to understand what "existing environmental conditions" are.

***Existing environmental conditions** are defined as the current state of:*

- 1) physical environmental elements such as air, land, and water; and*
- 2) socioeconomic elements, such as cultural resources, commerce and funding. (See also Section 2.4.)*

In Chapter 5, the Status Quo policy direction is defined *relative to existing environmental conditions* for the complete list of environmental consequences. This description reveals how conditions are expected to change if no action is taken to change existing policies. The likely changes are heavily influenced by population growth and associated changes in land use.

BPA has considered *all* concepts presented by the community and incorporated that information within the range of Policy Directions, even though *some* of the included actions in the different Policy Directions below may prove infeasible under current law or impractical for other reasons, and others may not seem to have the potential to achieve meaningful fish and wildlife recovery. (For a more detailed description of sample actions for the Policy Directions, see Section 3A at the end of this Chapter.)

In general, three basic models have emerged in the region:

- A focus on **preserving nature**, wildness, and wild creatures, setting aside areas for preservation where ecosystems will function in their natural states with little or no human intervention. The natural world is to be protected from human actions.
- A focus on **relationships between human beings and fish and wildlife** in the natural world. Humans are but one part of an integrated whole of nature and are responsible for maintaining appropriate, reciprocal relationships with fish and wildlife. These relationships emphasize a long-term connection to place and the use of natural resources to meet subsistence and spiritual needs.
- A focus on **harnessing nature** and using natural resources to meet human wants and needs. Humans can and should improve on nature, to maximize productivity, efficiency, and economic gain. The "conservation" movement of the 1930s exemplified this view: to conserve resources meant to use them; not using resources meant wasting them.

Each of the Policy Directions includes some assumptions about future conditions that are held in common with the other Policy Directions. Most of these common assumptions

are existing conditions that are expected to continue in the future. Some important common assumptions are as follows:

- Internal and external pressures for population growth and urbanization will continue unless specifically changed by an alternative.
- BPA's roles in marketing federal hydropower and funding and implementing fish and wildlife programs will continue unless changed or affected by an alternative.
- All Policy Directions seek to attain their goals at least cost. This statement should not be taken to mean that the goals themselves are necessarily economical or cost-efficient.

3.2.1 Status Quo Policy Direction (and Current Implementation Actions)

The Status Quo Alternative (and the associated current implementing actions) represents the "no action" alternative—not changing the current ad-hoc approach. Analysis of a "Status Quo" alternative is required by NEPA. For this DEIS, the Status Quo serves as a baseline for comparison with the Policy Direction alternatives.

The Status Quo Alternative includes continued current actions and the future changes relative to existing environmental conditions that can be reasonably expected. Increasing population, economic growth, and additional urbanization are assumed based on existing trends; these assumptions are also included in the other Policy Directions except as they may be affected by the implementation actions under each Policy Direction. (For example, a policy that discouraged new construction might reduce population growth.)

Description: *Human intervention with no unified or single regional plan:* a combination of other policy themes. Independent strategies, multiple plans, different and sometimes conflicting goals, multiple governmental actions, and unclear expectations of results for fish and wildlife policy.

Emphasis:

- Operation of hydrosystem primarily for authorized purposes: fish, power generation, recreation, navigation, irrigation, and flood control.
- Anadromous fish, especially ESA-listed species.
- Mitigation (e.g., flow augmentation, spill, juvenile transportation, predator control, and passage improvements, as well as off-site mitigation with replacement habitat) for the effects of hydro generation.
- Recognition of government's past trade-offs of fish, wildlife, and other resources for commodities and commercial activities.
- Increasing consideration of tribal viewpoint and co-management role.
- Hatcheries operated primarily in an effort to sustain anadromous and resident fish harvest.

- Mitigation efforts for terrestrial habitat consisting largely of purchases and preservation of land to replace habitat that was lost to hydro development.
- Boom and bust cycles of harvest, with recent trends away from maximizing fish harvest and toward weaker stock protection.
- Sustained commercial activity by preserving the hydrosystem and avoiding unbearably costly and restrictive mandates.

3.2.2 Natural Focus

Description: Under a unified regional planning approach, emphasizes *removing the past major human "interventions"* in the ecosystem and allowing the existing fish and wildlife to return to a natural balance without further major human intervention (*let nature heal itself*).

Focuses on restoring *habitat* and reducing *hydro* operations to reestablish ecological processes. Gives priority to ecosystem protection by putting restoration of habitat quality over economic activity. "Effort and money now spent to maintain relatively constant conditions to benefit economic needs would be redirected toward changing the ecosystem back toward the condition it was in prior to large-scale human development."²

The Philosophy behind the Direction:

"A value for, and an emphasis on preserving 'wildness' and 'wild areas' from future human development." (Cone, 1995:49-59)

Under this alternative, the first priority is to protect areas considered pristine, especially those areas untouched by previous human development. The value of "wildness" and wild creatures is not directed at any species in particular: rather, a high value is placed on ecosystems that function *without human interference*, whatever species they may contain. Second, for those ecosystems already altered by human activities, efforts would focus on minimizing further degradation by limiting any human activities deemed environmentally destructive. Restoration would emphasize regeneration via natural processes. Third, in exceptional cases where an ecosystem has been so changed that natural regeneration is unlikely, humans might intervene to restore the most essential elements needed for natural functioning. This Direction particularly focuses on removing those elements that have significantly altered the natural functioning of ecosystems: for instance, by breaching dams and eliminating non-native species.³

Differences from Current Implementation Actions:

- Restores habitat emphasizing passive techniques.
- Decreases harvest.
- Discontinues hatcheries.

² Council (2000b), p. 15.

³ Sources: Cone (1995), pp. 50-55; Kloor (1999).

- Removes six dams: McNary, John Day, Lower Granite, Lower Monumental, Little Goose, and Ice Harbor.
- Decreases some commercial activity.
- Allows tribal harvest of healthy fish and wildlife populations.

3.2.3 Weak Stock Focus

Description: Under a unified regional planning approach, emphasizes *human intervention to support recovery* of weak stocks of fish and wildlife populations that are listed or proposed for listing under the Endangered Species Act or other legal protections.

Focuses on restoring *habitat* and reducing *hydro* operations to enhance the life cycle of weak fish stocks and wildlife populations. Gives priority to restoring water quality and habitat for weak stocks over economic activity.

The Philosophy behind the Direction:

"Extinction is not an option." (State of Washington, Statewide Strategy to Recover Salmon, September 1999)

This alternative emphasizes an active posture to prevent the extinction of fish and wildlife populations, especially those listed as threatened or endangered under the Endangered Species Act or other legal protections. The focus would be on saving the weakest populations first. Reasons for preserving species may range from "existence value" to moral imperative to potential beneficial uses of species to humans.⁴ The USFWS "ESA Basics" noted the connection between the passage of the ESA and American concern about the decline and possible extinction of many wildlife and plant species, not only around the world, but also especially within the U.S. Congress attached aesthetic, ecological, educational, recreational, and scientific value to the diverse environments of the nation and so sought to conserve and recover both endangered and threatened species and the ecosystems on which they depend. The ultimate ESA goal is to "recover" species so they no longer need protection under the ESA. The ESA is the primary driver behind this Policy Direction and, because the focus is on the enforcement of this law, this Policy Direction is likely to entail more emphasis on continued regulation.⁵

Differences from Current Implementation Actions:

- Restores more habitat for weak stocks.
- Decreases harvest.
- Manages hatcheries for weak stocks.

⁴ Summarized from Daniel J. Rohlf, *The Endangered Species Act: A Guide to Its Protections and Implementation* (Stanford Environmental Law Society, Stanford, CA), 1989:12-17.

⁵ Sources: US Fish and Wildlife Service "ESA Basics" (June 1998).

- Removes four dams to assist weak stocks: Lower Granite, Lower Monumental, Little Goose, and Ice Harbor.
- Decreases commercial activity that affects weak stocks.
- Uses selective techniques for tribal harvest to assist weak stocks.

3.2.4 Sustainable Use Focus

Description: Under a unified regional planning approach, emphasizes *human intervention as part of a goal to restore and maintain* sustainable stocks of fish and wildlife populations to promote expanded harvest and recreation opportunities. (*Sustainable* is defined as the continued use of a resource at a stable rate over the long term.)

Focuses on increasing *hatcheries*, modifying *hydro* operation, and restoring *habitat* to increase harvest opportunities. Gives priority to harvest over other economic activity. Removes dams if harvest goals are not achieved by other actions. Applies available resources to maintain and expand harvest opportunities. Emphasizes human management of targeted fish and wildlife species to balance intrinsic, sport, and commercial value.

The Philosophy behind the Direction:

"Conservation holds that it is about as important to see that the people in general get the benefit of our natural resources as to see that there shall be natural resources left." (Gifford Pinchot, The Fight for Conservation: p. 81.)

This Policy Direction emphasizes the expansion of opportunities to harvest fish and wildlife resources. The philosophy behind this Direction fundamentally emphasizes sustainable relationships between human beings and fish and wildlife. Humans and their technology are but one part of an integrated whole of nature and are responsible for maintaining appropriate, reciprocal relationships with fish and wildlife and a long-term connection to place. One of the tenets behind this Direction is that humans have rights to use natural resources to meet sustenance, spiritual, and economic needs. But humans also have an obligation to insure that those resources (e.g., fish populations) are self-sustaining, and therefore may intervene at all various stages in the life cycles of fish and wildlife species and their environments, to help those populations rebuild and maintain themselves in perpetuity.⁶

Differences from Current Implementation Actions:

- Restores habitat to maximize production.
- Increases harvest of natural and hatchery stocks.
- Increases hatchery production and supplementation (supplementing wild stocks).
- Improves hydro operations for fish and wildlife, including dam removal as a last resort if other measures fail to recover populations.

⁶ Source: CRTFC (1996).

- Decreases commercial activity.
- Increases tribal harvest overall.

3.2.5 Strong Stock Focus

Description: Under a unified regional planning approach, emphasizes *human intervention to avoid declines* of strong fish stocks and strong wildlife populations into weakened conditions requiring legal protection. Focuses on maintaining *habitat* to sustain the strong fish stocks and strong wildlife populations. Gives priority to avoiding harm to currently strong stocks by protection and maintenance of habitat over economic activity and new development.

The Philosophy behind the Direction:

"It is time to apply 'triage' techniques, i.e., face up to what are likely irreversible declines in some runs in order to direct resources to those runs where the odds for long-term survival are better with adequate help" (Thomas: 2000: 5).

The focus here is on maintaining viable stocks and ecosystems to avoid broader collapse of fish and wildlife populations. Program priorities would be based on effectiveness of stock maintenance (as opposed to recovery). Costly efforts to recover populations that are so depleted that they cannot or likely will not be recovered without substantial costs to other species should be abandoned. These costs, which would be avoided by this Direction, include "massive changes in the number and lifestyle of [humans], changes that society shows little willingness to seriously consider, much less implement" (Lackey, 2000:1). "Effective options to reverse the decline of wild salmon, and especially to restore *depleted* runs, would be socially disruptive, economically costly, and ecologically equivocal" (Michael, 1999, in Lackey, 2000:4). "Clearly, chances for survival of various runs of salmon are not equal. Many of the runs have winked out, and the genetic make-up of the fishes in those runs is forever lost. Other runs continue in what appears to be an inexorable death spiral in spite of 'best' (i.e., politically acceptable) efforts. Some runs are in reasonably good shape, and may well survive with appropriate management actions. The perceived inflexibility in the ESA precludes the use of techniques to assign limited resources to those runs that have the best chance of maintenance and recovery, while ignoring those that are likely doomed" (Thomas, 2000: 4).⁷

Differences from Current Implementation Actions:

- Maintains habitat for strong stocks.
- Increases harvesting while maintaining strong stocks.

⁷ Sources: "The Future of Washington Salmon." John H. Michael. *Northwest Science*. 73(3): 235-239, quoted in: "Restoring Wild Salmon to the Pacific Northwest: Chasing an Illusion?" Robert T. Lackey. Presented at the Portland State University Salmon Symposium, July 7-8, 2000; Dr. Jack Ward Thomas, Columbia River Conference IV (March 16 & 17, 2000).

- Maintains hatcheries that support strong stocks.
- Decreases restrictions on hydro operations not affecting strong stocks.
- Increases commercial activity while maintaining strong stocks.
- Increases tribal harvest while maintaining strong stocks.

3.2.6 Commerce Focus

Description: Under a unified regional planning approach, emphasizes *human intervention to enhance economic value* of river uses and allocates a portion of the revenues to fund fish and wildlife mitigation.

Focuses on increasing *hatchery* production and improving *hydro* operations to support the commercial values of the river. Gives priority to the economic efficiencies of basin activities, applying increased revenues toward funding fish and wildlife mitigation programs (through other available means by using any of the other available resources of habitat, harvest, hatcheries, or hydro that do not affect economic efficiency).

The Philosophy behind the Direction:

"Endangered species has divided the country on an issue that seemingly pits growth (and jobs) vs. the environment. This does not have to be the case. Protecting endangered species can be integrated with economic growth, turning a win-lose or lose-lose situation into one where everyone benefits. This can be accomplished by using economic incentives to promote conservation. . . . Although the costs incurred by these incentives may be high in some cases, they will be highly cost-effective. The current 'at any cost' strategy is only marginally effective, and can actually harm species in some circumstances" (Schaerer, 1996: 1).

This Policy Direction emphasizes economic efficiency in choosing a recovery effort strategy. Money is a scarce resource and a major component in any recovery effort plan, and should be spent only when costs are justified by benefits. The Direction represents a "libertarian" approach to conservation, in that it decreases government regulation and instead emphasizes voluntary actions, financial incentives and market mechanisms to bring about desired results. Private companies and citizens are given flexibility to determine how they can best meet the goals of conservation, while still fulfilling their economic needs. Decisionmaking is decentralized, and the "command and control" approach is abandoned. Managers of a unified recovery plan would "adopt cost-effective recovery measures that create accountability, clear goals, priority setting, and effective monitoring and continuous program improvements" (PNWA, 1996). Cost efficiency would consider hydrosystem benefits and benefits foregone, as well as program costs. Conservation in this ideology allows for "wise use" of resources, with the option for landowners to set aside and preserve land from certain human uses, while still retaining title to the land. This Policy Direction relies on voluntary actions and incentives rather than government regulation. "The Columbia and Snake Rivers support a tremendous diversity of life and bring a remarkable array of benefits to the region and the nation. The rivers support complex ecological systems and are the lifeblood of the regional economy"

(PNWA, 2000). "For us, we have to be left standing if we are going to support it (a unified plan). This can't be a recovery effort that sticks it to all the economic interests" (Smith, 1998:12).⁸

Differences from Current Implementation Actions:

- Emphasizes economically efficient restoration of habitat.
- Increases economically efficient harvesting.
- Increases economically efficient hatcheries.
- Operate hydrosystem for economic efficiency, including minimization of fish and wildlife mitigation costs.
- Increases other commercial activity.
- Targets fish farming and cost-effective production for tribal harvest.

3.2.7 Hybrid Policy Directions

Finally, the Policy Directions above do not limit BPA to those themes alone: combinations of themes (i.e., "hybrid" Policy Directions) are possible. Using the relationship analysis established in this DEIS (see Section 3.1.6), BPA can anticipate the environmental consequences of the Policy Direction selected by the region, even if it is an amalgam of several policy themes and/or independent implementing actions. Alternative current regional proposals, and any future proposals, may be compared against the sample implementation actions to determine which Policy Direction they most closely resemble, and therefore what natural and socioeconomic environmental effects are likely to result from their implementation. This methodology can be applied for proposals that cover a broad range of issues, as well as for those with a more narrow focus. See **Appendix I** (Build Your Own Alternative).

3.3 COMPARING THE POLICY DIRECTIONS

- **This section compares Status Quo and the five Policy Direction alternatives, first in terms of their likely environmental consequences, then against the DEIS purposes. In reading the comparison, please bear in mind that the environmental consequences are described in terms of relationships, not numerical computations (see section 3.1.6).**

3.3.1 Important Policy Direction Decision Considerations

Table 3.3-1 in Section 3.3.2 summarizes the major environmental consequences of implementing each Policy Direction. The following considerations are also very important in the consideration of any public policy choice, and should be borne in mind when reading and using this Table.

⁸ Sources: PNWA (1996); Schaerer (1996); Smith (1998); PNWA (2000).

Legal parameters –Some of the Policy Directions listed, or ones that others may create, may seem incompatible with current laws or regulations.⁹ As with policies, laws and regulations change over time. A Policy Direction considered incompatible with the present laws might be quite viable and consistent with future legislation or interpretation of the law. Where individual actions within a particular Policy Direction would require legal reconciliation or adjustment prior to implementation, necessary measures would have to be taken to implement that Policy Direction.

Regional values – Given the broad diversity of opinion in the region, any proposed solution is likely to please some and upset others. Decisionmakers will recognize that there are often conflicting values for natural resources in the Columbia River Basin. These different value systems are represented across the spectrum of Policy Directions.

Political intervention – Many of the actions that have been proposed for fish and wildlife recovery efforts have generated a great deal of controversy due to their anticipated effects. The degree of political resistance to any given Policy Direction is directly related to the degree of economic, social, and environmental consequences of that Policy Direction. Naturally, decisionmakers will want to minimize the effects on their constituents. The region, the public at large, must consider what kinds of tradeoffs it is willing to make. It is unlikely that a "sacrifice-free" option will emerge for recovering fish and wildlife populations. Political pressure is likely to play a significant role in the selection and successful implementation of any regional recovery effort plan.

3.3.2 Comparing Alternatives by Environmental Consequences

The Administrator is to make a fully informed decision about BPA's funding and the implementation of its fish and wildlife obligations to support the region's recovery effort. That choice will be based on the need and purposes presented in Chapter 1, with consideration of the possible environmental consequences discussed in detail in Chapter 5.

This EIS is not intended to define the region's values or to determine what laws and regulations are applicable. It is designed to provide an understanding of how the many issues that affect the region's ability, and specifically BPA's ability, to reach a more comprehensive and consistent unified planning approach interact with the human environment and lead to certain environmental consequences.

Table 3.3.1 provides a summary of **Natural Environment**, and **Social and Economic Environment**,¹⁰ consequences of Policy Directions, based on the analysis in Chapter 5.

⁹ An alternative that is outside the legal jurisdiction of the lead agency must still be analyzed in the EIS if it is reasonable. A potential conflict with local or federal law does not necessarily render an alternative unreasonable, although such conflicts must be considered. CEQ, Forty Most Asked Questions Concerning CEQ's NEPA Regulations, 46 Fed. Reg. 18026, 18027 (1981).

¹⁰ For information about the existing environmental conditions in these effect areas, please see Chapter 2. For a listing of those actions that are proposed for each Policy Direction, as well as the current implementation actions now underway, please see Section 3A. For a more detailed discussion of environmental consequences, including the analysis behind Table 3.3-1, please see Section 5.3.

Results are summarized as being more or less favorable for fish and wildlife, as well as more or less favorable to economic and social well-being. The summary table illustrates the anticipated long-term environmental effects of possible implementation actions of alternatives (see Section 3A) compared to environmental conditions in the Status Quo Policy Direction. The summary highlights the areas where the effects are clearly different, but also shows where they may be similar, offering the opportunity to quickly see the possible "trade-offs." Public policy evolves as the region responds to these trade-offs. The shade of the boxes indicates the direction in which the effects are moving *relative to the Status Quo Policy Direction*, and shows the reader whether the five Policy Directions would result in worse, the same, or better conditions relative to the Status Quo. Effect categories are condensed from the expanded list of categories described in Section 5.3. Condensing allows the reader to more easily see the major trends in effects. Where categories are condensed, the summaries represent the central tendency of the more detailed results presented later in this document.

In reading the tables, which are based on *relationship analysis*, it is useful to remember the following points:

- The Status Quo or the No Action Alternative is used as the baseline to gauge how the five Policy Directions (or combinations of Policy Directions) change relative to that baseline for the environmental consequences identified.
- The Status Quo is established by describing the types of actions being taken now and anticipated to continue without a unified Policy Direction.
- No judgment is made about whether the Status Quo is *good* or *bad*. Some may believe that economic prosperity should be the overriding value; others may believe that maintaining a natural environment should be the appropriate value. Still others may believe that some form of balance between economic prosperity and preservation of the natural environment should be the "correct" value for the region. Making such a call is not appropriate for this EIS. This decision will be taken up during the preparation of the Record of Decision.
- The comparative tables that follow set the Status Quo as a "neutral" point for all of the environmental consequences. This is done to make it possible to determine whether working toward one of the five Policy Directions changes the condition of the environment. These changes are labeled as "better" and "worse." These terms are equivalent to the NEPA terms "beneficial" and "adverse." They describe environmental consequences in the conventional terms as defined by NEPA.

Ideally, the "best" alternative might be selected by looking for the greatest number of *light-colored* boxes (improving conditions). But there is no clear single choice. The issues are complex: a "plus" for one factor may mean a "minus" for another important factor. (For example, a "plus" for anadromous fish might mean a "minus" for resident fish.) As noted earlier, there will also be other considerations regarding laws, perceptions, and values. Many people are involved in developing a recovery effort plan,

and many different authorities govern the participants. This means that trade-offs will have to be considered.

The reader can use Table 3.3-1 to determine which one of the five alternative Policy Directions might best reflect her or his unique perspective:

- 1. First, look down the column of boxes for each Policy Direction to find where the areas of greatest concern for environmental consequences will likely be for the different directions.** Here, mitigation (if available) will be needed to lessen the effect—perhaps by a physical action such as making a dam modification or change in habitat.
- 2. Next, consider which Policy Direction has the greatest number of benefits (light-colored boxes).**
- 3. Then, determine how well the desired Policy Direction fulfills the purposes (Chapter 1). (See Tables 3.3-2 and -3 and 3.3-4.)**

Note: If none of these "fits" the reader's or decisionmaker's concept of a better Policy Direction, the table and the sample Implementing Actions (Section 3A) can be used to try to construct additional Policy Directions by "mixing and matching" the best parts of one Policy Direction with the best parts of another. For information on how to do this, please see section 3.4 or **Appendix I**.

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Table 3.3-1: Comparison of the Alternatives Against Baseline Conditions* and Summary of Effects

<i>Effect Category</i>	<i>Status Quo*</i>	<i>Natural Focus</i>	<i>Weak Stocks</i>	<i>Sustainable Use</i>	<i>Strong Stocks</i>	<i>Com. Focus</i>
NATURAL ENVIRONMENT						
Land Habitat						
Upland						
Riparian/Wetland						
Water Habitat:						
Nitrogen Supersaturation						
Non-Thermal Pollution						
Sedimentation						
Temperature/Dissolved Gas						
In-Stream Water Quality						
Amount River Habitat						
Reservoir Habitat						
Fish & Wildlife						
Anadromous Fish**						
Resident Fish**						
Wildlife						
Air Quality						
SOCIAL and ECONOMIC						
Commerce						
Commercial Interests						
Recreation (including fishing & hunting)						
Economic Development						
Tribes						
Fishing Harvest						
Health, Spirituality, & Tradition						
Costs and Funding						
Cultural/Historical Resources						
Aesthetics						

* Status Quo = Baseline conditions. For more information on existing conditions, please see Section 2.4.

** Although anadromous fish for Natural Focus and Commerce Focus appear the same, there are sharp differences between numbers of hatchery and naturally produced fish. For resident fish, the two Policy Directions differ substantially in numbers of native and non-native fish. See Chapter 5, Section 5.3.



3.3.3 Comparing Alternatives against EIS Purposes

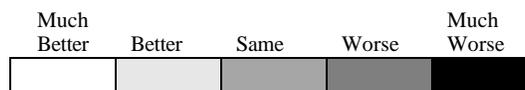
In Chapter 1, we described the state of significant disagreement within the region about the “best” way to recover endangered or threatened species and to restore self-sustaining populations. There is no clear regional consensus about what the goals of a recovery effort plan should be, and there is considerable uncertainty as to whether the proposed actions will produce the desired results.

However, also in Chapter 1, the BPA purposes (goals) were listed. For BPA, understanding the environmental consequences of implementing the Policy Direction selected by the region is paramount. An equally important objective of this DEIS is to present the BPA Administrator with a forecast of how the Policy Direction selected by the region will affect BPA’s ability to meet its obligations under legal statutes, its trust responsibility to Indian tribes, and its unique mission of providing public benefits to the citizens of the Northwest. The purposes, then, become the major criteria for measuring the effectiveness of the DEIS Policy Direction alternatives in meeting the need for action. The decisionmaker will consider the environmental consequences (3.3.2) together with the analysis of the purposes (3.3.3). Based on the most likely regional choice among the Policy Directions and the possible implementing actions for carrying it out, the Administrator will make his decision on implementation for BPA. Table 3.3-2 (below) evaluates each Policy Direction against those purposes.

Table 3.3-2: Summary of Alternatives Compared against the BPA Purposes

<i>Purpose</i>	<i>Status Quo*</i>	<i>Natural Focus</i>	<i>Weak Stocks</i>	<i>Sustainable Use</i>	<i>Strong Stocks</i>	<i>Com. Focus</i>
Facilitate implementation of a regional unified planning approach						
Fulfill obligations under Regional Act						
Fulfill the Administration’s Fish Funding Principles						
Fulfill BPA’s other obligations under law						
Promote predictable and stable fish and wildlife costs and competitive rates.						

* Status Quo = Baseline conditions. For more information on existing conditions, please see Section 2.4.



The differences among the Policy Directions (including Status Quo) often turn on differences in people’s opinions and perception. This DEIS has tried to condense

the information from thousands of pages of key sources across the region, present this information in a user-friendly way, and provide a reasonably objective discussion of the data. However, the opinions of the public, interest groups, and other interested parties (including decisionmakers) regarding fish and wildlife recovery efforts will be a prime factor in determining the degree to which BPA will be able to meet all its purposes. As one group or another sees a particular Policy Direction as superior or inferior, extreme or moderate, those views will affect BPA's ability to meet its purposes. Consideration of such factors as legal challenges, political interventions, and direct pressure on the Administrator from these outside influences have been factored into the Table above to give an indication of how each Policy Direction diverges from the Status Quo situation. (See Table 3.3-3, below, for a detailed explanation of each purpose under each Policy Direction).

Table 3.3-3: Comparison of Policy Direction Alternatives as They Meet the Purposes

<i>Facilitate implementation of a regional unified planning approach for fish and wildlife mitigation and recovery efforts that will improve: coordination, efficiency, and consistency</i>	
Status Quo	The current implementing actions are uncoordinated and inefficient because there is no unified planning approach. The actions are implemented through a series of multi-governmental plans in an attempt to meet numerous and sometimes conflicting statutes, regulations, and authorities. In addition, there are many inconsistencies within the recovery effort.
Natural Focus	This naturalistic approach to a unified plan may significantly change existing socio-economic patterns in the region. Since it maybe perceived as an extreme position, this Direction is much less likely than Status Quo to help achieve a unified planning approach.
Weak Stock Focus	This approach represents a distinct push toward new measures to recover <i>all</i> ESA-listed fish and wildlife. This Direction may be seen by some as an inefficient use of financial resources for fish and wildlife. Because its focus might be viewed as extreme, this approach is not as likely to help achieve a unified planning approach as Status Quo.
Sustainable Use Focus	This focus represents a more consistent approach to fish and wildlife recovery efforts. By focusing efforts through all stages of the life cycle of valuable species, it may be more efficient. Because it tries to balance the intrinsic value of natural resources and human need for increased comforts, this direction may be more acceptable. It has a much greater chance of facilitating an agreement on a unified planning approach than Status Quo.
Strong Stock Focus	The emphasis on strong fish stocks and healthy wildlife populations may alienate those who believe that the emphasis should be on ESA-listed fish and wildlife. Although this approach may be more balanced for some, it is less likely than Status Quo to help achieve a unified planning approach.
Commerce Focus	This focus favors a cost-and-benefit approach to fish and wildlife recovery efforts. Because it focuses on production, it is much less likely than Status Quo to help reach agreement on a unified planning approach.
<i>Fulfill statutory, legal obligations under Regional Act; especially, to evaluate how Policy Directions may affect BPA's obligations to: protect, mitigate, and enhance fish and wildlife, and provide a reliable, adequate, efficient, and economical power supply.</i>	
Status Quo	Currently, BPA has substantial difficulty satisfying all its legal obligations under the Regional Act. The apparent lack of regional coordination among the numerous agencies

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	with competing authorities in the region causes BPA's current efforts to be less efficient and often inconsistent with other regional actions.
Natural Focus	This focus would require a dramatic change from reliance on the current hydro-based power system to one based on other types of resources, most likely new combustion turbines and renewable energy sources, where cost-effective. BPA's ability to remain a competitive, low-cost provider of electric power in the region would likely be compromised. Also, BPA's role as a major contributor to fish and wildlife recovery effort costs would decrease. Overall, BPA would experience greater difficulties than under Status Quo in meeting its Regional Act obligations, with corresponding changes to the transmission system.
Weak Stock Focus	Under a weak stock approach, BPA would face the same issues as under Natural Focus with somewhat less difficulty in meeting its obligations.
Sustainable Use Focus	This focus would probably allow BPA to remain competitive in the electric markets and maintain its low-cost electric power. BPA would retain its role as a major contributor to fish and wildlife recovery effort costs, as well as other Regional Act costs. BPA would likely be able to better meet its obligations under the Regional Act than under Status Quo.
Strong Stock Focus	This focus would provide greater certainty that BPA could fulfill its dual responsibilities under the Regional Act, and the added efficiency of a unified planning approach. The controversy over whether a strong stock focus is consistent with the Regional Act's intent for protecting, mitigating, and enhancing fish and wildlife would cause this direction to be only be slightly (if at all) better than Status Quo.
Commerce Focus	Under this focus, BPA's ability to protect, mitigate, and enhance fish and wildlife would likely be perceived as secondary to economic concerns. This approach would be more difficult to carry out than Status Quo.
<i>Fulfill the Administration's Fish Funding Principles such that BPA: meets all of its fish and wildlife obligations, including trust and treaty obligations; takes into account the full range of potential fish and wildlife costs; demonstrates a high probability of Treasury repayment; minimizes rate effects on power and transmission customers, adopts rates and contracts that are easy to implement; and adopts a flexible fish and wildlife strategy.</i>	
Status Quo	Given the number of agencies with competing regional authorities to implement fish and wildlife responsibilities, BPA has substantial difficulty in satisfying all of the principles. Continued requests for fish and wildlife funding for actions outside BPA's normal authorities has created inefficiencies in BPA's ability to fund the fish and wildlife recovery effort. These high costs for fish and wildlife expenditures and the lack of regional coordination have compromised the probability of Treasury repayment without rate effects. Additionally, cost uncertainty is unsettling to customers, making it more difficult for BPA to gain stability and predictability from long-term contracts.
Natural Focus	With such a radical change to the region's energy power and transmission base and the subsequent negative effect on BPA's revenues and costs, it is likely that BPA costs would exceed revenues, i.e., MSR (see discussion under 2.3.2.3) would be exceeded. This would inhibit BPA's ability to meet the Principles more than under Status Quo.
Weak Stock Focus	In addition to the loss of the low-cost hydro-based system and the increased costs of replacement energy and transmission and of reconstructing historical habitat, this focus would cause BPA's rates to reach MSR quickly, lowering BPA's probability of making the Treasury repayment and make BPA's ability to fulfill the Principles much more difficult than under Status Quo.
Sustainable Use Focus	This focus could still be more costly than Status Quo. However, the increased chance of a comprehensive and consistent unified fish and wildlife recovery effort planing approach would provide BPA's customers more certainty for low-cost power. This difference increases the likelihood that BPA could meet the principles, repay the Treasury, and minimize rate effects than under Status Quo.

Fish and Wildlife Implementation Plan DEIS
Chapter 3: Comparison of Alternatives

Strong Stock Focus	This focus could be much less costly than Status Quo. Low-cost hydropower would continue, while focus on healthy populations of fish and wildlife would increase, a less costly combination. Even though the BPA revenues and costs would be better than under Status Quo, the increased difficulty in reaching a unified planning approach would reduce efficiencies. BPA's ability to fulfill the Principles would be somewhat better than under Status Quo.
Commerce Focus	This focus would be less costly; however, BPA's ability to satisfy its fish and wildlife and possibly its trust and treaty obligations, and the accounting of the full range of potential fish and wildlife costs would be compromised by an economic focus. BPA's ability to fulfill the Principles would be much more difficult than under Status Quo.
<i>Fulfill BPA's other obligations under other applicable laws, including federal treaty and trust obligations with regional tribes, the Endangered Species Act, the Clean Water Act, and the National Historic Preservation Act.</i>	
Status Quo	The multiple and potentially conflicting authorities held by various federal, state, and tribal entities working in the fish and wildlife recovery effort frequently causes confusion with the public and other interests over perceived statutory compliance. Legal challenges are often raised due to the lack of regional coordination and inconsistent multi-agency fish and wildlife actions.
Natural Focus	This focus could raise many historical issues connected with past fish and wildlife policy. Because some in the region perceive this focus (of returning things back to their natural state) as extreme, BPA likely would face more legal challenges than under Status Quo.
Weak Stock Focus	This alternative focuses heavily on listed fish stocks and wildlife populations. BPA could face more legal challenges for not being consistent with other laws and regulations, which would make fulfilling its obligations more difficult than under Status Quo.
Sustainable Use Focus	This focus is by design more balanced in its approach than Status Quo. Because it gives more equal weight to all laws and regulations, it is likely to meet less resistance than Status Quo to fulfilling these legal obligations.
Strong Stock Focus	This focus would likely be viewed by many as not being consistent with the ESA. This would make it much more difficult to BPA to fulfill this purpose as compared to Status Quo.
Commerce Focus	This approach is likely to lead to a decision by an Endangered Species Committee to prioritize economic considerations. The consistency with other environmental legal obligations is likely to call into question through legal challenges. BPA's ability to fulfill these obligations would likely much more difficult to achieve than under Status Quo.
<i>Promote predictable and stable fish and wildlife costs, enhancing BPA's ability to provide funding and remain competitive in the marketplace.</i>	
Status Quo	BPA's customers and potential customers have seen the fluctuating fish and wildlife costs as unpredictable under this Policy Direction. BPA's status as a low-cost power provider and its competitive position in the marketplace is constantly changing. Any significant costs changes such as those with fish and wildlife can cause BPA to encroach on its MSR level, which would reduce the amount of fish and wildlife funding available.
Natural Focus	This focus might eventually lead to more predictable and stable fish and wildlife costs, as a consequence of the seemingly drastic steps of breaching dams (thus removing further hydro changes in some areas) than under Status Quo. The likely level of funding fish and wildlife would be much lower than under Status Quo because of the lost hydro revenues. Increased replacement power costs would be higher.
Weak Stock Focus	This approach would be similar to that of Natural Focus, except that the fish and wildlife costs would increase more for the recovery of historic habitat and would continue to fluctuate based on the status of the listed species, while revenues declined from loss of hydro resources and replacement power costs increased. Thus, the predictability and stable

	fish and wildlife costs, as well as the amount available for funding, would be much worse than under Status Quo.
Sustainable Use Focus	Costs would be higher, and might seem more predictable for the short term, but the ambiguity about breaching in the long term would make this focus somewhat more unsure and costly than Status Quo. Additionally, the need for energy resources would be unpredictable.
Strong Stock Focus	This alternative would have more predictable and stable costs due to continuing existing fish and wildlife activities and would likely provide more funding to ensure that strong fish and wildlife stocks stay strong than under Status Quo, which spreads the funding over a much larger group of species. Also, the need for energy resources would not be accelerated.
Commerce Focus	This focus would treat fish and wildlife costs as a business expense and factor them into overall competitiveness within the marketplace. The fish and wildlife costs would likely be more predictable and stable than under Status Quo. More funding would be available for fish and wildlife recovery efforts via the enhanced economic provisions made for commerce, making the BPA funding for fish and wildlife go much further than under Status Quo. New energy resources would likely be postponed.

3.3.4 Other Considerations: Implementation

In addition to the environmental consequences and the purposes discussed in this document, decisionmakers will need to consider questions of implementation when selecting a Policy Direction. Practical concerns, such as availability of funding, the degree of political support, and the legal feasibility of implementation should be taken into account.

Other questions to consider include the following:

- How many species will benefit?
- What is the magnitude of benefit?
- What is the certainty of achieving the intended results?
- How long might it take to achieve the intended results for fish and wildlife?
- How likely is that the Policy Direction can be implemented?
- How long can the benefits of the selected actions be expected to last?

The questions above were drawn from the Federal Caucus' Conceptual Plan (All-H Paper) process. These are examples only; each decisionmaker and stakeholder undoubtedly will raise his or her own questions, unique to their circumstances. A more detailed discussion of "implementation factors"—those events or influences that may determine whether or not a Policy Direction will be successful -- can be found in Chapter 4.

3.3.5 Relationship between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

All of the Policy Directions analyzed in this EIS involve short-term changes in the physical environment (air, land, and water) with varying degrees of success in maintaining and enhancing the long-term productivity of fish and wildlife in the natural

environment. Operations intended to benefit anadromous fish should contribute to the recovery of species listed under ESA and to the maintenance of other stocks. Some of the Policy Directions would improve conditions for resident fish and wildlife, and thus improve the long-term productivity of these resources. However, some of the alternatives (Weak Stock, Natural Focus, and Life Cycle) do so at considerable expense of long-term socioeconomic productivity, including cultural resources and commercial activities. Alternatively, the Commerce Focus and, to a lesser degree, the Strong Stock Focus Policy Direction(s), are designed such that short-term uses of the environment would enhance long-term socioeconomic productivity.

All of the Policy Direction alternatives evaluated in this EIS involve varying amounts of construction and operation of generation and transmission resources, although some would occur sooner than others. Alternatives that anticipate dam removal, such as Natural Focus and Weak Stock, would cause greater construction activity and infrastructure improvements than the other alternatives. Additionally, some alternatives include an increase in hatcheries to support production of targeted stocks. All of these activities require both long-term and short-term uses of the environment, although many of these short-term impacts can be substantially mitigated.

In the short-term, construction would cause noise, soil compaction and erosion, and degradation of water and air quality. In the long-term, there could be impacts on air quality, altered land use, reduced water quality, and contributions to global warming from construction and operation of generation and transmission resources and fish hatcheries. Renewable resources, such as wind power, generally have less air and water impact than thermal resources, such as combustion turbines (CTs). However, since renewable resources are often located farther from load than CTs, the associated impacts from transmission would be greater.

At a minimum, each of the proposed Policy Directions fosters both fish and wildlife recovery in the region and the delivery of electric energy to BPA's customers. To the extent that a Policy Direction delivers cost-effective electric energy and enhances fish and wildlife recovery, the corresponding short-term uses of the environment would have a beneficial effect on the long-term socioeconomic productivity. However, often these goals counterbalance one another within a Policy Direction.

3.3.6 Irreversible and Irretrievable Effects

An irreversible and irretrievable commitment of resources (IIC) occurs when resources are consumed or lost such that they cannot be recovered. NEPA requires that these effects be identified and described where possible.

Many types of actions included in the Policy Directions are construction projects. Construction projects may be reversible, but the energy, labor, and capital consumed in construction are not retrievable. Construction actions include new generation and transmission facilities, dam construction, removal or breaching, habitat creation or active restoration, and construction of hatcheries.

A dam can be built and removed, but the energy and labor required for building is not recovered when the dam is removed. In fact, the dam removal will require more energy, labor, and capital. Construction has IIC effects, and deconstruction or removal also has IIC effects. Some physical components of the dam might be recovered and used elsewhere, but most components are rendered useless and actually require an additional cost for disposal or storage.

The Natural Focus Policy Direction would have IICs primarily from dam removals and construction of new thermal capacity. In comparison to Status Quo, some types of construction activities—new hatcheries and active restoration projects, for example—would be reduced. The Weak Stock Focus would also have IICs from dam removals and construction of new thermal capacity; IICs from active habitat restoration would be more than Status Quo. The Sustainable Use Focus would not have IICs from dam removals, but some IICs would result from increases in thermal capacity; IICs from active habitat restoration would probably be the largest of any Policy Direction. The Strong Stock Focus might reduce the need for IICs from new thermal capacity, but new hatchery construction would result in IICs. The Commerce Policy Focus would reduce IICs from thermal capacity. The availability of low-cost power might result in more IICs from construction related to economic growth.

The consumption of fossil fuels required for new generation is not reversible. The amount of fossil fuel consumption, in order from most to least, would probably be Natural Focus, Weak Stock, Sustainable Use, Status Quo, Strong Stocks, and Commerce Focus. For all of the alternatives, relying upon conservation and renewable resources would reduce consumption of fossil fuels.

Other irreversible effects may include destruction of cultural resources, loss of habitat, or species extinction(s). Destruction of cultural resources is primarily related to dam breaching in the Natural Focus and Weak Stock Policy Directions. Permanent loss of habitat might be largest in the Commerce Focus. The probability of species extinction(s) would probably be greatest in the Commerce Focus and Strong Stock Policy Directions.

3.4 TAILORING A POLICY DIRECTION

We recognize that no single Policy Direction described and compared in this chapter may be exactly the Direction that decisionmakers ultimately choose. However, it is expected that the ultimate Policy Direction will be encompassed within the range of Policy Directions analyzed. The region, as well as the decisionmaker, may wish to modify and adapt the Policy Directions to reflect an entirely new one. Individual readers may also wish to "build their own Policy Direction alternatives." Or, in the future, conditions may change and the region may wish to make additional changes in Policy Direction or choose a new Policy. This DEIS contemplates such modifications (see Chapter 4 and **Appendix I**).

3.4.1 Decisionmakers' Changes that Determine a Modified Policy Direction

Initially, regional decisionmakers are likely to select a Policy Direction and implementing action plan similar to one of the identified Policy Directions, but somewhat different in design. To accommodate this likelihood, a means to "mix and match" components of the sample implementation actions (Section 3A) to create "hybrid" alternatives has been designed. These hybrids can combine the themes or sample actions of more than one Policy Direction to meet the changing needs of the region. Decisionmakers can thereby respond to areas of known controversy or concern within the region, or can choose alternative strategies that better meet their needs at the time of decision. This document will provide them with the necessary structure to understand the environmental consequences without being drawn into a needless protracted procedural process at a time when expedient decisions are essential to the recovery of fish and wildlife species.

Because BPA has *individually* identified the actions for implementation, and has analyzed the *environmental consequences* of those actions under the entire spectrum of Policy Directions, the BPA Administrator (and other decisionmakers) can quickly assess the overall environmental consequences of potential alternatives for fish and wildlife recovery efforts. The mix-and-match approach can also be used to simulate actual regional alternatives and provide a basic analysis of environmental consequences.

3.4.2 Build Your Own Alternative

The directions for building a hybrid Policy Direction are:

- 1. Pick a new combination of underlying characteristics for the Policy Direction, using Table 3.3-1.**
- 2. Review the sample Implementing Actions (Section 3A) behind the different Policy Directions to see if the mix can work.** Remember that *some* implementing actions might be incompatible or would cancel each other out. For example, it would not be possible to match up parts of Natural Focus, which includes dam breaching, with the Commerce Focus aspects that require the dams to be in place. Remember also that when actions are combined differently, the associated environmental effects must also be considered.

Several cautions are in order for anyone wishing to "mix and match."

- **Compatibility.** Not all combinations of actions are possible; some actions are mutually exclusive.
- **Consistency.** Choosing actions from several different Policy Direction implementation actions may result in a plan that is truly indicative of none.
- **Effectiveness.** A "scattershot" technique that tries to reach too many goals with too little money for each will dilute the desired effect.
- **Clarity and Coordination.** The more that different "pieces" of different Directions are mixed, the more likely that confusion might result in interpreting who does what and how.

- **Cause-and-Effect.** If you change or substitute an action, remember that you are also substituting the *effects* (natural resource and/or socioeconomic) of that action.

Please see **Appendix I** for detailed information and helpful tools for performing the mix-and-match.

The Bottom Line : The more consistent the application of a Policy Direction, the more coordinated and effective mitigation and recovery efforts will be.

- **Chapter 4, Implementation, discusses factors that can influence the direction of and success in implementing each Policy Direction, and presents ways to assist implementation and change. It also presents the criteria for implementation results.**

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3A SAMPLE IMPLEMENTATION ACTIONS

The tables that follow contain over 2000 sample implementation actions. For each Policy Direction, BPA has compiled—from regional proposals—a sample list of actions in the Key Issue areas. Where regional proposals did not address a particular action area, the EIS Team has supplied sample actions to give the reader a more comprehensive view of each Policy Direction. These are marked "Sample Action." All other actions in the tables are identified by the name of the process or document from which they came, for example: *Conceptual Plan*, or *Framework Alternative 2*.

Once a Policy Direction is selected within the region by active choice or default, every agency, commercial entity, tribe, and private citizen will decide how (or whether) to implement the Policy Direction in their respective jurisdiction(s). The Policy Direction approach described in this EIS is intended to allow stakeholders flexibility and freedom to support the fish and wildlife recovery effort in a manner appropriate to their particular circumstances. So long as they are consistent with the Policy Direction selected, actions could be implemented on a *voluntary* basis, through *incentives*, or through *regulation*. However, in order to aid regional decisionmakers and the BPA Administrator in understanding the level of effort and resources each Policy Direction would likely require, BPA is providing a preview of the kinds of implementing actions that might take place under each Policy Direction. ***The actions found in these pages are examples only and do not necessarily represent all specific possibilities nor do they represent the position, an implied endorsement, or commitment by the BPA.***

How to Read the Tables in this Section

The sample implementation actions Tables are made up of two main components—the Policy Direction or theme and then the sample implementing actions for that theme. The implementation actions are grouped by the Key Issues that were identified in section 3.2 to help the reader better understand and find the types of actions that might be taken for their issue area. Figure 3-5 illustrates this breakdown of the components.

It is important to recall the distinction between *Status Quo* and *the current implementation actions*.

- **Status Quo** represents a continuation of the policy **direction** the region appears to be following now.
- **The current implementation actions** represent a snapshot view of those **actions** currently being taken to implement that Policy Direction.

This allows for comparing the changes in regional direction on fish and wildlife policy. As further implementing actions are taken, the Current Implementation Actions will have been changed. The Status Quo Policy Direction on the other hand could be continued, although the actions taken to implement it will change. The Policy Direction is a reflection of the objectives and beliefs guiding implementation. These two concepts must not be confused when evaluating the potential consequences of implementing a Policy Direction.

Readers may notice that some actions appear more than once throughout the tables. There are two reasons for this. First, a sample implementation action may be appropriate for more than one Policy Direction. Second, the categories (Fish and Wildlife, Commerce, and Tribes) are not mutually exclusive. Commercial and tribal activities may appear in the Fish and Wildlife section also. Recovery and mitigation will encompass a broad range of players and sectors throughout the region—and in fact, must be inclusive if efforts are to be successful.

Actions in the Fish and Wildlife section would likely be implemented by government agencies with jurisdiction over habitat, harvest, hatcheries, and hydropower. Actions that appear in the Commerce section are focused on changes in economic activity that could be implemented or funded by commercial entities to support the fish and wildlife recovery measures listed in the Fish and Wildlife sections. Actions in the Tribal section are focused on changes that might be made in harvest and hatchery practices, or in habitat located on tribal lands, to support fish and wildlife recovery measures listed in the Fish and Wildlife sections.

The following is a list of many of the sources used for the sample implementation actions in this section.

- Northwest Power Planning Council's (Council) Framework Concept Papers 1-28
- Multi-Species Framework Alternatives 1-7
- Framework Human Effects Analysis Appendix D
- Council Artificial Production Review
- Council Draft 2000 Fish & Wildlife Program
- Draft Conservation of Columbia Basin Fish: Building a Conceptual Recovery Plan (All-H Paper) (General)
- Draft Conservation of Columbia Basin Fish: Building a Conceptual Recovery Plan (All-H Paper) Habitat, Harvest, Hatcheries, and Hydro Appendices
- Final Conservation of Columbia Basin Fish: Final Basin-wide Salmon Recovery Strategy (All-H Paper) Dec. 2000
- US Fish and Wildlife Service Biological Opinion 2000
- National Marine Fisheries Service Biological Opinion 2000
- Spirit of the Salmon
- Tribal Vision
- Columbia River System Operation Review (SOR) Final EIS Alternatives
- Inter-Columbia Basin Ecosystem Management Project (ICBEMP) Final EIS
- Lower Snake River Juvenile Salmon Migration Feasibility Study EIS
- Lower Columbia River Estuary Program
- Governors' Recommendations

Figure 3-5: Integration of Policy Directions and Sample Implementation Plans

Policy Direction
(Policy direction title and theme or basis)

SAMPLE IMPLEMENTATION ACTIONS
FOR THE
NATURAL FOCUS POLICY DIRECTION

Emphasizes *removing the past major human interventions* in the ecosystem and allowing the existing fish and wildlife to return to a natural balance without further major human intervention (*let nature heal itself*).

SAMPLE Implementation Plan
(Includes Key Issues and examples of the types of actions for each issue)

FISH & WILDLIFE
1 HABITAT

Humans would have less control of the system in this alternative (Framework Alternative 1). Options must focus on recreating key natural ecosystem components within which...fish evolved and prospered, not focus on attempting to circumvent natural ecosystem processes (Framework Concept Paper 9). Effort and money...would be redirected toward changing the ecosystem back toward the condition it was in prior to large-scale human development (Framework Alternative 1). The ecosystem is able to achieve conditions consistent with native fish and wildlife with a minimum of external support (Draft Framework Alternative 1).

Restore as many areas as possible through natural means (Framework Alternative 1). Phase out use of artificial means of salmon recovery, such as barging and hatcheries, as habitat is restored (Framework Alternative 1). Restore the ecosystem to a much more natural state by eliminating dams, hatcheries and other artificial constraints and approaches (Framework Alternative 1). Restore natural processes throughout entire watershed and ecosystem. Identify, protect and connect aquatic refuges and reserves (Framework Concept Paper 1).

The first step towards mitigation involves looking at a list of activities in the local area that are linked to degradation of the ecosystem. Once these activities are listed, we can begin to look at what type of changes we can make that are realistic. The key to this step is working within social and economic structures (which incorporate ecosystem value) to choose how a certain activity can be altered. By examining these activities outside a 'cause and effect context,' [support] the notion that we are not able to predict individual and cumulative effects upon the surrogate measures, but acknowledging that some type of pathway of influence exists (Framework Concept Paper 16).

Humans are just beginning to realize how complex the interconnections in the ecosystem really are. What we do know is that our present society recognizes that our ecosystem has been thrown off balance. Those living in the Columbia Basin have identified salmon recovery to be of utmost priority and concern. It has been said that the first step to solving a problem is acknowledging it exists. A proactive strategy that stresses prevention followed by mitigation is an effective tool that can be used to help our troubled ecosystem. The challenge lies in making sure the situation does not get worse, and moving from there to make it better (Framework Concept Paper 16).

Maintain and restore the natural ecosystem that includes all naturally producing indigenous species, and their habitats (Framework Concept Paper 4). Increase habitat connections throughout the basin (Framework Alternative 5). Where designated lands identified in the habitat assessment are already publicly owned, implement management practices that ensure that those lands function naturally (LCREP). Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-O2). Maintain habitats by permitting natural forces, including disturbance events such as fire, to continue whenever these processes will contribute to long-term sustainability of habitat (ICBSDEIS, T-O2).

Establish riparian and upland area conditions that provide the full set of functions needed to maintain water and habitat quality that will support native aquatic species, achieved mainly through natural regenerative processes (Draft AII-H paper Dec. 1999). Establish riparian reserves to protect vegetation and soils (Spirit of the Salmon). Set aside the Hanford Reach as an ecological preserve (Framework Alternative 5). Adhere to and enforce existing habitat laws, regulation (including water quality, screening, fish passage, etc); strengthen where needed. Develop incentives and cost sharing programs (Tribal Vision).

[W]e prefer to benefit salmon through strategies and actions that emphasize and build upon natural processes. While we recognize this may not always be feasible, we think it is an important policy decision that will, in turn, clarify the region's choice of strategies and allow us to make most effective use of our finite financial resources (Governors' Recommendations, July 2000).

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 (Council's 2000 Fish and Wildlife Program).

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 (Council's 2000 Fish and Wildlife Program).

[The following] fundamental principles will be the basis...for the measures used to characterize the Columbia Basin ecosystem and its interrelated parts and to evaluate ecosystem changes that may result from various strategies and actions: 1) The abundance and productivity of fish and wildlife reflect the conditions they experience in their ecosystem over the course of their lifecycle; 2) Natural ecosystems are dynamic, evolutionary, and resilient; 3) Ecosystems are structured hierarchically; 4) Ecosystems are defined relative to specific communities of plant and animal species; 5) Biological diversity accommodates environmental variation; 6) Ecosystems develop primarily through natural processes. 7) Ecological management is adaptive and experimental; and 7) Human actions can be key factors

- Idaho Department of Fish and Game and Title 36 Idaho Code
- Thoreau Institute
- Columbia River Conference IV
- BPA-Sponsored Public Meeting.

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CURRENT IMPLEMENTATION ACTIONS

FOR THE

STATUS QUO POLICY DIRECTION

Human intervention with no coordinated regional plan: Independent strategies, multiple plans, unspecified or unclear goals, multiple governmental actions, and unclear direction on species recovery with conflicting laws, jurisdictions, and scientific analyses.

FISH & WILDLIFE

1 HABITAT

Under the Northwest Power Act, Bonneville is required to protect, mitigate and enhance the fish and wildlife affected by the development and operation of the federal hydropower projects on the Columbia River and its tributaries. The agency is obligated to provide treatment for fish and wildlife that is equitable with other project purposes. Bonneville must take into account, to the extent fully practicable, the Fish and Wildlife Program that the Northwest Power Planning Council adopts and recommends. Tribal, state, and federal fish and wildlife resources agencies, local governments, universities, watershed councils, and individuals recommend the Fish and Wildlife Program actions.

The budget for the Program (about \$127 million annually) is divided into three general categories: anadromous fish projects (approximately 70 percent of the budget); resident fish and wildlife projects (about 15 percent of the annual budget); and anadromous fish habitat work (about 15 percent of the budget).

Projects funded by the Program address the array of possible mitigation actions, including:

- Research projects, marking and tagging projects, monitoring and evaluation projects, and projects that develop new technology useful for monitoring and evaluation.
- A wide array of habitat improvement projects, including screening water diversions, replacing temporary irrigation dams with alternative fish friendly structures, fencing projects, water development projects, vegetative plantings and plant control, and environmental monitoring and evaluation projects.
- Land and water acquisitions, conservation easements, mainstem passage improvements, predator control actions, facilities' construction and operations and maintenance (O&M) actions, and watershed coordination.
- Special provisions are applied for the protection and management of critical habitat supporting species listed under the ESA.
- Enforcement of existing laws that provide for the protection of fish and wildlife and their habitat.

While different federal agencies administer different lands, and federal lands are subject to multiple mandates and demands, the fact that they are owned by a single entity means that federal lands can be more amenable to integrated habitat management. Particularly since 1993, when the Northwest Forest Plan was adopted, federal agencies have taken important steps toward a common vision of land management. Habitat management increasingly addresses landscape- and watershed-level approaches that address broad ecosystem issues in the Basin, including the decline of salmon and other species; poor forest health leading to catastrophic fires; and the expansion of noxious weeds on degraded rangelands.

The tribal viewpoint encompasses the need to take actions that restore habitat to levels that support not only de-listing of species under the ESA, but also the maintenance of sustainable, harvestable fish runs and wildlife throughout widespread areas of the basin.

On nonfederal lands, there are a number of federal and state programs that either regulate activities or are aimed at restoring habitat. There are also federal and state programs that provide incentives, particularly funding and technical assistance, to help land and water users protect and restore aquatic and terrestrial habitat.

1-1 Anadromous Fish

The ESA and federal land and resource management plans infer limited road building, grazing restrictions, and more protective stream buffers. Anadromous fish habitat restoration is based on pilot projects and political priorities. Current mitigation programs provide fish primarily for harvest. The ESA provides protections for listed stocks.

1-2 Resident Fish
Resident fish habitat receives lower priority than anadromous fish habitat. The focus is on mitigating for fish losses in areas around and above water storage projects. Sturgeon are a major focus.
1-3 Introduced Species
Resident fish above blockages are often introduced (rather than native) species. Habitat programs focus on opening up access (e.g., culverts), fencing, riparian, and streambed work to promote native species; and actions to reduce non-native predators.
1-4 Wildlife
Effects on wildlife from dam development are mitigated through land purchases and dedications, wildlife trusts, and land acquisitions to establish preserves. Mitigation agreements with states and tribes aim to replace inundated wildlife habitats.
1-5 Predators of Anadromous Fish
Programs aim to reduce non-native predators of anadromous fish. For example, the Northern Pikeminnow Management Program was designed to substantially reduce predation losses of juvenile outmigrants—Northern pikeminnow harvest fisheries have been employed since 1990. Also, terns that feed on anadromous fish are controlled (e.g., at Rice Island).
1-6 Watersheds
Currently, watershed approaches to habitat management are being funded by BPA and used throughout the Columbia Basin to implement the Fish and Wildlife Program. In many cases, the Natural Resources Conservation Service through its county offices is facilitating these efforts with participation from the states of Oregon, Washington, and Idaho, and the tribes. The focus is moving from piecemeal approaches to whole watersheds, with projects tested on a pilot basis by watershed.
1-7 Tributaries
Habitat projects on tributaries address anadromous fish, resident fish, and wildlife. Below blockages, the focus is on anadromous fish; above blockages, the focus is on resident fish. The selection process for tributary habitat actions generally lacks a prioritization component.
1-8 Mainstem Columbia
Habitat actions on the mainstem focus on migration corridors, with little attention to habitat structure.
1-9 Reservoirs
Two flow management strategies are used for reservoir operations: limit the winter and spring drafts of storage reservoirs to increase spring flows and the probability of full reservoirs at the beginning of summer; and draft from storage reservoirs during the summer to increase summer flows.
1-10 Estuary and Ocean
Estuarine and ocean habitat currently receives little or no emphasis. Dredging to deepen the Columbia River navigation channel is planned. Selected actions are conducted in estuary habitat to reduce imminent risks and improve survival of listed stocks (e.g., Rice Island measures).
1-11 Water Quality
Habitat measures to address water quality focus on federal projects in the mainstem, primarily total dissolved gas (nitrogen supersaturation) and water temperature issues.

2 HARVEST

2-1 Anadromous Fish

Anadromous fish harvest restrictions vary for ocean and in-river fisheries. Ocean fisheries are governed by U.S. and Canadian regulations, and the Pacific Salmon Treaty (PST). The PST is a 10-year agreement that implements an abundance-based (rather than quota-based) ocean harvest regime for chinook and coho salmon. The regime is moving from a catch-based to escapement-based harvest management strategy. The agreement places special emphasis on further restrictions for fisheries that incidentally harvest weak stocks, and on getting the required number of fish onto the spawning grounds. The two primary principles of the treaty are fish conservation and equity (harvest sharing). Ocean fisheries have been greatly curtailed—increasingly restrictive regulations, shortened seasons, area closures, special gear regulations, license moratoria, and buyout of fishing fleets have all occurred to limit harvests. Also, the PST establishes funds to pay for commercial salmon fleet reduction and improve fisheries knowledge.

In-river commercial fisheries include the non-Indian gillnet fishery below Bonneville Dam, and the treaty Indian gillnet fishery above Bonneville Dam and McNary Dam. Freshwater sport fisheries operate in the mainstem and in tributaries throughout Oregon, Washington and Idaho (run sizes permitting). And Tribal subsistence and ceremonial fisheries are conducted in the mainstem and in some tributaries as well (run sizes permitting).

Incidental harvest of listed stocks occurs inadvertently. The amount of incidental harvest varies by geographic area and species. Fishing in mixed stock areas would continue to be constrained by natural stocks present in the fishery and harvest allocation requirements. The current harvest management trend, accelerated by ESA listings, is to reduce harvest rates in mixed stock areas in favor of harvest in fisheries closer to the rivers of origin where the stocks can be segregated and more selectively caught. Large mixed-stock fisheries that once were managed to maximize catch are now managed to reflect the productive capability and conservation needs of naturally spawning fish and to achieve allocation objectives to river-of-origin fisheries. Management techniques such as time, area, and gear management would be used to ensure greater harvest selectivity. New mass marking technologies that make it possible to identify and selectively harvest hatchery fish, even in mixed stock areas, would continue to be developed and employed.

For many species of Columbia River salmon, harvest allocation between non-Indian and treaty Indians is subject to continuing jurisdiction of the federal courts under *United States v. Oregon* and *United States v. Washington*. Under those cases, certain tribes are entitled to a fair share (50%) of the harvestable fish. The central issues in both of these long-standing cases deal with state regulation of treaty Indian fishing (primarily involving harvest allocation), and legal standards for conservation and management. The parties to *U.S. v. Oregon* are presently negotiating harvest and hatchery programs in hopes of developing a management plan that addresses conservation under the ESA while meeting trust obligations to the tribes.

Fisheries law enforcement in sport and commercial fisheries is conducted by the states and the United States acting through the Coast Guard, U.S. Fish and Wildlife Service, and National Marine Fisheries Service. Tribal fisheries enforcement is implemented by the respective tribes and cooperatively through the Columbia River Inter-tribal Fisheries Enforcement Office.

2-2 Resident Fish

Resident fish are managed by the states for sport and maintenance of species. Some species also are managed by Indian tribes for subsistence. Federally-listed species, such as bull trout, receive special protection.

2-3 Wildlife

Wildlife are managed by the states for sport and maintenance of hunted species; and some species are managed by Indian tribes for subsistence, ceremonial and cultural purposes. Federally-listed wildlife species receive special protection.

3 HATCHERIES

There are more than 150 hatcheries and associated facilities for anadromous and resident fish in the basin. Federal and state agencies, Indian tribes and private interests operate them. Many are intended to mitigate the impact of dams, which have blocked access to about one-third of the salmon and steelhead habitat that existed historically in the Columbia basin. Resident fish hatcheries, like salmon and steelhead hatcheries, mitigate losses caused by the hydropower system. In some cases, such as in areas blocked by dams, losses of anadromous species are mitigated through the production of resident species, which may include native and nonnative species adapted to the altered environment. Artificial production programs produce the majority of salmon and steelhead that annually return to the Columbia River, and significant amount of resident trout and other resident fish. Most of the artificial production programs in the Columbia River Basin are financed with federal money in some way.

The emphasis of the hatchery programs is on a coordinated habitat restoration/production program in which artificial

production efforts are tied to habitat improvements. Focuses of hatcheries are on: mitigation for fish losses associated with hydrosystem construction and operation; improvement of the quality and survival of hatchery fish produced and released; conserving genetic resources; and testing new methods to enable use of hatcheries in ESA recovery efforts.

3-1 Anadromous Fish

The majority of the funds spent under the Mitchell Act have been used to mitigate for the salmon and steelhead losses that occurred throughout the river by developing hatchery production in the lower Columbia. Mitchell Act facilities are largely concentrated in the lower Columbia below Bonneville Dam (16 facilities) or in the Bonneville Dam pool area (7 facilities). Two facilities are located in the mid-Columbia area upstream of the confluence with the Snake River. Cutbacks in Congressional appropriations have been largely responsible for the reduction in total production. Production to preserve lower-river and ocean harvest opportunities has been the main focus of the Mitchell Act program.

In the Water Resources Development Act of 1976, Congress authorized funding for a program to mitigate for fish and wildlife losses caused by construction and operation of the four lower Snake River hydroelectric projects (Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams), known as the Lower Snake River Compensation Plan (LSRCP). Three recently completed fall chinook facilities on the Snake and Clearwater rivers (Pittsburg Landing, Big Canyon, Capt. John's Rapids), although part of the LSRCP program, have operations and evaluation costs directly funded by Bonneville Power Administration. The purpose of the LSRCP has been to replace lost salmon, steelhead and trout fishing opportunities, with management goals focused on replacing the loss of returning adult steelhead and salmon, rather than on releasing a given number of smolts.

Separate from the LSRCP is a production program to mitigate for steelhead and resident trout losses caused by the construction of Dworshak Dam, blocking the North Fork Clearwater River in Idaho. For this purpose, the Corps of Engineers funded the construction of the Dworshak National Fish Hatchery and the USFWS receives funds via the Corps to operate the facility, all reimbursed by Bonneville (the Dworshak hatchery also produces spring chinook as part of the LSRCP). The primary goal of fishery mitigation at Dworshak has been to preserve artificially the North Fork steelhead run.

Authorized in 1966 and operational by 1978, the Warm Springs National Fish Hatchery is located on the Warm Springs River in Oregon and funded and operated by the U.S. Fish and Wildlife Service. This is one of the few federally funded anadromous production facilities in the basin outside of the Mitchell Act facilities that are not directly or by reimbursement funded by Bonneville.

Anadromous fish mitigation for dams on tributaries on the Willamette River is provided by the Leaburg, McKenzie, Marion Forks, South Santiam, and Willamette hatcheries. The Oregon Department of Fish and Wildlife operates the hatcheries under a cooperative agreement with the Corps, and the Corps provides a majority of the funding while the State of Oregon also provides a substantial portion of the funds. The Bonneville Power Administration reimburses the Corps funded portion.

In addition to federally funded production programs, privately owned and public electric utilities produce millions more fish as mitigation for the impacts of their FERC-licensed dams.

State fish and wildlife agencies and tribes operate many of the federally financed production facilities. They also operate most of the production facilities associated with FERC-licensed projects. But the state agencies also operate hatcheries in the basin that are not federally funded or linked to FERC-licensed projects, projects funded by the states themselves and developed primarily to address declining fisheries.

3-2 Resident Fish

Hatcheries continue to produce significant numbers of native and non-native resident fish species. Frequently, resident fish species are substituted for anadromous species in aquatic areas blocked by hydro or other development. Special hatchery provisions are used to address species listed for protection under the ESA.

4 HYDRO

4-1 Dam modifications and facilities

Existing dams and hydro facilities remain in place. Ongoing improvements to the hydro system would continue, with roughly the existing annual level of investment continuing into the future. Improvements address concerns for fish passage and water quality targets of the federal Clean Water Act.

Fish passage efforts emphasize year-to-year planning and project implementation to improve passage at eight mainstem dams via structural modifications, more or improved spillway flow deflectors, turbine improvements, adult fish attraction modifications, new trash booms, modifications to fish separators, added cylindrical dewatering screens,

and juvenile fish bypass systems including new fish barges.

Major additional structural modifications under consideration include:

- Modifying adult ladder entrances and exits to improve adult passage survival.
- Installing juvenile bypasses at all major dams with high fish mortality rates.
- Installing fish screens at dams and over irrigation diversion outlets.
- Developing fish byways to divert and rejoin rivers.
- Constructing a smolt canal paralleling the Snake and Columbia Rivers from the mouth of the Clearwater to just below Bonneville Dam.
- Developing new facilities and equipment to improve the juvenile fish transportation program.
- Installing locks at additional dams to expand the navigation system.
- Modifying recreational facilities to allow their use over a wider range of operating conditions.

No hydro facilities fish passage facilities specifically designed for bull trout. As a result, it is unknown if the existing fishways at the Lower Snake or Columbia River Dams are suitable for bull trout. There are no fish passage facilities at Albeni Falls Dam at the outlet of Lake Pend Oreille.

4-2 Hydro Operation

The federal hydro system is operated to serve an array of individual project and system purposes, including power generation, flood control, irrigation, recreation, fish and wildlife and other purposes defined by Congressional authorizations. Systemwide purposes focus on supplying electrical energy to meet existing and projected loads, flood control, and more recently, salmon recovery. Current hydro operations reflect recommendations of Biological Opinions to promote recovery of listed fish stocks. Measurable performance standards are being developed to guide future system improvements.

Water is managed per the 1995 Water Budget, as well as additional water for flow augmentation to benefit the anadromous fish migration. The additional water is stored in Grand Coulee, Libby, and Arrow, and provided on a sliding scale tied to runoff forecasts. Flow targets are established at Lower Granite and McNary.

Since 1991, special flow operations for Kootenai River white sturgeon spawning and egg incubation have been in effect at Libby Dam project from April 1 through early July. In recent years, operating guidelines developed by the USFWS have specified that discharges from Libby Dam not be fluctuated for electrical load following purposes.

A selective water withdrawal system at Libby Dam provides temperature control to protect cold-water fish such as bull trout in the Kootenai River. The USFWS has specified special rates for reducing flow in the Kootenai River downstream from Libby Dam following flow augmentation for sturgeon spawning and incubation. Temporary flow-ramping rates and stable flows are established when necessary to minimize stranding and desiccation of bull trout and other aquatic life along the river edges. The USFWS also requested that steady flows of 8,000 cfs be maintained between the end of the sturgeon flows and the start of augmentation flows for salmon. The present strategy for improving bull trout habitat conditions includes maintaining steady summer streamflows and reducing short-term flow fluctuations downstream from both Libby and Hungry Horse Dams.

Presently, there are no specific measures designed to improve conditions for burbot migrations or spawning, nor are there any specific operations or structural measures in place to improve conditions for white sturgeon in the Lower Snake or Columbia Rivers, or westslope cutthroat.

4-3 Spill

Voluntary spill has been used as an interim passage strategy for anadromous fish since the late 1970s, pending development of more effective alternatives. Spill is an action provided to reduce turbine-related mortality of juvenile salmon and steelhead at lower Snake and Columbia River hydroelectric projects.

Currently, voluntary spill for fish passage is provided at each of the eight federal mainstem dams in the spring, up to interim dissolved-gas limits established by the States of Oregon and Washington. Fish spill is provided at Bonneville, The Dalles, and Ice Harbor Dams for 24 hours/day, and for 12 hours/day at John Day, McNary, Lower Monumental, Little Goose, and Lower Granite Dams.

When the falling water plunges into the water below, air can be entrained and dissolved under pressure, thus raising dissolved gases. This can form bubbles in fish, which may result in injury or death. The amount of spill is at the levels recommended in Biological Opinions, assuming that waivers are obtained from the states of Oregon and Washington to exceed their 110% TDG state water quality standards. Federal agencies would continue to provide spill for fish passage, but not to exceed TDG levels allowed under the standard. Both structural and operational measures (e.g., flow detectors) have been employed to reduce dissolved gas supersaturation levels during periods of spill. Other measures are also employed to manage dissolved gas and additional measures are under development for potential future consideration.

4-4 Flow

Current flow programs, with some protection for upstream reservoirs, would continue. Flow augmentation, or use of water from storage reservoirs to augment natural streamflows, is one of the primary strategies to mitigate the effects of impoundments and the regulated hydrograph on juvenile passage. The general concept of flow augmentation is to increase flows and water velocities when most juvenile migrants are present. Water from key storage reservoirs – Grand Coulee, Dworshak, Hungry Horse, Libby, Snake River reservoirs, and Canadian reservoirs – is used to augment natural flows to meet these targets, to the extent possible. The probability of meeting these targets varies depending on snow pack and the runoff volume forecasts, shape of the runoff, and general weather patterns throughout the spring and summer flow augmentation period.

A flow augmentation program aims to restore more natural flow patterns during the time juvenile and adult salmon and steelhead are migrating. Biological Opinions include two flow management strategies: (1) limiting the winter and spring drafts of storage reservoirs to increase spring flows and the probability of full reservoirs at the beginning of summer; and (2) drafting from storage reservoirs during the summer to increase summer flows. In the Snake River, operational measures would continue to include flow augmentation from Dworshak Reservoir as needed to moderate temperatures in the lower Snake River. Water from Canadian storage reservoirs may be secured to meet flow needs.

4-5 Reservoir Levels

Spanning the river, the dams form a physical barrier that impedes the river's flow, forming an artificial lake or reservoir. Water pools behind each dam covering land that was previously exposed, allowing navigation and creating opportunities for recreation, irrigation, and water supplies. Reservoir levels would continue to be managed as multi-use facilities that provide navigation, hydropower, irrigation, recreation, and fish and wildlife conservation benefits.

Storage reservoir levels would be managed to maximize availability of flow augmentation water in the spring and summer. Some mainstem run-of-river reservoirs (Little Goose, Lower Monumental, and Ice Harbor) on the lower Snake River and John Day Reservoir on the Columbia River would be lowered during the spring and summer migration periods to increase water velocity, which is intended to increase the migration rate and survival of salmonid smolts. However, the Lower Snake River dams are all run-of-river dams, which means that they have limited storage capacity in their reservoirs and pass water through the dam at about the same rate as it enters the reservoir.

4-6 Water Quality

The federal hydropower system would continue to operate to reduce water temperatures during periods of juvenile and adult fish migration and to reduce the harmful effects of elevated levels of spill-generated total dissolved gas (TDG) on anadromous and resident fish. For example, flows would be released from Dworshak Dam to help reduce water temperatures in the lower Snake River for migrating fall chinook salmon and steelhead. Gas concentrations would be controlled by limiting the amount of spill at mainstem dams and by installing gas abatement structures that reduce the generation of TDG.

4-7 Juvenile Migration and Transportation

Juvenile migrating fish pass dams in three ways under a spread-the-risk strategy: (1) through the turbines, (2) over the spillways, or (3) through bypass systems where they are diverted to trucks or barges for transport. Some juvenile fish may enter the intake openings of the powerhouse, move with water through the turbines and exit on the other side. The fish may experience trauma from pressure changes, turbulent water conditions, or striking the machinery; however, about 90 to 95 percent of fish entering the turbines survive past the dam.

Currently, most juvenile migrants pass dams through non-turbine routes. Some juvenile fish travel in water passing through the spillway and falling to the lower river. These fish may be damaged in the fall or be affected by dissolved gasses in the water; however, about 98 percent of fish passing through the spillway survive.

Juvenile fish bypass systems include screened turbine intakes, and ice and trash sluiceways. Turbine intake screens are devices designed to intercept fish that enter turbine intakes. The two kinds of screens that are currently employed are submersible traveling screens and extended-length submersible bar screens. The Dalles Dam is the only federal mainstem dam without mechanical screens. The screens guide the fish to a channel that conveys them to the downstream side of the dam and back into the river or into trucks or barges for transportation to below the dam. Juvenile fish bypass facilities would be operated continuously during the fish passage period from April through November. All juvenile fish bypass systems would be operated and maintained based on the Corps' criteria, as modified.

Juvenile fish transportation is a means to convey fish past multiple dams and reservoirs to reduce the cumulative effects of dam-related and reservoir-related mortality. Juvenile migrants that are guided by turbine intake screens are collected in channels or holding tanks, and loaded onto trucks or barges and transported for release below Bonneville Dam where they continue their migration to the ocean. The collected and transported fish may suffer delays and

handling stress; however, about 98 to 99 percent of the transported fish survive to the point of release below Bonneville Dam.

Research covering various aspects of juvenile fish passage would be implemented annually based on provisions in Biological Opinions and through coordination with regional work groups. These studies would be intended to provide information related to key passage uncertainties, for improving operational criteria, modifying/improving existing fish passage facilities, and constructing new passage facilities.

4-8 Adult Fish Passage

General concepts for adult fish passage at low-head dams were fairly well established at the time that large dams were constructed on the Columbia River. As a result, adult passage facilities, such as fishway entrances, collection/transportation channels, and ladders, were incorporated into the original construction of some mainstem dams. These adult fish passage facilities would continue to be operated and maintained. In general, the migration rate of adult migrants through dams and reservoirs would be similar to that of pre-impoundment.

All the mainstem hydroelectric dams in the Columbia/Snake migration corridor have fish ladders and associated auxiliary water supply and powerhouse collection facilities. The adult fish passage period is March through November at Bonneville, The Dalles, and John Day dams; and March through December at McNary and the four lower Snake River projects. Adult salmonids (and other species) are counted at each mainstem dam, with the schedule varying according to location and time of year.

The height difference between the river on the downstream side of the dam and the reservoir behind the dam is approximately 100 feet for all of the Lower Snake Dams. Fish ladders, which have been in place since the dams were built, and devices to attract fish to the entrances of the ladders are the primary aid to surmounting the dams. The Corps would continue to investigate and adopt new technologies for maximizing the number of fish that safely pass the dams in both directions.

Research covering various aspects of adult fish passage would be implemented annually based on provisions in Biological Opinions and through coordination with regional work groups. These studies would be intended to provide information related to key passage uncertainties, for improving operational criteria, modifying/improving existing fish passage facilities, and constructing new passage facilities.

4-9 Flood Control

Existing dams with flood control capabilities would continue to be operated for that purpose. The four Lower Snake dams were not built to control floods, and would not be modified for that function.

COMMERCE

5. POWER

5-1. Existing Generation

System operations and configurations for power generation would continue as they have been, as modified to protect and recover fish listed under the ESA.

5-2. New Generation

New generation resources would continue to be developed to meet increasing demand. New generation sources would be subject to environmental laws including NEPA, Clean Air and Water Acts, and FERC licensing.

5-3. Transmission Reliability

Actions to maintain and improve power transmission reliability would continue to meet demands for economic growth and development. Upgrades and improvements would be subject to environmental laws including NEPA, Clean Air and Water Acts, and FERC licensing.

6. INDUSTRY

6-1. Industrial Growth

Proposed new industry is reviewed at the local level for compliance with existing local zoning and environmental ordinances. Local zoning plans and plans for water supply and other public services may be subject to federal or state environmental documentation requirements. New industry is subject to environmental regulations, including the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA); the Toxic Substances Control Act of 1976 (TSCA); the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); the Resource Conservation and Recovery Act (RCRA); the Clean Air Act (CAA); the Clean Water Act (CWA); the Endangered

Species Act (ESA); and others. Common law and statutory law regarding environmental impacts, damages and liability may also affect the behavior of industrial growth.
6-2. Aluminum and Chemical
Aluminum and chemical production facilities would continue to be subject to existing environmental regulations, including CERCLA, TSCA, FIFRA, RCRA, CAA, CWA, ESA and others.
6-3. Mining
Existing and future mining operations would continue to be subject to existing environmental regulations, including CERCLA, TSCA, FIFRA, RCRA, CAA, CWA, ESA and others. On federal land, mining operations are managed according to federal land and resource management plans.
6-4. Pulp and Paper
Pulp and paper production facilities would continue to be subject to existing environmental regulations, including CERCLA, TSCA, FIFRA, RCRA, CAA, CWA, ESA and others.
7. TRANSPORTATION
7-1. Navigation and Barging
The Columbia and Willamette Rivers would continue to be dredged to maintain the shipping channels. A lower Columbia navigation channel-deepening project is planned to enhance river transportation. Navigation locks would continue to be operated to lift and lower boats and barges between the lower river levels downstream of the dams and the higher reservoir levels. The federal Rivers and Harbors Act would continue to regulate potential obstructions in navigable waterways.
7-2. Trucking and Railroads
Existing railroads and trucking facilities would continue to operate and complement the barging industry along the rivers.
8. AGRICULTURE
Environmental considerations for agricultural operations are addressed by a variety of federal, state, and local programs for public and private lands. Take avoidance and critical habitat provisions of ESA would continue to affect agricultural practices.
8-1. Irrigation
Millions of acres of land in the Basin would continue to be irrigated. Although most withdrawn water eventually returns to streams from agricultural runoff or from ground water recharge, crops consume much of the water. Idaho, Oregon, and Washington water resources agencies have adopted limited, temporary moratoria on new water diversion permits from sensitive salmon streams. The Corps would continue to issue permits for water withdrawal structures in waters of the United States and in navigable waterways.
8-2. Pesticides and Agricultural Practices
On federal land, agricultural management and pesticide application would continue as directed by existing and amended land and resource management plans. Standards would continue or be modified to address conservation recommendations from the Biological Opinions for listed species. On private land, programs administered by the USDA and EPA may influence agricultural practices. Many USDA conservation subsidies, some targeted to water conservation and water quality, currently are provided under the Environmental Quality Incentives Program. Cost sharing and technical assistance are provided for approved practices. Some agricultural lands are leased and put in long-term conserving uses under the Conservation Reserve and Wetlands Reserve Programs. The USDA and EPA would continue to administer laws and programs to control pesticide use on private lands and to reduce potential adverse effects of agricultural practices.
8-3. Grazing
On federal land, grazing would continue to be managed according to land and resource management plans, as modified to address ESA species listings.
8-4. Forestry
Environmental effects of forestry practices are addressed by a number of federal and state laws and programs. On federal land, forest management would be directed by federal land and resource management plans. On private land,

state laws regulate practices and federal laws provide certain management incentives to provide conservation outcomes.

9. COMMERCIAL HARVEST

Commercial harvest of salmon within the Columbia River is regulated by the Columbia River Compact, a bi-state compact established by the legislatures of Oregon and Washington in 1918. Compact fishing regulations are implemented under the state laws of Oregon and Washington and allow the sale and purchase of fish caught commercially in non-Indian and treaty Indian fisheries. The Compact is supported by the state staffs of Oregon and Washington, and the Technical Advisory Committee, composed of representatives of the state, tribal and U.S. agencies that are parties to *U.S. v. Oregon*. The tribal governing bodies of each of the tribes collaborate with the Compact agencies in establishing fishing regulations that affect tribal members.

With the exception of a limited commercial fishery in 2000, no commercial in-river fisheries directed at upper Columbia River spring chinook have occurred since 1977, and impacts have been limited to tribal ceremonial and subsistence and very minimal incidental catch levels. As a result, the average harvest rate on that spring chinook presently averages less than 6 percent. For summer chinook, there have been no commercial fisheries since 1965. Taking into account the very limited tribal ceremonial and subsistence fisheries, the harvest rate for the summer chinook run has averaged less than 3 percent annually since 1986. There has been no commercial harvest of sockeye salmon since 1988 (with the exception of a very limited three-day commercial fishery targeting sockeye in the mainstem Columbia River in 2000). Columbia River sockeye are not known to be harvested in ocean fisheries.

Presently, there are no commercial or sport fisheries directed at Lower Columbia River chum salmon, although chum are taken incidentally in gillnet fisheries for coho and chinook salmon, and a minor catch occurs in tributary recreational fisheries.

Ocean commercial fisheries have been greatly curtailed, with a corresponding reduction of the ocean commercial salmon fishing fleet. Increasingly restrictive regulations, shortened seasons, area closures, special gear regulations, license moratoria, and buyout of fishing fleets have all occurred to limit harvests. The annual commercial and sport catch of chinook off Washington and northern Oregon coasts (where Columbia River chinook predominate in the catch) has declined from nearly 600,000 fish in 1974 to an average of about 15,000 fish since 1994.

10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Local land use, zoning and planning regulations guide residential and commercial development, which is affected by ESA, CWA, NEPA, and other federal laws and incentives.

11. RECREATION

Ocean recreational fishing would continue to harvest Columbia River salmon off the Oregon, Washington and California coasts. Also, recreational fisheries occur in the mainstem, and in various tributaries in Idaho, Oregon, and Washington. Marine harvest regulations would continue to be enforced by the states and the U.S. through the NMFS, USFWS and Coast Guard. Sport fishing for anadromous fish in state waters is regulated and administered by the respective fish and wildlife departments in Idaho, Oregon and Washington. Recreational fishing would emphasize the use of hook-and-line gear.

TRIBES

12-1. Tribal Harvest

There is a unique and long-standing relationship between the U.S. government and the region's Indian tribes. The United States holds a trust responsibility to all tribes to protect tribal trust resources, including natural resources such as fish, wildlife, timber and water, and cultural resources. In treaties between some tribes and the U.S. government, the tribes reserved certain rights, including fishing rights, that have been adjudicated through court proceedings notably, *U.S. v. Oregon*. Many people believe that multiple agency, tribal, and individual efforts in the region lack overall direction and focus, and that the existing governance structures do not adequately include tribal sovereign governments in decision making.

Current mitigation programs attempt to provide fish for harvest and protection mechanisms for listed stocks. All-Hatchery fish would continue to be marked to enable selective harvest. Tribal harvest would be managed to achieve escapement goals of adults to spawning grounds.

To the extent the resource permits, tribal people would continue to fish for ceremonial, subsistence, and commercial purposes employing--as they always have using a variety of technologies. Tribal people fish from wooden scaffolds and from boats using set nets, spears, dip nets, and poles and lines.

Ecosystem and fish production actions would be taken that promote and sustain fishing opportunities in treaty

reserved usual and accustomed fishing areas. Ceremonial, subsistence, and commercial fisheries would be conducted, consistent with court interpretations of Indian treaties. As run sizes permit, tribal members would continue to catch salmon primarily with set gillnets in the mainstem Columbia River.

12-2. Tradition, Health, Spirituality

Tribal society is closely linked with the natural world. There is no distinction between natural resources and cultural resources--all are necessary for culture, economy, religion and a way of life to be expressed, practiced and maintained. Tribal people still maintain a dietary preference for salmon, and its role in ceremonial life remains preeminent. Salmon is important and necessary for physical health and for spiritual well being.

The present condition of the ecosystem and its fish and wildlife resources limits the ability of tribal governments to enjoy those resources and to exercise self-determination. As a result, tribal well-being, health, economics, and all other aspects of tribal culture are compromised.

SAMPLE IMPLEMENTATION ACTIONS

FOR THE

NATURAL FOCUS POLICY DIRECTION

Emphasizes *removing the past major human interventions* in the ecosystem and allowing the existing fish and wildlife to return to a natural balance without further major human intervention (*let nature heal itself*).

FISH & WILDLIFE

1 HABITAT

Humans would have less control of the system in this alternative (Framework Alternative 1). Options must focus on recreating key natural ecosystem components within which...fish evolved and prospered, not focus on attempting to circumvent natural ecosystem processes (Framework Concept Paper 9). Effort and money...would be redirected toward changing the ecosystem back toward the condition it was in prior to large-scale human development (Framework Alternative 1). The ecosystem is able to achieve conditions consistent with native fish and wildlife with a minimum of external support (Draft Framework Alternative 1).

Restore as many areas as possible through natural means (Framework Alternative 1). Phase out use of artificial means of salmon recovery, such as barging and hatcheries, as habitat is restored (Framework Alternative 1). Restore the ecosystem to a much more natural state by eliminating dams, hatcheries and other artificial constraints and approaches (Framework Alternative 1). Restore natural processes throughout entire watershed and ecosystem. Identify, protect and connect aquatic refuges and reserves (Framework Concept Paper 1).

The first step towards mitigation involves looking at a list of activities in the local area that are linked to degradation of the ecosystem. Once these activities are listed, we can begin to look at what type of changes we can make that are realistic. The key to this step is working within social and economic structures (which incorporate ecosystem value) to choose how a certain activity can be altered. By examining these activities outside a 'cause and effect context,' [support] the notion that we are not able to predict individual and cumulative effects upon the surrogate measures, but acknowledging that some type of pathway of influence exists (Framework Concept Paper 16).

Humans are just beginning to realize how complex the interconnections in the ecosystem really are. What we do know is that our present society recognizes that our ecosystem has been thrown off balance. Those living in the Columbia Basin have identified salmon recovery to be of utmost priority and concern. It has been said that the first step to solving a problem is acknowledging it exists. A proactive strategy that stresses prevention followed by mitigation is an effective tool that can be used to help our troubled ecosystem. The challenge lies in making sure the situation does not get worse, and moving from there to make it better (Framework Concept Paper 16).

Maintain and restore the natural ecosystem that includes all naturally producing indigenous species, and their habitats (Framework Concept Paper 4). Increase habitat connections throughout the basin (Framework Alternative 5). Where designated lands identified in the habitat assessment are already publicly owned, implement management practices that ensure that those lands function naturally (LCREP). Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-O2). Maintain habitats by permitting natural forces, including disturbance events such as fire, to continue whenever these processes will contribute to long-term sustainability of habitat (ICBSDEIS, T-O2).

Establish riparian and upland area conditions that provide the full set of functions needed to maintain water and habitat quality that will support native aquatic species, achieved mainly through natural regenerative processes (Draft All-H paper Dec. 1999). Establish riparian reserves to protect vegetation and soils (Spirit of the Salmon). Set aside the Hanford Reach as an ecological preserve (Framework Alternative 5). Adhere to and enforce existing habitat laws, regulation (including water quality, screening, fish passage, etc); strengthen where needed. Develop incentives and cost sharing programs (Tribal Vision).

[W]e prefer to benefit salmon through strategies and actions that emphasize and build upon natural processes. While we recognize this may not always be feasible, we think it is an important policy decision that will, in turn, clarify the region's choice of strategies and allow us to make most effective use of our finite financial resources (Governors'

Recommendations, July 2000).

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 (Council's 2000 Fish and Wildlife Program).

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 (Council's 2000 Fish and Wildlife Program).

[The following] fundamental principles will be the basis...for the measures used to characterize the Columbia Basin ecosystem and its interrelated parts and to evaluate ecosystem changes that may result from various strategies and actions: 1) The abundance and productivity of fish and wildlife reflect the conditions they experience in their ecosystem over the course of their lifecycle; 2) Natural ecosystems are dynamic, evolutionary, and resilient; 3) Ecosystems are structured hierarchically; 4) Ecosystems are defined relative to specific communities of plant and animal species; 5) Biological diversity accommodates environmental variation; 6) Ecosystems develop primarily through natural processes. 7) Ecological management is adaptive and experimental; and 7) Human actions can be key factors structuring ecosystems (NPPC Artificial Production Review, October 1999, Section II.A).

Encourage human activities to develop in ways that allow expression of a productive natural system consistent with the needs of native fish, wildlife and plant communities (Draft Framework Alternative 1).

Research, Monitoring, and Evaluation:

Establish pre-development baseline information and restore to those conditions (Tribal Vision).

Implement multiple-scale assessments and data management systems (USFS, BLM) (Final All-H Paper Dec. 2000).

1-1 Anadromous Fish

Leave natural predators and leave spawned-out adult fish carcasses to provide nutrients to juvenile fish (Sample Action).

Begin improving in-channel stream conditions for anadromous fish by improving or eliminating land-use practices that degrade watershed quality (Framework Concept Paper 3 and Spirit of the Salmon). Increase the abundance of anadromous fish to increase the biomass of ocean-derived energy and nutrients delivered to freshwater areas (Draft Framework Alternative 1). Identify, protect and connect aquatic refuges and reserves (Framework Concept Paper 1). Increase connections within freshwater areas to facilitate wide distribution of energy and nutrients within the system. Establish riparian conditions that allow energy and nutrient transfer between terrestrial and aquatic areas via predation, carcass scavenging or plant production and grazing (Draft Framework Alternative 5). Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-02).

Through ICBEMP's and the Northwest Forest Plan's aquatic strategies, provide a base for habitat protection (USFS, BLM) (Final All-H Paper Dec. 2000).

Accelerate land acquisition, using LWCF [*Land and Water Conservation Fund*] funds prioritizing fish habitat (USFS, BLM) (Final All-H Paper Dec. 2000).

Complete HCP for Mid-Columbia Dams (Final All-H Paper Dec. 2000).

1-2 Resident Fish

Restore ecosystem components that were represented by healthy anadromous fish runs to benefit native resident fish and wildlife by increasing the prey base and nutrient cycling, and reducing constraints on resident fish management actions through more normative management actions for anadromous fish. Direct management actions include restoring free-flowing river reaches and associated riparian habitats (Framework Concept Paper 6). Increase the abundance of adfluvial and migratory resident fish to distribute energy and nutrients within freshwater areas, especially above anadromous blockages (Draft Framework Alternative 1).

Research, Monitoring, and Evaluation:

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate potential habitat use of the White Salmon River subsequent to removal of Condit Dam (FWS Biological Opinion Dec. 2000).

1-3 Introduced Species

Cease introductions of exotic fish and wildlife species (Sample Action).

Discourage proliferation of non-native species and conditions favoring non-native species (Framework Alternative 1). Avoid the introduction of unwanted exotic species and control the deliberate introduction of desirable exotic species in the lower Columbia River and estuary (LCREP). The ecosystem would be restored and managed primarily with respect to native fish, wildlife and plant species (Draft Framework Alternative 5).
1-4 Wildlife
Restore river health, thereby restoring fish and wildlife in conditions under which they evolved (Framework Concept Paper 2).
1-5 Predators of Anadromous Fish
Establish riparian conditions that allow energy and nutrient transfer between terrestrial and aquatic areas via predation, carcass scavenging or plant production and grazing (Draft Framework Alternative 5). Increased amount of riparian vegetation will provide shade, which lowers water temperature and reduces threat of predators (Framework Concept Paper 1). Restore natural biological communities in tributary streams such that they exhibit natural predator/prey relationships (Draft All-H paper Dec. 1999). Restore more natural predator-prey conditions (e.g., broader food base for aquatic, terrestrial and avian predators (Framework Concept Paper 6). Reduce non-native predators (Framework Concept Paper 1). Remove Rice Island. Don't relocate the terns (Public Meeting). ¹
1-6 Watersheds
Restore natural processes throughout entire watershed and ecosystem. Identify, protect, and restore aquatic refuges and reserves. Restore damaged riparian areas and watersheds, re-establish more natural streamflows; and let floodplains be floodplains (Framework Concept Paper 1). Stop government programs that allow or promote development in sensitive floodplains (Tribal Vision). Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000). Implement wetland restoration and management practices that help maintain stream flows, filter pollutants, and provide flood storage (Draft All-H paper Dec. 1999). Support water acquisitions using federal funding (Final All-H Paper Dec. 2000). Restore soil, riparian vegetation and re-create wetlands (Framework Concept Paper 3). Re-establish ecological linkages in watersheds, linking the aquatic system with the terrestrial. This should also include watersheds where dams create an ecological barrier, isolating a portion of the river from others (Framework Concept Paper 10). Emphasize watershed restoration in all management decisions and reduce commodity subsidies that harm salmon and steelhead habitat (Framework Concept Paper 1). Develop floodplain management and shoreland zoning protection programs (LCREP). <i>[Encourage]</i> non-governmental participation in planning and implementation of watershed solutions (Federal Habitat Team, NRCS) (Final All-H Paper Dec. 2000). Return water to streams throughout the basin to recreate natural flows and hydrograph of pre-dam and pre-diversion conditions (Framework Concept Paper 1).
1-7 Tributaries
Focus intensively on improvements in both the mainstem sections of the Columbia and Snake Rivers and their tributaries. Protect, connect, and restore habitat on the tributaries throughout the basin (Framework Alternative 1). Manage river regulation of tributaries to remove thermal blockages that impede biological exchange within the basin (Draft Framework Alternative 2,3). Fund land acquisitions and conservation easements (BPA) (Final All-H Paper Dec. 2000). Coordinate mitigation plans with system operating plans, reclaiming spawning and rearing habitat by opening migration corridors and repairing degraded tributaries. Coordinate funding among federal, state, and private sources (Framework Concept Paper 2). Management actions to implement instream flow protection for small streams and tributaries throughout the region include: 1) supporting agency efforts to address small stream and tributary streamflow issues, including information gathering and analysis, and development of policies and programs; and 2) seeking out opportunities for collaborative partnerships with stakeholders to restore and protect instream flows. Stakeholders include water right holders; watershed councils and other community groups; non-governmental organizations including land and water trusts; and federal, state and local governmental agencies and tribes (Framework Concept Paper 17). Re-establish sources of large woody debris for each stream adequate to maintain long term supply and to meet the structure and nutrient needs of the stream (Framework Concept Paper 10). Protect and restore degraded habitats in tributary watersheds. Emphasize the use of natural processes to restore native habitat characteristics and ecological functionality. Use minimal structural or other actions to restore these habitats. Restore normative seasonal flow patterns in tributaries through voluntary measures. Remove or bypass physical or biological impediments (e.g., culverts, highways and railroads) that fragment habitats for different species and life

¹ Pasco Public Meeting

stages and between aquatic and terrestrial areas (Draft Framework Alternative 6; Framework Concept Paper 21). Outside of major urban areas, develop incentives, zoning or other measures to protect riparian areas and to allow normative development of riparian zones (Draft Framework Alternative 6).

Reclaim spawning and rearing habitat by reopening access to fish migrations and repairing degraded tributaries (Framework Concept Paper 8). Establish instream flows in tributaries that reflect natural seasonal flow patterns. Restore natural biological communities in tributary streams such that they exhibit natural predator/prey relationships (Draft All-H paper Dec. 1999, derived from the draft NPPC Multi-Species Framework Alternatives). Provide instream flows adequate to support the natural functioning of small streams and tributaries as part of the Columbia River Basin's natural ecosystem (Framework Concept Paper 17).

Research, Monitoring, and Evaluation:

With the Council, develop subbasin and watershed assessments and plans; ensure that assessments and plans are coordinated across nonfederal and federal ownerships and programs (Final All-H Paper Dec. 2000). Fund technical support for 2001-2006 plan implementation; identify in annual and 5-year implementation plan appropriate habitat actions and implement them (Final All-H Paper Dec. 2000).

BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows by, for example, establishing a water brokerage. BPA will begin these experiments as soon as possible and submit a report evaluating their efficacy at the end of 5 years (NMFS Biological Opinion Action Table Dec. 2000).

Develop and implement TMDLs for anadromous fish tributaries within five years. Coordinate TMDL and Water Quantity planning assessments with NPPC program. Provide TMDL technical assistance to states (Final All-H Paper Dec. 2000).

By December 1, 2001, the Action Agencies shall quantify the effects of groundwater seepage associated with the magnitude and duration of sturgeon flows on crops in the Kootenai Valley relative to all other types high flow/stage events which occur in the Kootenai River. The effects of direct precipitation and runoff from small tributaries within the Kootenai Valley on both surface and ground water levels shall also be accounted for in this study. This shall include delineation of specific sites affected and identification of all feasible remedies specific to those sites such as, drainage, willing seller land purchases, and enrollment in the Department of Agriculture's Wetland Reserve Program (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate potential habitat use of the White Salmon River subsequent to removal of Condit Dam (FWS Biological Opinion Dec. 2000).

1-8 Mainstem Columbia

Focus intensively on improvements in both the mainstem sections of the Columbia and Snake Rivers and their tributaries (Framework Alternative 1). Possibilities for a mainstem habitat implementation plan: create shallow-water habitat by excavating backwater sloughs, alcoves, and side channels and other measures; add large woody debris to these systems; re-connect alcoves, sloughs, and side channels to the main channel; establish emergent aquatic plants in shallow water areas; re-establish or enhance historic or existing wetlands; mimic natural hydrographs to the extent practicable; dredge or excavate lateral channels that have silted in; acquire and protect a belt of lands adjacent to the mainstems (Draft All-H paper Dec. 1999).

Protect, conserve, and enhance identified habitats, particularly wetlands, on the mainstem of the lower Columbia River (LCREP). Implement restoration programs (BPA) (Final All-H Paper Dec. 2000). Protect Hanford Reach (FWS, DOE) (Final All-H Paper Dec. 2000). Designate Hanford Reach under the Federal Wild and Scenic Rivers Act; re-establish normative river conditions there (Tribal Vision). Evaluate opportunities to improve spawning habitat in the Ives Island area (Final All-H Paper Dec. 2000).

[Implement] significant land use changes on both public and private lands (Framework Alternative 1). Mainstem habitat is returned to natural conditions that are linked to a downstream passage survival rate closer to that which existed prior to construction of the dams (Spirit of the Salmon).

Research, Monitoring, and Evaluation:

The Corps shall develop and conduct a detailed feasibility analysis of modifying current system flood control operations to benefit the Columbia River ecosystem, including salmon. The Corps shall consult with all interested state, federal, tribal, and Canadian agencies in developing its analysis. Within 6 months after receiving funding, the Corps shall provide a feasibility analysis study plan for review to NMFS and all interested agencies, including a peer-review panel (at least three independent reviewers, acceptable to NMFS, with expertise in water management, flood control, or Columbia River basin anadromous salmonids). A final study plan shall be provided to NMFS and all interested agencies 4 months after submitting the draft plan for review. The Corps shall provide a draft feasibility

analysis to all interested agencies, NMFS, and the peer-review panel by September 2005 (NMFS Biological Opinion Action Table Dec. 2000).

Assess opportunities for mainstem habitat improvements (BPA) (Final All-H Paper Dec. 2000). BPA, working with BOR, the Corps, EPA, and USGS, shall develop a program to 1) identify mainstem habitat sampling reaches, survey conditions, describe cause-and-effect relationships, and identify research needs; 2) develop improvement plans for all mainstem reaches; and 3) initiate improvements in three mainstem reaches. Results shall be reported annually (NMFS Biological Opinion Action Table Dec. 2000).

1-9 Reservoirs

No reservoirs at John Day, McNary and four Lower Snake project sites, except those created by natural conditions. Reservoirs at other dams may be drawn down (Sample Actions).

The Action Agencies will work with the Service and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

1-10 Estuary and Ocean

Restore estuaries to pre-settlement conditions. Remove Sand Island and Rice Island. Govern estuarine hydrology by upstream hydrology. Naturally restore estuarine habitats from shore to deep water (Sample Actions).

Re-establish normative estuarine conditions to expand the size of the estuary and increase its productivity (Draft Framework Alternative 2, 3,5).

Restore estuarine conditions that provide for adequate prey production, cover and habitat complexity for both smolts and returning adults. Restore quantity and quality of shallow water estuarine habitats (e.g., wetlands and marshes, tidal channels, submerged aquatic vegetation) to those that will support natural aquatic communities. Restore estuarine flow, sediment, and nutrient levels to those that support natural aquatic communities. Restore estuarine temperature, turbidity, bacteria, dissolved oxygen and gas and salinity concentrations that support natural aquatic communities (Draft All-H paper Dec. 1999). Reestablish floodplains, wetlands and estuary areas to promote passive flood control, develop spawning and rearing habitat and enhance water quality (Framework Concept Paper 7). Restore 3,000 acres of tidal wetlands along the lower 46 river miles to return tidal wetlands to 50 percent of the 1948 level (LCREP).

Expand knowledge and understanding of the ocean and Columbia River estuary (Framework Concept Paper 27).

The Action Agencies, coordinating through the Water Quality Team, shall annually develop a 1- and 5-year water quality plan for operation and configuration measures at FCRPS projects (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall develop a pilot study to assess the feasibility of enhancing the function of ecological communities to reduce predation losses and increase survival in reservoirs and the estuary (NMFS Biological Opinion Action Table Dec. 2000).

During 2001, the Corps and BPA shall seek funding and develop an action plan to rapidly inventory estuarine habitat, model physical and biological features of the historical lower river and estuary, identify limiting biological and physical factors in the estuary, identify impacts of the FCRPS system on habitat and listed salmon in the estuary relative to other factors, and develop criteria for estuarine habitat restoration (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps, working with LCREP and NMFS, shall develop a plan addressing the habitat needs of salmon and steelhead in the estuary (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BPA, working with LCREP, shall develop and implement an estuary restoration program with a goal of protecting and enhancing 10,000 acres of tidal wetlands and other key habitats over 10 years, beginning in 2001, to rebuild productivity for listed populations in the lower 46 river miles of the Columbia River. The Corps shall seek funds for the federal share of the program, and BPA shall provide funding for the non-federal share. The Action Agencies shall provide planning and engineering expertise to implement the non-federal share of on-the-ground habitat improvement efforts identified in LCREP, Action 2 (NMFS Biological Opinion Action Table Dec. 2000).

During 2000, BPA, working with NMFS, shall continue to develop a conceptual model of the relationship between estuarine conditions and salmon population structure and resilience. The model will highlight the relationship among hydropower, water management, estuarine conditions, and fish response. The work will enable the agencies to identify information gaps that have to be addressed to develop recommendations for FCRPS management and operations (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop a physical model of the lower

Columbia River and plume. This model will characterize potential changes to estuarine habitat associated with modified hydrosystem flows and the effects of altered flows where they meet the California Current to form the Columbia River plume (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River estuary. These studies support the actions to develop criteria for estuarine restoration (Action 158), restoration planning (Action 159), and implementation (Action 160) in Section 9.6.2.2 (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River plume (NMFS Biological Opinion Action Table Dec. 2000).

Conduct habitat mapping inventory in early 2001; develop and implement modeling and restoration criteria beginning early 2001 (BPA, Corps, LCREP) (Final All-H Paper Dec. 2000).

Prioritize habitats for protection and restoration (2001) (LCREP) (Final All-H Paper Dec. 2000).

Develop conceptual model of estuary conditions and fish population structure and resilience (Final All-H Paper Dec. 2000).

Authorize and fund expanded Corps of Engineers Restoration Program (Final All-H Paper Dec. 2000).

Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000).

Facilitate Lower Columbia River Estuary Program implementation (LCREP, EPA). Strengthen Lower Columbia River Estuary Program authority (Final All-H Paper Dec. 2000).

Seek authorization for Lower Columbia River Greenway Program (DOI/DOA); Establish Greenway Habitat Protection Fund to protect 10,000 acres of wetlands; 3,000 acres of upland (Final All-H Paper Dec. 2000). Implement the Lower Columbia Greenway Project (Final All-H Paper Dec. 2000):

- Habitat mapping and priorities for protection or restoration
- Habitat acquisition/protection
- COE habitat restoration
- Monitoring
- Public education and outreach.

Research, Monitoring, and Evaluation:

Implement monitoring and evaluation program (Final All-H Paper Dec. 2000).

1-11 Water Quality

Improve water quality through watershed habitat improvements and compliance with federally approved state and tribal water quality standards. Establish sediment regimes (input, storage, transport) consistent with those under which the aquatic ecosystem evolved (Draft All-H paper Dec. 1999).

Review and analyze water quality data to calculate ranges of temperature and dissolved gas supersaturation that would have occurred as a result of flow dynamics experienced for the given natural structures (Framework Concept Paper 15).

Improve water quality by eliminating sources of toxic pollution that accumulates in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for anadromous fish (Framework Concept Paper 3).

Manage the river and river uses for seasonal flows and water quality consistent with the needs of salmon, steelhead, and resident fish species (Framework Alternative 1). Determine water quality standards for fish habitat—for example, water temperatures can be no higher than 60°F. If standards are not met, land and water managers must take action that will achieve compliance (Spirit of the Salmon).

Monitor and evaluate potential effects of pollutants on human health, and fish and wildlife. Develop a basin-wide strategy for identified toxic and conventional pollutants that defines their sources, fate, and effects and reduces their discharge (LCREP). Manage human activities to meet regional and federal air and water quality standards (Framework Alternative 1). Improve water quality by eliminating sources of toxic pollution that accumulates in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for anadromous fish (Framework Concept Paper 3; Spirit of the Salmon).

Limit the amount of sediment in spawning habitat and in streams generally (Sprit of the Salmon). BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and federal law to ensure that a reasonable portion of any water conserved will benefit listed species (NMFS Biological Opinion Action

Table Dec. 2000).

Within 2 years from the date this [2000 Biological Opinion] is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use (NMFS Biological Opinion Action Table Dec. 2000).

Support TMDL development and implementation (BPA) (NMFS Biological Opinion Action Table Dec. 2000; Final All-H Paper Dec. 2000). The Action Agencies, coordinating through the Water Quality Team, shall annually develop a 1- and 5-year water quality plan for operation and configuration measures at FCRPS projects (NMFS Biological Opinion Action Table Dec. 2000).

By June 30, 2001, the Action Agencies shall develop and coordinate with the Service, NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations, including Libby and Hungry Horse Dams. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and state and tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of the project operations (FWS Biological Opinion Dec. 2000).

2 HARVEST

Develop stable system capable of supporting sustainable fish populations and harvest, equal to the level of historical (pre-dam) conditions (Sample Action).

Encourage human activities to develop in ways that allow expression of a productive natural system consistent with the needs of native fish, wildlife and plant communities (Draft Framework Alternative 1). The needs of the ecosystem with regard to native fish and wildlife take precedence over other management objectives such as harvest (Draft Framework Alternative 1).

2-1 Anadromous Fish

Reduce virtually all fishing except that related to tribal ceremonial and subsistence purposes (Framework Alternative 1).

Require that fish be caught in their rivers of origin (Framework Alternative 1). Re-negotiate Pacific Salmon Treaty (US-Canada) to prevent overfishing (Framework Concept Paper 1). Impose sanctions on nations that illegally catch salmon and steelhead (Framework Concept Paper 1).

Establish escapement objectives by population in each watershed that maintain natural selection and nutrient enrichment of streams with salmonid carcasses (Framework Concept Paper 10).

2-2 Resident Fish

Cease stocking. Attempt to eliminate introduced species (Sample Action).

Reduce virtually all fishing except that related to tribal ceremonial and subsistence purposes (Framework Alternative 1).

Develop stable system capable of supporting sustainable resident fish populations and harvest, equal to the level of historical (pre-dam) conditions (Framework Concept Paper 13). *[Most harvest eliminated in the short term.]*

Continue to suspend stocking of fluvial rainbow trout in tributaries utilized by adfluvial rainbow trout (Framework Concept Paper 13).

2-3 Wildlife

Allow hunting for subsistence purposes, if ecological balance is maintained, and to control nuisances. Manage populations to the carrying capacity of available habitat (Sample Action).

3 HATCHERIES

Discourage the use of artificial production except in special circumstances such as temporary preservation of genetic resources *[extremely endangered species]* (Framework Alternative 1).

Protect and enhance naturally spawning Columbia Basin fish and wildlife populations. This includes all salmonids and wildlife native to the Columbia Basin. Honor tribal rights, including treaty fishing rights, to catch fish for ceremonial and subsistence purposes. Sustain viable sport fisheries. Sustain viable commercial fishery (Framework Concept Paper 20).

Expand the safety net program for the most at-risk populations; use a variety of conservation hatchery techniques to aid the recovery effort (NMFS/BPA/USFWS) (Final All-H Paper Dec. 2000).

Implement aggressive monitoring & evaluation programs to reduce uncertainties, e.g., hatchery/wild fish interactions, the effectiveness of hatchery spawners, etc., and assess performance of conservation efforts (Final All-H Paper Dec. 2000).
3-1 Anadromous Fish
Discourage the use of artificial production except in special circumstances such as temporary preservation of genetic resources (Framework Alternative 1). Do not accept artificial production in lieu of habitat protection. Use funds saved by downsizing hatchery programs to restore habitat (Framework Concept Paper 1).
3-2 Resident Fish
Discourage the use of artificial production except in special circumstances such as temporary preservation of genetic resources (Framework Alternative 1).
4 HYDRO
Support those measures that restore or mimic natural functions (Framework Alternative 1). Encourage human activities to develop in ways that allow expression of a productive natural system consistent with the needs of native fish, wildlife and plant communities (Draft Framework Alternative 1).
The Action Agencies shall coordinate with NMFS, USFWS, and the states and tribes in pre-season planning and in-season management of flow and spill operations. This coordination shall occur in the Technical Management Team process (see Section 9.4.2.2) (NMFS Biological Opinion Action Table Dec. 2000).
4-1 Dam Modifications and Facilities
Breach or lower one or more mainstem dams to re-establish riverine conditions in the mainstem Columbia and Snake rivers (Draft Framework Alternatives 1,2,3). Breach the John Day, McNary, and four Lower Snake dams (Framework Alternative 1). <i>Dams that remain may be drawn down (either seasonally or year-round) or operated to achieve a natural hydrograph, to the extent possible (Sample Action).</i>
Adopt mitigation measures, up to and including modifications and removal of dams, which are consistent with the ISAB recommendations to create a more natural or "normative" river system. On non-federal dams, remove projects for which it is extremely costly or difficult to adequately mitigate the adverse impacts (e.g., Condit, Enloe) (Framework Concept Paper 1; Framework Concept Paper 21). On other non-federal dams, utilize relicensing or license reopener clauses, to adopt mitigation measures consistent with the ISAB recommendations to create a more natural or "normative" river system (Framework Concept Paper 1).
Change from an engineering driven process to an environmental science driven process that results in aquatic environments conducive to productive populations that are capable of sustaining the future populations of the Pacific Northwest (Framework Concept Paper 15).
Compare the structure of the dams with the natural river structure to see what dimensions of the dams are outside of the ranges of the natural river structures (Framework Concept Paper 15).
Develop conceptual modifications for all of the hydropower projects that incorporate the river structure dimensions into the structure of the dams so that the fish can pass in safety with sufficient quantity and quality of flow to ensure a healthy and productive environment for all aquatic life (Framework Concept Paper 15).
Evaluate feasibility of breaching (B1, B2) John Day Dam, and implement by 2012 (Framework Concept Paper 6).
Every hydroelectric dam, whether federally owned or operated by a public or private utility licensed by the Federal Energy Regulatory Commission (FERC), operates according to the following conditions: (a) flows required of sufficient quality and quantity, and at the ecologically appropriate time as dictated by the natural hydrograph; (b) minimal unnatural daily flow variations; (c) installation and maintenance of state of the art fish passage facilities; and (d) consistency with correlative watershed protection and restoration efforts (Framework Concept Paper 5).
Redesign the dams to mimic the natural aquatic bathymetric structure using Wheels, Pools, and Falls approach to mitigation of hydroelectric project impacts in the Columbia Basin (Framework Concept Paper 15).
Set up a systematic process whereby other dams (irrigation, navigation, flood control, etc..) in the Columbia River Basin and the impacts of such projects on ecological processes are identified, quantified, and addressed (Framework Concept Paper 5).
Achieve natural river-level drawdown of lower Snake projects (partially dismantling Lower Granite, Little Goose, Lower Monumental, and Ice Harbor by removing the earthen portion of each dam by spring 2005) (Framework Concept Paper 2).
In the Snake River (Objectives 1-3): achieve objectives for all Snake River stocks by implementing natural river in the

lower Snake by 2005 (bypass 4 dams, removing the earthen portion of Lower Granite, Little Goose, Lower Monumental, Ice Harbor) (Framework Concept Paper 2).

Remove existing extended length turbine intake screens; halt construction of new screens; consider removing existing standard length screens (Tribal Vision).

The Corps shall complete the design of debris removal facilities for the Bonneville First Powerhouse forebay (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall include evaluations of divider walls at each FCRPS project in the spillway deflector optimization program. Design development and construction of divider walls would begin only after coordination within the annual planning process, and only if warranted (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

Conduct advance planning for possible future actions, including dam breaching (Final All-H Paper Dec. 2000).

4-2 Hydro Operation

Draw down, breach, or remove Lower Snake dams, John Day, and McNary (Sample Action).

Provide a more normative hydrograph in the Columbia and Snake rivers to create and maintain mainstem riverine habitats in unimpounded areas. This would move away from an emphasis on minimum flows toward a regime that would include periodic flooding and droughts between years and smooth ramping to and away from the spring freshet within a year (Draft Framework Alternative 1).

Every hydroelectric dam, whether federally owned or operated by a public or private utility licensed by the Federal Energy Regulatory Commission (FERC), operates according to the following conditions: (a) flows required of sufficient quality and quantity, and at the ecologically appropriate time as dictated by the natural hydrograph; (b) minimal unnatural daily flow variations; (c) installation and maintenance of state of the art fish passage facilities; and (d) consistency with correlative watershed protection and restoration efforts (Framework Concept Paper 5).

4-3 Spill

Some spill would be used for flood control purposes. Storage of water would be limited in order to create a more natural hydrograph (i.e., closer to what existed prior to the construction of storage dams) (Sample Action).

Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). Prevent lethal temperature rises (Framework Concept Paper 1).

4-4 Flow

Augment/manipulate flows and storage volumes to more closely approximate the natural historic hydrograph (Tribal Vision). Restore natural river levels and hydrograph to lessen impacts to natural ecosystem (Framework Concept Paper 4).

Manage flows in the Hanford Reach to match natural seasonal and daily patterns (Framework Alternative 5). Implement a normalized annual hydrograph below Priest Rapids (Framework Concept Papers 2,5). In the Columbia, the development of normative flow conditions with flow augmentation from the Upper Columbia and IRCs at storage projects (would) create a more natural hydrograph (Framework Concept Paper 5). Adjust system operations to normalize Snake River flows below Hells Canyon complex (Framework Concept Paper 5). Restore normative flow conditions from Priest Rapids dam to the estuary, using spring and summer flow augmentation under a system operating plan that implements a normalized hydrograph. From Priest Rapids downstream, *normative* steps include meeting flow minimums and 24-hour spill during the spring migration (Framework Concept Paper 5).

Analyze the dynamics of the water flowing through the river structures and the ranges of the flow, velocity, head, turbulence and other parameters that would have occurred under the natural environmental fluctuations (Framework Concept Paper 15).

Efforts would continue to acquire additional water from Canadian reservoirs, implementation of "Variable Q" flood control operations at Libby and Hungry Horse dams to protect resident fish, and meet minimum discharge requirements for fall chinook and chum salmon spawning and rearing needs in the Hanford reach and below Bonneville Dam. In addition, fluctuation of flows from Priest Rapids would be reduced to limit fry stranding and stabilize riparian areas. Integrated Rule Curve (IRC) operation at storage dams would be further evaluated and implemented based on tradeoffs in benefits to resident fish and effects on salmon habitat and other system operation purposes (Draft All-H paper Hydro Option 2, Dec. 1999).

BPA and the Corps shall continue to request and negotiate agreements to annually provide 1 Maf of Treaty storage from January through April 15, release the water during the migration season, and seek additional storage amounts

(NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to request, and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring for subsequent release in July and August for flow enhancement, as long as operations forecasts indicate that water stored in the spring can be released in July and August (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to evaluate, request, and negotiate with BC Hydro the shaping and release of water behind Canadian Treaty storage projects in addition to the non-Treaty storage water previously discussed during July and August (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

Analyze the dynamics of the water flowing through the river structures and the ranges of the flow, velocity, head, turbulence and other parameters that would have occurred under the natural environmental fluctuations (Framework Concept Paper 15).

The Action Agencies have proposed to seek opportunities to reduce the second peak flow created by July/August salmon flow through Kootenay Lake [by October 2001]. One such opportunity for consideration to reduce the second peak is retention of July/August water in Lake Kooconusa under a Libby-Arrow water exchange (FWS Biological Opinion Dec. 2000).

By December 1, 2001, the Action Agencies shall report specifically on the effects of load following on levee integrity throughout the Kootenai Valley over the last 26 years. The Action Agencies shall limit daily load following in the outflow from Libby Dam to the extent that levees in Kootenai Valley are no longer damaged (FWS Biological Opinion Dec. 2000).

By December 1, 2002, the Action Agencies shall complete an evaluation and report on any changes in depth, water velocity and substrate in the vicinity of Bonners Ferry which have occurred since Libby Dam became operational. [If] spawning/incubation habitat changes [are] documented, the report shall be expanded to include all feasible remedies such as channel constrictions or other physical habitat modification(s) to restore and maintain suitable spawning/incubation substrate, water velocities, and depths between RKM 228 and 246, or greater water depths above RKM 246 (FWS Biological Opinion Dec. 2000).

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby (NMFS Biological Opinion Action Table Dec. 2000).

By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

During sturgeon recruitment flow periods, the Action Agencies shall allow local inflow to supplement Libby Dam releases to the maximum extent feasible (FWS Biological Opinion Dec. 2000).

By December 1, 2001, the Action Agencies shall report specifically on the effects of load following on levee integrity throughout the Kootenai Valley over the last 26 years. The Action Agencies shall limit daily load following in the outflow from Libby Dam to the extent that levees in Kootenai Valley are no longer damaged (FWS Biological Opinion Dec. 2000).

By December 1, 2002, the Action Agencies shall complete an evaluation and report on any changes in depth, water velocity and substrate in the vicinity of Bonners Ferry which have occurred since Libby Dam became operational. [If] spawning/incubation habitat changes [are] documented, the report shall be expanded to include all feasible remedies such as channel constrictions or other physical habitat modification(s) to restore and maintain suitable spawning/incubation substrate, water velocities, and depths between RKM 228 and 246, or greater water depths above RKM 246 (FWS Biological Opinion Dec. 2000).

By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

4-5 Reservoir Levels

Reduce the amount of water stored for hydropower production to provide for more natural flows, including periodic flooding and droughts to restore native plants (Framework Alternative 1). At other lower Columbia dams [*besides John Day and McNary, which would be breached under this Policy Direction*], operate at lowest possible reservoir elevation (generally MOP) (Framework Concept Paper 5).

Implement Integrated Rule Curves (IRCs) at upstream projects (e.g., Libby, Hungry Horse) to benefit resident fish and wildlife, and to restore a more natural hydrograph with no loss of flood controls (Framework Concept Papers 2,8,13).

BOR shall operate Banks Lake at an elevation 5 feet from full during August by reducing the volume of water pumped from Lake Roosevelt into Banks Lake by about 130 kaf during this time (NMFS Biological Opinion Action Table Dec. 2000).

BOR shall assess the likely environmental effects of operating Banks Lake up to 10 feet down from full pool during August. The assessment and NEPA compliance work shall be completed by June 2002 to determine future operations at this project by the summer of 2002 (NMFS Biological Opinion Action Table Dec. 2000).

Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).

[Develop research/study plans with FWS, USFS, state agencies, and the tribes as appropriate, and] initiate studies to determine the effect of flow fluctuations on river or reservoir water surface elevations and on stranding or entrapment of bull trout and other aquatic life related to the prey base of bull trout (FWS Biological Opinion Dec. 2000).

It is recommended that the Action Agencies seek cooperation of West Kootenai Power and other involved agencies and parties in Canada to negotiate higher Kootenay Lake/Kootenai River stages within the 1938 IJC order during sturgeon spawning flows. This may promote sturgeon recruitment with less stored water and fewer configuration improvements at Libby Dam during intermediate and low water years (FWS Biological Opinion Dec. 2000).

4-6 Water Quality

Adopt, monitor, and enforce strict water quality standards including turbidity, temperature, velocity, and pollutants (Sample Action).

Enforce existing pollution control laws and meet the standards of the Clean Water Act (Framework Concept Paper 1). Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). Prevent lethal temperature rises (Framework Concept Paper 1).

Review and analyze water quality data to calculate ranges of temperature and dissolved gas supersaturation that would have occurred as a result of the flow dynamics experienced for the given natural structures (Framework Concept Paper 15).

Research, Monitoring, and Evaluation:

Review and analyze water quality data to calculate ranges of temperature and dissolved gas supersaturation that would have occurred as a result of flow dynamics experienced for the given natural structures (Framework Concept Paper 15).

The Action Agencies shall monitor the effects of TDG [*Total Dissolved Gas*]. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-Columbia PUDs' monitoring programs (NMFS Biological Opinion Action Table Dec. 2000).

As part of DGAS, the Corps shall complete development of a TDG model to be used as a river operations management tool by spring 2001. Once a model is developed, the applications and results shall be coordinated through the Water Quality Team. The Corps shall coordinate the systemwide management applications of gas abatement model studies with the annual planning process, the Transboundary Gas Group, the Mid-Columbia Public Utilities, and other interested parties (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue the spillway deflector optimization program at each FCRPS project and implement it, as warranted. The Corps and BPA shall conduct physical and biological evaluations to ensure optimum gas abatement and fish passage conditions. Implementation decisions will be based on the effect of spill duration and volume on TDG, spillway effectiveness, spill efficiency, forebay residence time, and total project and system survival of juvenile salmon and steelhead passing FCRPS dams (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to develop and construct spillway deflectors at Chief Joseph Dam by 2004 to minimize TDG

levels associated with system spill (NMFS Biological Opinion Action Table Dec. 2000).

By June 30, 2001, the Action Agencies shall develop and coordinate with the Service, NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations, including Libby and Hungry Horse Dams. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and state and tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of the project operations (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall evaluate and report to the Service on total dissolved gas concentrations downstream of Albeni Falls Dam in the Pend Oreille River which may occur within the full range of operations of the facility, including forced spills (FWS Biological Opinion Dec. 2000).

Investigate, and in coordination with the Service, implement as appropriate, structural and operational measures to reduce TDG production. The Corps has recently installed flow deflectors at John Day Dam and, through its Gas Abatement Study, is investigating other potential measures at other FCRPS projects to reduce gas supersaturation. Measures recommended in this study to reduce gas supersaturation should be implemented as soon as possible (FWS Biological Opinion Dec. 2000).

The Service recommends that the Corps continue monitoring TDG levels, and invest in facility improvements to keep TDG levels at or below 110% (or other applicable state water quality standards) (FWS Biological Opinion Dec. 2000).

The Corps shall investigate TDG abatement options at Libby Dam, including the installation of spillway deflectors and/or additional turbine units. The Corps shall construct gas abatement improvements at Libby on the Kootenai River, as warranted, to reduce TDG levels below the project (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate TDG abatement options at Dworshak Dam and implement options, as warranted, in coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete its DGAS by April 2001. The results of this study will be used to guide future studies and decisions about implementation of some long-term structural measures to reduce TDG (NMFS Biological Opinion Action Table Dec. 2000).

4-7 Juvenile Fish Passage and Transportation

Eliminate fish transportation (Framework Alternatives 2,3; Framework Concept Papers 1,2,3,4; Tribal Vision; SOR FEIS Alternative 9a).

Eliminate juvenile fish transportation and allow fish to migrate on their own through the river in order to connect with selected adaptations such as travel time, feeding regimes, escaping overcrowding, disease transmission, suitable arrival timing to estuary, and normal levels of natural mortality (Framework Concept Paper 5).

All fish screens should be removed and transportation discontinued. It has been proven that bypass systems have a higher mortality than the turbines (Framework Concept Paper 11).

Barging of juvenile fall chinook from the Snake River would not be possible with this operation (SOR FEIS Alternative 5c).

Achieve all objectives by passing juvenile fish past existing dams via flow/spill, and with improved passage for juveniles and adults achieved through relatively low-cost modifications (Framework Concept Paper 1).

4-8 Adult Fish Passage

Re-connect instream aquatic habitats via the removal, modification or circumvention of physical or biological impediments (e.g., culverts, diversion structures, highways, high temperatures) to passage (Draft All-H paper Dec. 1999).

Achieve all objectives by passing juvenile fish past existing dams via flow/spill, and with improved passage for juveniles and adults achieved through relatively low-cost modifications (Framework Concept Paper 1). Make low-cost capital improvements to enhance in-river migration (e.g., gas abatement deflectors, adult fish ladder improvements, and experiments with low-cost notched spill gates for juvenile passage). At The Dalles, evaluate measures to reduce passage problems caused by the unusual configuration (Framework Concept Paper 2).

In the mid- and lower-Columbia (Objectives 4-6): achieve all objectives by passing juvenile fish past existing dams via flow/spill, and with improved passage for juveniles and adults achieved through relatively low-cost modifications. Restore normative flow conditions from Priest Rapids dam to the estuary, using spring and summer flow augmentation under a system operating plan that implements a normalized hydrograph. Implement Integrated Rule Curves (IRCs) at upstream projects (e.g., Libby, Hungry Horse) to benefit resident fish and wildlife, and to restore a more natural hydrograph with no loss of flood controls (Framework Concept Paper 2).

Study the natural aquatic environment to determine the dimensions of the river structures—pools, falls, rapids, and habitat—that proved to be safe for fish passage as demonstrated by the existence of healthy productive populations (Framework Concept Paper 15).

Implement state fish passage regulations (e.g., WAC 220-110-070 [Water Crossing Structures]; RCW 77.55.060 [Fishways required in dams, obstructions]; RCW 77.55.070 [Modify inadequate fishways and fish guards]; ORS 498.268 and ORS 509.605 through 509.645 [Maintenance of fish passage at all man-made in-channel obstructions in streams where fish are present]).

4-9 Flood Control

Flood control operations in remaining reservoirs would be conducted to mimic natural hydrology to extent possible (Sample Action).

Allow seasonal flooding of mainstem areas within unimpounded reaches to restore floodplain conditions and vegetation patterns (Draft Framework Alternatives 2,3). Relax [and/or] seek flexibility in rigid flood control rule curves to re-create normative hydrographs and reclaim floodplains (Tribal Vision).

Flood control operations are modified from current operations to allow for variable releases during the runoff period to simulate a naturally shaped spring freshet (Framework Concept Paper 8). Develop floodplain management and shoreland zoning protection programs (LCREP). Re-connect stream channels, flood plains, and wetlands such that inundation and water table elevation is consistent with naturally functioning patterns. [Encourage] wetland restoration and management practices that help maintain stream flows, filter pollutants, and provide flood storage (Draft All-H paper Dec. 1999).

Implement Integrated Rule Curves (IRCs) and careful use of VARQ flood control strategy at all storage projects except John Day and McNary, which would be breached under this Policy Direction (Framework Concept Papers 2, 8, 13). Create IRCs for projects that do not presently have integrated operational rules, by modeling watershed technology. (Significant expertise is readily available from scientists in Montana and the USACE.) Refine IRCs using a team of site-specific experts. After IRCs are developed, a system model with sufficient time resolution (e.g., weekly or daily) can incorporate operating rules at various dams (Framework Concept Papers 2,8).

Reduce reservoir drawdown and improve reservoir refill probability to assure a sustainable basin-wide operation for all native species and their prey in the Columbia River watershed. Replace static flow targets in the lower Columbia with attainable normative-type flow targets resulting from basin-wide application of IRCs (Framework Concept Paper 8). Implement IRCs and tiered flow regime from Libby Dam to provide sufficient flows and habitat for successful white sturgeon spawning and recruitment (Framework Concept Paper 13).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion Action Table Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to request, and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring for subsequent release in July and August for flow enhancement, as long as operations forecasts indicate that water stored in the spring can be released in July and August (NMFS Biological Opinion Action Table Dec. 2000).

BPA and the Corps shall continue to evaluate, request, and negotiate with BC Hydro the shaping and release of water behind Canadian Treaty storage projects in addition to the non-Treaty storage water previously discussed during July and August (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion Action Table Dec. 2000).

Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by

October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

Authorize systemwide flood control review (Final All-H Paper Dec. 2000). By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

Authorize systemwide flood control review (Final All-H Paper Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

By May 2004 the Action Agencies shall seek means to restore, maintain, or enhance levees throughout the Kootenai Valley to the greater of: 1) the PL 84-99 Corps' 1961 levee specifications, or 2) the levee elevations needed to contain the flows/river stages of the 100 year event as authorized for the Libby Project, which is now defined as 1,770 feet at Bonners Ferry. The Action Agencies shall also seek means to incorporate conservation measures for sturgeon, including self maintaining rocky spawning substrates, as a component and federal purpose of any new levee project above. In the interim, the Service and Corps will coordinate efforts to attempt to limit sturgeon spawning flows so they do not exceed a levee elevation of 1,764 feet at Bonners Ferry (FWS Biological Opinion Dec. 2000).

Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS Biological Opinion Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

The Corps shall routinely identify opportunities to shift system flood control evacuation volumes from Brownlee and Dworshak reservoirs to Lake Roosevelt and identify such opportunities for the Technical Management Team. The Corps shall implement flood control shifts as necessary to best protect listed fish, as called for by NMFS in coordination with the Technical Management Team, taking into account water quality issues and the concerns of all interested parties (NMFS Biological Opinion Action Table Dec. 2000).

COMMERCE

5. POWER

5-1. Existing Generation

Eliminate hydropower generation in the Lower Snake and reduce hydropower generation in the Columbia River (Framework Alternative 1). Breach Snake River dams as soon as Congressional authorization and appropriation occur (Draft All-H paper).

Natural river operation would eliminate the system's load-shaping and reduce average annual energy by taking turbines out of service (SOR FEIS Alternative 5c).

Provide support for increased electrical costs (Framework Concept Paper 5).

5-2. New Generation

Invest in new sources of generation to replace hydroelectric power. Renewable and non-polluting technologies would receive first priority (i.e., wind and solar power, fuel cells); however, at least in the short term, thermal power generation would be used to replace most of lost hydropower capacity. Prices and incentives would encourage conservation (Sample Actions).

5-3. Transmission Reliability

Major changes to transmission system will be required if the Snake River dams are breached (refer to the Lower Snake Drawdown EIS). Additional changes not included in this EIS would also be required for the John Day and McNary dams' drawdown or breach. New power plants that are constructed to provide replacement power may also require transmission additions, depending on their location (Sample Action).

Changes in vegetation management maintenance practices to meet habitat requirements will require constant monitoring and reductions in transmission capability. Transmission reliability could be sacrificed as un-maintained areas becomes widespread and effective monitoring becomes impractical. Public safety is a direct concern both at individual sites and for power users that may be affected by the blackouts (Sample Action).

Reduced road densities on public lands could affect access to transmission facilities, which impairs the ability to perform maintenance in a timely manner, causing the potential for longer outages in emergencies (Sample Action).

Costs increase for routine maintenance practices as additional objectives are met (Sample Action).

To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005 (NMFS Biological Opinion Action Table Dec. 2000).

BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall seek redundancy in transformers at Libby Dam to assure that sturgeon flows can be released. Loss of one transformer can result in the loss of use of two turbines, or 10,000 cfs of release capacity (FWS Biological Opinion Dec. 2000).

6. INDUSTRY

6-1. Industrial Growth

Provide strong incentives for "clean" industry, pollution abatement, reduced development impacts, and no new development on riparian or natural lands. Actively and passively restore abandoned riparian locations (Sample Action).

[Assume] increased facility deconstruction and material salvage (e.g., Deconstruction – Building Disassembly and Material Salvage: The Riverdale Case Study. Peter Yost and Eric Lund, Upper Marlboro, MD: NAHB Research Center 1997).

Protect high quality aquatic habitat on private lands while allowing restricted use. *[Encourage]* urban storm runoff control, municipal waste management, road management, *[and]* obstruction removal (Human Effects Analysis Appendix D). Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).

Improve water quality by eliminating sources of toxic pollution that accumulates in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for anadromous fish (Framework Concept Paper 3).

Increase emphasis on eco-efficiency including the three Rs of conservation—reduce, reuse, recycle (e.g., World Business Council for Sustainable Development); and eco-effectiveness whereby all the products and materials manufactured by industry provide nourishment for something new after each useful life (e.g., Paul Hawken, *The Ecology of Commerce* 1993).

6-2. Aluminum and Chemical

Eliminate or reduce to insignificance most discharges from aluminum and chemical facilities (Sample Action).

Use pollution prevention to reduce or eliminate toxic and conventional pollution generated during manufacturing and industrial processes (LCREP).

6-3. Mining

Reduce polluting mining activities, and provide incentives for water quality improvements. Passively and actively restore abandoned mining sites (Sample Actions).

Improve mining discharges *[and]* mining practices. Rehabilitate *[and reclaim]* marginal and closed mines (Human Effects Analysis Appendix D). Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).

<p>Implement recommendations from the International Institute for Environment and Development's Mining Minerals and Sustainable Development Project (e.g., <i>Planning for Outcomes: A Framework for the Consideration of Options</i> [http://www.iied.org/mmsd/index.html]).</p>
<p>6-4. Pulp and Paper</p>
<p>Use pollution prevention to reduce or eliminate toxic and conventional pollution generated during manufacturing and industrial processes [<i>of the pulp and paper industry</i>] (LCREP).</p> <p>Increase emphasis on eco-efficiency including raw material reduction, reuse, and recycling (e.g., World Business Council for Sustainable Development).</p> <p>Promote the use of agricultural residues and other non-wood fibers in currently wood-dependent pulp and paper and building materials industries (e.g., http://www.fiberfutures.org).</p>
<p>7. TRANSPORTATION</p>
<p>7-1. Navigation and Barging</p>
<p><i>Commercial navigation on the lower Snake and mid-Columbia eliminated (Sample Action).</i></p> <p>Remove dikes and manage dredging and other measures to restore estuarine habitats. Manage dredging to avoid increased predation (Human Effects Analysis Appendix D).</p>
<p>7-2. Trucking and Railroads</p>
<p><i>Improve infrastructure to upgrade trucking and increase railroad volume (Sample Action).</i></p> <p>Provide support for alternative forms of transportation of agricultural and other products including improved rail service (Framework Concept Paper 5).</p>
<p>8. AGRICULTURE</p>
<p><i>Remove some agricultural lands from production and use natural processes to restore lands and water to the extent possible (Sample Action).</i></p> <p>Re-create key natural ecosystem components within which fish evolved and prospered. Do not attempt to circumvent natural ecosystem processes (Framework Concept Paper 9).</p> <p>BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion Action Table Dec. 2000). Provide permanent protection for riparian areas in agricultural areas by supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000).</p> <p>Reform and enforce land use statutes governing growth management, forestry practices, and agricultural practices (e.g., Washington Forests & Fish model) (Final All-H Paper Dec. 2000).</p> <p>Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).</p> <p><u>Research, Monitoring, and Evaluation:</u></p> <p>By December 1, 2001, the Action Agencies shall quantify the effects of groundwater seepage associated with the magnitude and duration of sturgeon flows on crops in the Kootenai Valley relative to all other types high flow/stage events which occur in the Kootenai River. The effects of direct precipitation and runoff from small tributaries within the Kootenai Valley on both surface and ground water levels shall also be accounted for in this study. This shall include delineation of specific sites affected and identification of all feasible remedies specific to those sites such as, drainage, willing seller land purchases, and enrollment in the Department of Agriculture's Wetland Reserve Program (FWS Biological Opinion Dec. 2000).</p>
<p>8-1. Irrigation</p>
<p><i>Emphasis on land retirement and passive restoration. Limit new irrigation, Substantially reduce existing irrigation, especially on dewatered tributaries, on riparian lands (for habitat), and for water temperature or other quality management (Sample Action).</i></p> <p>Restore normative seasonal flow patterns in tributaries through measures such as improved irrigation efficiency, use of xeric (less water intensive) crops, lease or sale of water rights or other voluntary measures (Draft Framework Alternative 2,3).</p>

Protect and increase instream flows by limiting additional consumptive water withdrawals, using the most efficient irrigation methods, preventing soil compaction and riparian vegetation removal and wetland destruction; where necessary, restore soil, restore riparian vegetation and re-create wetlands (Framework Concept Paper 3).

Protect and increase instream flows by limiting additional consumptive water withdrawals, using the most efficient irrigation methods, preventing soil compaction and riparian vegetation removal and wetland destruction; where necessary, restore soil, restore riparian vegetation and re-create wetlands (Spirit of the Salmon). Maximize irrigation efficiency and decrease out-of-stream water withdrawals (Tribal Vision). Implement soil and water conservation practices that control erosion and runoff in order to reduce stream sedimentation, flooding, and bank erosion and those that help to maintain or improve base streamflows (Draft All-H paper).

Habitat objectives would be accomplished by land and water lease, purchase, subsidy and similar incentives (Human Effects Analysis).

Reduce existing permits for water withdrawal. Encourage cultivation of less water-intensive crops. *[Initiate more intensive]* agricultural water conservation, irrigation waste water treatment, and irrigation withdrawals screening (Human Effects Analysis Appendix D).

Within 2 years from the date this opinion is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use (NMFS Biological Opinion Action Table Dec. 2000).

Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

8-2. Pesticides and Agricultural Practices

Substantially reduce use of pesticides (Sample Action).

Reduce the use of pesticides in agriculture to lower input to terrestrial and aquatic areas (Framework Alternative 1,2,3).

Encourage integrated pest management and sustainable farming practices, and end inefficient, unauthorized, and illegal use of water (Framework Concept Paper 1). *[Encourage]* nutrient and pest management practices needed to limit delivery of pollutants that create eutrophic or toxic conditions for fish and other aquatic organisms (Draft All-H paper Dec. 1999). *[Encourage]* pesticide/herbicide reduction (Human Effects Analysis Appendix D).

Lower irrigation pumps to adjust to changed river levels (Framework Concept Paper 5).

Eliminate agricultural practices in riparian areas and farmed wetlands; reduce and manage agriculture in upland areas, especially marginal farmland (Sample Action). Restore Prior Converted Croplands (Sample Action).

Use federal and state cost-share programs to reduce the impacts of agricultural practices through water quality and habitat improvement (e.g., provide incentives for farmers and ranchers to establish riparian buffers through the Conservation Reserve Enhancement Program).

8-3. Grazing

Eliminate grazing in riparian areas; reduce and manage grazing in upland areas (Sample Action).

Prevent damage to and destruction of riparian vegetation by fencing and other means, such as purchasing grazing permits and restore impacted riparian areas (Tribal Vision). Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).

[Encourage] nutrient and pathogen load reduction from grazing/agriculture. Reduce grazing impacts to riparian/aquatic ecosystem (Human Effects Analysis Appendix D).

8-4. Forestry

Eliminate timber harvest in riparian areas and aquatic buffer zones; reduce timber harvest in upland areas (Sample Action).

Allow a more normative fire frequency on public forest lands within limits imposed by safety considerations. Allow a more normative fire frequency on private forest lands using incentives and similar means within limits imposed by safety considerations (Draft Framework Alternative 2,3; Human Effects Analysis Appendix D).

Reduce road densities on public forested lands (Draft Framework Alternative 2,3). Reduce forestry impacts to riparian/aquatic ecosystem. Limit size and frequency of clearcuts. Develop normative forest age structure. Provide gradual forest ecotones. Reduce forest road density (Human Effects Analysis Appendix D).

Restore vegetation patches, patterns, structure, and species composition to be more consistent with the landform,

climate, and biological and physical characteristics of the ecosystem, and provide the source of habitat for terrestrial species. Manage disturbances to make vegetation patterns more consistent with their location in the landscape (ICBSDEIS, R-O2).

9. COMMERCIAL HARVEST

Eliminate most ocean harvest and freshwater mixed stock harvest; remaining commercial harvest is tribal (Sample Action).

Promote and sustain fishing opportunities in all treaty reserved usual and accustomed fishing areas (Framework Concept Paper 3).

10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Avoid new development on natural or riparian lands. Increase interjurisdictional coordination and planning for rural land development (Sample Action).

Develop floodplain management and shoreland zoning protection programs (LCREP). Protect high quality aquatic habitat on private lands while allowing restricted use. Urban storm runoff control. Municipal waste management. Obstruction removal. Road management. Manage land use and riparian conditions to maintain water quality (Human Effects Analysis Appendix D).

11. RECREATION

Restrict recreation on rivers and riparian areas so that habitat can return to a natural balance without human interference. In the long term, recreation consistent with a natural hydrograph (i.e., whitewater rafting) would be gradually re-established (Sample Action).

Use the Wilderness Act to promote a network of wild lands. Estimate the total economic benefits of wilderness by considering wilderness as a multiple-use resource that provides a multitude of benefits to the current generation as well as future ones (e.g., Pete Morton, *The Economic Benefits of Wilderness*, The Wilderness Society, Denver, CO 1999).

Honor tribal rights, including treaty fishing rights, to catch fish for ceremonial and subsistence purposes (Framework Concept Paper 20).

TRIBES

12-1. Tribal Harvest

Tribal harvest would be limited to ceremonial and subsistence only. Commercial fishing would be eliminated (Sample Actions).

Restore tribal fisheries at all usual and accustomed fishing sites (Spirit of the Salmon). Manage harvest to achieve escapement of adults to spawning grounds; revise escapement goals (Framework Concept Paper 27). Take habitat actions that promote and sustain fishing opportunities in all treaty reserved usual and accustomed fishing areas (Framework Concept Paper 3).

Decrease/eliminate artificial fish production overall (FC All-H paper).

12-2. Tradition, Culture, Spirituality

Passively restore ecosystem health and associated species. Over time, as the system is naturally restored, improve tribal well-being and the ability of tribes to exercise their respective rights and to enjoy traditional values (Sample Action).

Improve conditions under which tribes can exercise sovereignty and self-determination (Sample Action).

There is no distinction between natural resources and cultural resources—all are necessary for culture, economy, religion and a way of life to be expressed, practiced and maintained (Tribal Vision).

Recognize native plant communities as traditional resources that are important to tribes and an essential component to treaty-reserved gathering rights (ICBSDEIS, B-045). Support federally recognized tribes' and tribal communities' subsistence needs to the greatest extent practicable (ICBSDEIS, B-061). Better understand and incorporate into federal land management how places are valued by American Indians (ICBSDEIS, B-069).

SAMPLE IMPLEMENTATION ACTIONS

FOR THE

WEAK STOCK FOCUS POLICY DIRECTION

Emphasizes *human intervention to support recovery* of weak stocks of fish and wildlife populations that are listed or proposed for listing under the Endangered Species Act or other legal protections.

FISH & WILDLIFE

1 HABITAT

Implement actions that result in the best survival of listed stocks (ESA-listed anadromous salmonids) (Framework Concept Paper 6). The ecosystem recovers depleted populations to the point of self-sustainability with a very low probability of extinction in the foreseeable future (Draft Framework Alternative 2,3,4,5). Minimize short-term risk, especially to threatened, endangered or proposed species, important species habitats, and riparian areas (ICBSDEIS Alternative S2). Increase the overall productivity and resilience of the Columbia River ecosystem by stopping the loss of biological diversity of fish, wildlife, and plants, especially those listed under the Endangered Species Act (Framework Alternative 2,3,5,6). Contribute to recovery of federally listed or proposed species (or subspecies or populations) across their ranges by maintaining and restoring habitat quality, quantity, and effectiveness (ICBSDEIS, B-O52).

Establish a basin-wide policy for the conservation of native wild populations, their population structure and biological diversity (Framework Concept Paper 10). Conserve and restore different types of habitat and corridors between those habitats within each ecosystem, preserve genetic diversity (Framework Concept Paper 1).

Balance the need for restorative actions to address long-term threats to listed and proposed species with the short-term need to protect listed and proposed species (ICBSDEIS, B-O53). Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-O2). Specific habitat components or features that contribute to the viability of species should be maintained and, where needed, restored. These features include, but are not limited to caves, mines, cliffs, talus or burrows (ICBSDEIS, B-O46).

Protect, connect, and restore key habitats (Framework Alternative 3). Increase habitat connections throughout the basin (Framework Alternative 1,2,5). Manage public lands, which provide critical wild salmon habitat, for the benefit of salmon (Framework Concept Paper 1).

Improve measurements of survival through all salmonid life stages to identify high mortality areas and reduce mortality (Framework Concept Paper 26).

Percent of fish and wildlife budget in a subbasin should match the percent of impact to that subbasin. Strategies: CBFWA should develop a formula for dividing up recovery efforts based on miles of river impacted, acres of reservoir created, and wildlife units lost. Funding should then follow similar distribution (Framework Concept Paper 22).

Review existing laws that are destructive to habitats that are critical for indigenous species (Framework Concept Paper 4).

The first step towards mitigation involves looking at a list of activities in the local area that are linked to degradation of the ecosystem. Once these activities are listed, we can begin to look at what type of changes we can make that are realistic. The key to this step is working within social and economic structures (which incorporate ecosystem value) to choose how a certain activity can be altered. By examining these activities outside a 'cause and effect context,' we are supporting the notion that we are not able to predict individual and cumulative effects upon the surrogate measures, but acknowledging that some type of pathway of influence exists (Framework Concept Paper 16).

The timeframe for seeing change in the ecosystem must also be defined before any mitigative measures are undertaken (Framework Concept Paper 16).

Use and improve computer models to assemble existing data and relationships to predict effects on salmon and steelhead from management actions (Framework Concept Paper 26).

Protect weak salmon and its habitat in order to maintain resource productivity (Framework Concept Paper 19).

Establish and apply an effective management system to control human activities that affect salmon (Framework Concept Paper 19).

Geographic areas with the highest potential for increasing numbers of naturally spawning fish will be emphasized (Framework Concept Paper 20).

Focus greater emphasis on areas of the salmonid ecosystem that have not traditionally received much attention (e.g., estuary/ocean) (Framework Concept Paper 20).

Protect existing high quality habitat and improve degraded habitat. If savings can be found in existing management actions, the savings will be applied to the most critical fish and wildlife activities (Framework Concept Paper 20).

Adhere to and enforce existing habitat laws, regulation (including water quality, screening, fish passage, etc); strengthen where needed. Develop incentives and cost sharing programs (Tribal Vision). Stop government programs that allow or promote development in sensitive floodplains (Tribal Vision).

Manage public lands, which provide critical wild salmon habitat, for the benefit of the salmon. Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1). Land and water users and managers should meet specified habitat conditions associated with targeted salmon survival rates (Framework Concept Paper 3).

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 (Draft All-H Paper Habitat Option 2, Dec. 1999).

Increase regulation by the federal agencies under the CWA and ESA, to be implemented if the region cannot develop a coordinated plan with state and local governments (Draft All-H Paper Habitat Option 3, Dec. 1999).

A biodiversity trust fund could be set up on a local, state, or national scale, and would have an unlimited variety of conservation options that it could choose to support. These choices would include: purchasing land to establish preserves, purchasing conservation easements, paying bounties for endangered species on private lands, buying conservation contracts, offering grants or low-interest loans to conservation projects, and conducting research (with a small, fixed percentage of the fund) (O'Toole 1993; Thoreau Institute).¹ The Corps shall continue design development and, subsequently, construct an emergency auxiliary water supply system at The Dalles Dam's east ladder (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue to investigate alternatives to dewater adult auxiliary water system floor diffusers for inspection at The Dalles adult fishway powerhouse collection channel. The Corps shall implement design and construction of needed changes, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

The Action Agencies and NMFS shall work within regional prioritization and congressional appropriation processes to establish and provide the level of FCRPS funding to develop and implement a basin-wide hierarchical monitoring program. This program shall be developed collaboratively with appropriate regional agencies and shall determine population and environmental status (including assessment of performance measures and standards) and allow ground-truthing of regional databases. A draft program including protocols for specific data to be collected, frequency of samples, and sampling sites shall be developed by September 2001. Implementation should begin no later than the spring of 2002 and will be fully implemented no later than 2003 (NMFS Biological Opinion Action Table Dec. 2000).

1-1 Anadromous Fish

Implement actions that result in the best survival of listed stocks (ESA-listed anadromous salmonids) (Framework Concept Paper 6). Give the highest priority to protecting the habitat for fish that reproduce in the wild (Framework Concept Paper 22). Actively restore watersheds where salmon populations are in imminent danger of extirpation (Framework Concept Paper 3; Spirit of the Salmon). Begin improving in-channel stream conditions for anadromous fish by improving or eliminating land-use practices that degrade watershed quality (Framework Concept Paper 3).

¹Incentives for Species (by Brett Schaerer); Thoreau Institute:
<http://www.teleport.com/~rot/schaerer.html#RTFToC2>
 03/26/01 11:19 AM

Based on the historical strengths of the Columbia River, increase the abundance and resilience of chinook salmon with the ocean-type life history by providing or restoring spawning and rearing habitats in main-stem and lower tributary areas (Draft Framework Alternative 5; Draft Framework Alternative 6).

Rebuild Snake River fall chinook in the Blue Mountains ERU by attaining a 2-6% adult return rate (to Snake-Clearwater confluence, by restoring spawning habitat in the lower Snake, by substantially improving smolt survival from the mouth of the Clearwater to the mouth of the Snake, and by normalizing flows in existing habitat below Hells Canyon dam (Framework Concept Paper 2).

Recover Snake River sockeye by attaining a 1.5-2.0% adult return rate to Redfish Lake, in the Central Idaho Mountains ERU (Framework Concept Paper 2).

Increase connections within freshwater areas to facilitate wide distribution of energy and nutrients within the system. Establish riparian conditions that allow energy and nutrient transfer between terrestrial and aquatic areas via predation, carcass scavenging or plant production and grazing (Draft Framework Alternative 5). Closely and continuously monitor tributary production and escapement to improve management (Tribal Vision).

Restore vegetative patches, patterns, structure and species composition to be more consistent with the landform, climate and biological and physical characteristics of the ecosystem (ICBSDEIS, R-O2). Restore and maintain flow regimes sufficient to create and sustain riparian, aquatic and wetland habitats and to retain patterns of sediment, nutrient and wood routing (ICBSDEIS, R-O7). Restore and maintain the timing, variability, and duration of floodplain inundation and water table elevation (ICBSDEIS, R-O8). Restore terrestrial, riparian and aquatic habitats where adverse effects or pending risks to these habitats from roads can be quickly reduced (ICBSDEIS, R-O12). Restore connectivity within and among watersheds and networks of well-distributed high-quality habitats that sustain populations of aquatic and riparian-dependent species (ICBSDEIS, R-O23). Restore instream and riparian habitat of sufficient quality, patch size and distribution to support healthy populations of native fish and riparian-dependent species (ICBSDEIS, R-O24).

Protecting and recovering salmonids and other aquatic species requires protecting land on and around fish-bearing streams. Building upon successes elsewhere, we endorse creation of salmon sanctuaries that protect key aquatic habitats and related uplands through voluntary conservation easements, leases, land purchases, and tax-incentive donations. The region should attempt to obtain substantial additional habitat protections in the locations that promise the greatest benefits for fish (Governors' Recommendations, July 2000).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).

In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-federal habitat, especially if at risk of being degraded, in accordance with criteria and priorities BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies and NMFS shall study the feasibility (including both biological benefits and ecological risks) of habitat modification to improve spawning conditions for chum salmon in the Ives Island area (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall fund actions to improve and restore tributary and mainstem habitat for Columbia River chum salmon in the reach between The Dalles Dam and the mouth of the Columbia River (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall investigate and partition the causes of mortality below Bonneville Dam after juvenile salmonid passage through the FCRPS (NMFS Biological Opinion 2000 Action Table Dec. 2000).

In subbasins with listed salmon and steelhead, BPA shall fund protection of currently productive non-federal habitat, especially if at risk of being degraded, in accordance with criteria and priorities BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Improve existing habitat and fully evaluate passage opportunities through relicensing and Section 7 consultation for Idaho Power Company dams (Final All-H Paper Dec. 2000).

Through ICBEMP's and the Northwest Forest Plan's aquatic strategies, provide a base for habitat protection (USFS, BLM) (Final All-H Paper Dec. 2000).

Implement multiple-scale assessments and data management systems (USFS, BLM) (Final All-H Paper Dec. 2000).

Accelerate land acquisition, using LWCF funds prioritizing fish habitat (USFS, BLM). Protect existing high quality habitat and accelerate restoration in high priority subbasins. Complete HCP for Mid-Columbia Dams (Final All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

The Action Agencies shall continue to fund studies that monitor survival, growth, and other early life history attributes of Snake River wild juvenile fall chinook (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Initiate at least three tier studies (each necessarily comprising several sites) within each ESU (a single action may affect more than one ESU). In addition, at least two studies focusing on each major management action must take place within the Columbia River basin. The Action Agencies shall work with NMFS and the Technical Recovery Teams to identify key studies in the 1-year plan. Those studies will be implemented no later than 2003 (FCRPS Biological Opinion 2000).

1-2 Resident Fish

Increase the abundance and resilience of bull trout, burbot, cutthroat trout and other native aquatic species by providing or restoring spawning and rearing habitats in areas above anadromous fish blockages. It is recognized that non-native species may be important components of these communities in some cases, however, the focus is on development of native habitats and communities (Draft Framework Alternative 2,3).

Restore ecosystem components that were represented by healthy anadromous fish runs to benefit native resident and wildlife by increasing the prey base and nutrient cycling, and reducing constraints on resident fish management actions through more normative management actions for anadromous fish (Framework Concept Paper 6).

By December 1, 2002, the Action Agencies shall complete an evaluation and report on any changes in depth, water velocity and substrate in the vicinity of Bonners Ferry which have occurred since Libby Dam became operational. [If] spawning/incubation habitat changes [are] documented, the report shall be expanded to include all feasible remedies such as channel constrictions or other physical habitat modification(s) to restore and maintain suitable spawning/incubation substrate, water velocities, and depths between RKM 228 and 246, or greater water depths above RKM 246 (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to determine the movements of bull trout from the Hood River and other tributaries into Bonneville Dam reservoir (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate potential habitat use of the White Salmon River subsequent to removal of Condit Dam (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, and the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate re-establishment of fluvial bull trout in the Klickitat River (FWS Biological Opinion Dec. 2000).

[Develop research/study plans with FWS, USFS, state agencies, and the tribes as appropriate, and] initiate studies to determine use and suitability of bull trout habitat for all life history stages in the Lower Columbia River (FWS Biological Opinion Dec. 2000).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

1-3 Introduced Species

Discourage proliferation of non-native species (Framework Alternative 3,12).

Attention should be given to controlling or eliminating exotic fish that prey on and displace anadromous salmonids (Framework Concept Paper 11).

1-4 Wildlife

Determine problem areas for wildlife (blocked migration corridors, staging areas, etc.); mitigate for displaced wildlife and their habitat (Tribal Vision). Connect wildlife preserves and habitats with suitable connecting habitats (Draft Framework Alternative 5).

Watershed improvements for salmon and steelhead and resident fish will benefit other aquatic, wildlife and plant species as well (Draft All-H paper Dec. 1999).

Increase the abundance and range of existing populations and habitats. Expand and connect existing habitat pockets to facilitate development of normative population structures for aquatic communities. Connect wildlife preserves and habitats with suitable connecting habitats (Draft Framework Alternative 1). Implement vegetative practices that provide suitable cover to control erosion and runoff as well as provide food and shelter for wildlife (Draft All-H Paper Dec. 1999).

Specific habitat components or features that contribute to the viability of species should be maintained and, where needed, restored. These features include, but are not limited to caves, mines, cliffs, talus or burrows (ICBSDEIS, B-O46). Develop broad-scale connectivity/linkages of wide-ranging carnivore habitat (ICBSDEIS, B-O49). Minimize isolation of wide-ranging carnivore populations (ICBSDEIS, B-O50). Restore connectivity within and among watersheds and networks of well-distributed high-quality habitats that sustain populations of aquatic and riparian-dependent species (ICBSDEIS, R-O23). Restore instream and riparian habitat of sufficient quality, patch size and distribution to support healthy populations of native fish and riparian-dependent species (ICBSDEIS, R-O24).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

Quantify wildlife losses caused by the construction, inundation, and operation of the hydropower projects (Council's 2000 Fish and Wildlife Program).

1-5 Predators of Anadromous Fish

Immediately authorize expanded predator controls (MMPA) (Final All-H Paper Dec. 2000). Improve predator control (including developing a sea bird management plan) (COE, NMFS, FWS) (Final All-H Paper Dec. 2000). Reduce predator populations in the mainstem and estuary (Framework Concept Paper 25). Create and maintain sufficient activity on Rice Island to discourage occupation by Caspian Terns and Cormorants that prey on smolts, and if necessary make changes to the island that discourage avian predator habitat (Framework Concept Paper 27). Reduce predator populations in the mainstem and the estuary (Framework Concept Paper 25). Discourage proliferation of non-native species (Framework Alternative 3,12). Attention should be given to controlling or eliminating exotic fish that prey on and displace anadromous salmonids (Framework Concept Paper 11). Take direct action to control the bird population on Rice Island, marine mammals, and Northern pikeminnow that prey on salmon (Framework Alternative 7). Remove Rice Island. Don't relocate the terns (PM).²

Increased amount of riparian vegetation will provide shade, which lowers water temperature and reduces threat of predators (Framework Concept Paper 1). Rice Island and the peninsula at the mouth of the Walla Walla River should be planted in vegetation that discourages nesting of terns (Framework Concept Paper 11).

The Unified Regional Plan must address the full scope of the region's fish and wildlife resources and their interactions with each other, the economy and the interests of humans. For example, marine mammal populations and laws and policies that protect them must be balance with efforts to recover weak naturally spawning salmon and steelhead populations where marine mammal predation is a documented problem (Framework Concept Paper 14).

The legitimate, but disparate, focus of varying federal laws, including the Endangered Species Act, the Migratory Bird Treaty Act and the Marine Mammal Protection Act present management challenges as we seek to protect ESA-listed juvenile and adult salmon and steelhead that, in turn, are prey for the birds and mammals also protected by these laws. We support actions to improve the coordination among these laws so that they are not working at cross-purposes (Governors' Recommendations, July 2000).

We recommend that the U. S. Army Corps of Engineers (Corps), NMFS and the Fish and Wildlife Service develop a long-term management plan to address predation by fish-eating birds and marine mammals. The relocation of Caspian terns within the estuary was a good start but is not sufficient by itself. The number of Caspian terns, as well as that of double-crested cormorants, should be significantly reduced in the Columbia River Estuary. The Caspian tern predation rate on juvenile salmon and steelhead remains unacceptable, as is the inability of the federal agencies to agree upon a common approach and a lead agency status for this effort. We recommend that such an approach be presented to the region by the appropriate federal agencies by the end of the year. As part of the long-term management strategy for seals and sea lions, we recommend congressional approval of NMFS's Framework Concept Paper to acquire additional authority to take seals and sea lions that persistently impact listed salmonid species (Governors' Recommendations, July 2000).

We recommend changing existing sport fishing restrictions to concentrate on species that prey on, and compete with, salmon for food, including northern pikeminnow. Sport fishing regulation changes also should strive to minimize

² Pasco Public Meeting

effects of exotic species on native species. The region could experience short-term benefits from increased fishing opportunities for these competitor species (Governors' Recommendations, July 2000).

The Corps, in coordination with the NMFS Regional Forum process, shall implement and maintain effective means of discouraging avian predation (e.g., water spray, avian predator lines) at all forebay, tailrace, and bypass outfall locations where avian predator activity has been observed at FCRPS dams. These controls shall remain in effect from April through August, unless otherwise coordinated through the Regional Forum process. This effort shall also include removal of the old net frames attached to the two submerged outfall bypasses at Bonneville Dam. The Corps shall work with NMFS, FPOM, USDA Wildlife Services, and USFWS on recommendations for any additional measures and implementation schedules and report progress in the annual facility operating reports to NMFS. Following consultation with NMFS, corrective measures shall be implemented as soon as possible (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies, in coordination with the Caspian Tern Working Group, shall continue to conduct studies (including migrational behavior) to evaluate avian predation of juvenile salmonids in the FCRPS reservoirs above Bonneville Dam. If warranted and after consultation with NMFS and USFWS, the Action Agencies shall develop and implement methods of control that may include reducing the populations of these predators (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall quantify the extent of predation by white pelicans on juvenile salmon in the McNary pool and tailrace. A study plan shall be submitted to NMFS by September 30, 2001, detailing the study objectives, methods, and schedule. Based on study findings, and in consultation with USFWS and NMFS, the Action Agencies shall develop recommendations and, if appropriate, an implementation plan (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall recover PIT-tag information from predacious bird colonies and evaluate trends, including hatchery-to-hatchery and hatchery-to-wild depredation ratios (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall develop a pilot study to assess the feasibility of enhancing the function of ecological communities to reduce predation losses and increase survival in reservoirs and the estuary (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies, in coordination with NMFS, shall investigate marine mammal predation in the tailrace of Bonneville Dam. A study plan shall be submitted to NMFS by June 30, 2001, detailing the study objectives, methods, and schedule (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

The Action Agencies shall develop a pilot study to assess the feasibility of enhancing the function of ecological communities to reduce predation losses and increase survival in reservoirs and the estuary (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies shall continue to implement and study methods to reduce the loss of juvenile salmonids to predacious fishes in the lower Columbia and lower Snake rivers. This effort will include continuation and improvement of the ongoing Northern Pikeminnow Management Program and evaluation of methods to control predation by non-indigenous predacious fishes, including smallmouth bass, walleye, and channel catfish (NMFS Biological Opinion 2000 Action Table Dec. 2000).

1-6 Watersheds

Actively restore watersheds where salmon are in imminent danger of extirpation (Framework Concept Paper 3; Spirit of the Salmon). Coordinate reservoir operation across the watershed subbasins to achieve a protracted runoff event to aid anadromous species recovery while protecting and restoring aquatic ecosystems in the headwaters (Framework Concept Paper 8).

Build no new dams in salmon and steelhead habitat (Framework Concept Paper 1).

Actively restore watersheds where salmon populations are in imminent danger of extirpation. Use "Coarse Screening Process" to develop demonstration projects (Framework Concept Paper 3).

Begin improving in-channel stream conditions for anadromous fish by improving or eliminating land-use practices that degrade watershed quality (Framework Concept Paper 3).

Clearly anadromous fish are a key component to watershed and subwatershed interactions. Targeting appropriate experimental design strategies in combination with multi-scale landscape characterizations may produce a more informed understanding of species/habitat interactions. Initially, the interactions between the watershed and subwatersheds may be addressed. Most agencies have several years of data and local expertise relating to the

managed resource (Framework Concept Paper 24).

Establish reference watersheds and populations throughout the basin to serve as a control for management actions. Streams already included in this status are John Day, MF Salmon, and Wenaha. Reference watersheds should cover range of species and ecological conditions (Framework Concept Paper 10).

1) Construct a suite of coarse scale (1:24,000 base) ecological characterizations for each watershed (e.g., Grande Ronde Watershed); 2) Identify the available data that is ecologically relevant to the pattern of the managed resources; 3) Develop functional thresholds, which characterize significant (measurable) changes in the watershed; 4) Review and publishing of case studies that link abstract and empirical models; and 5) Target ecological functions and patterns at critical/ESA spatial scales (Framework Concept Paper 24).

Support watershed improvements and processes in the Oregon and Washington Plans (Framework Concept Paper 27).

To assist the local planning effort, we recommend that state authorities designate priority watersheds for salmon and steelhead and that plans for these watersheds be developed by October 1, 2002. Plans for all watersheds in the Columbia River Basin should be developed by 2005 (Governors' Recommendations, July 2000).

Land and water users and managers should meet specified habitat conditions associated with targeted salmon survival rates (Framework Concept Paper 3). Focus work in small tributaries in priority basins, where naturally low streamflows are exacerbated by irrigation withdrawals and where returning even a small amount of water to the stream has significant ecological benefits for anadromous and resident fish. Acquire water through donation, lease, purchase and conserved water projects, using a free market, voluntary, cooperative approach, and works with interested water rights holders, local watershed councils, and community leaders and agency officials (Framework Concept Paper 17).

BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and federal law to ensure that a reasonable portion of any water conserved will benefit listed species (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall work with the NWPPC to ensure development and updating of subbasin assessments and plans; match state and local funding for coordinated development of watershed assessments and plans; and help fund technical support for subbasin and watershed plan implementation from 2001 to 2006. Planning for priority subbasins should be completed by the 2003 check-in. The Action Agencies will work with other federal agencies to ensure that subbasin and watershed assessments and plans are coordinated across non-federal and federal land ownerships and programs (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall initiate programs in three priority subbasins (identified in the Conceptual Recovery Plan) per year over 5 years, in coordination with NMFS, FWS, the states and others, to address all flow, passage, and screening problems in each subbasin over 10 years. Under the NWPPC program, BPA addresses passage, screening, and flow problems, where they are not the responsibility of others. BPA expects to expand on these measures in coordination with the NWPPC process to complement BOR actions (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies and NMFS shall work within regional prioritization and congressional appropriations processes to establish and provide the appropriate level of FCRPS funding for a program to acquire and digitize aerial or satellite imagery of the entire Columbia River basin once every 3 to 5 years (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Implement seven watershed restoration initiatives targeting core populations most at risk (USFS, BLM) (Final All-H Paper Dec. 2000).

Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

[Encourage] non-governmental participation in planning and implementation of watershed solutions (Federal Habitat Team, NRCS) (Final All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

BPA shall work with the NWPPC to ensure development and updating of subbasin assessments and plans; match state and local funding for coordinated development of watershed assessments and plans; and help fund technical support for subbasin and watershed plan implementation from 2001 to 2006. Planning for priority subbasins should be completed by the 2003 check-in. The Action Agencies will work with other federal agencies to ensure that subbasin and watershed assessments and plans are coordinated across non-federal and federal land ownerships and programs (NMFS Biological Opinion Action Table Dec. 2000; Final All-H Paper Dec. 2000).

1-7 Tributaries

Prioritize tributary habitat restoration efforts to address stream reaches inhabited by weak stocks that are listed or proposed for listing under the ESA (Sample Action).

Protect, connect, and restore habitat on the tributaries throughout the basin (Framework Alternative 1). To protect and recover tributary habitat, land and water users and managers must meet a series of habitat conditions associated with survival rates (Framework Concept Paper 3). Promote aggressive habitat recovery methods for tributaries and in the Columbia and Snake River mainstems that optimize spawning and rearing habitat, including breaching dams in the tributaries where biologically and economically feasible (Framework Concept Paper 7).

Test the effectiveness of restoring habitat in tributary watersheds (Framework Alternative 4).

Maintain and improve egg-to-smolt survival in natal tributaries (Framework Concept Paper 2).

Management Actions: The best available technology would be used to improve stream quality at a random selection of replicate streams in a watershed or ecosystem. Response variables would be measured annually with annual assessments comparing treated and nontreated/control streams. Decision rules and time frames would be established *a priori* to determine success of remediation actions. Different subsets of streams would receive different remediation actions to compare strategies and identify cost-effective approaches to stream-wide recovery (Framework Concept Paper 23).

Management actions to implement instream flow protection for small streams and tributaries throughout the region include: 1) supporting agency efforts to address small stream and tributary streamflow issues, including information gathering and analysis, and development of policies and programs; and 2) seeking out opportunities for collaborative partnerships with stakeholders to restore and protect instream flows. Stakeholders include water right holders; watershed councils and other community groups; non-governmental organizations including land and water trusts; and federal, state and local governmental agencies and tribes (Framework Concept Paper 17).

Objective: Stream-wide recovery measured by improvements in adult salmon return numbers, spawner-recruit ratios, and fingerling-to-adult ratios would be the objective of adaptive management strategies. These measures of recovery provide integrated responses of survival and fecundity useful in monitoring environmental quality. The purpose of field trials would be to assess whether remediation actions enhance responses over yet nontreated control streams. Advantageous treatments would then be applied to new sets of streams for further comparison with prior treatments. A stair-step design would be implemented where adaptive management would test progressively better strategies for stream remediation based on prior field trial results. Strategy: The stair-step strategy to field testing progressively better remediation actions is motivated by large numbers of candidate streams and annual resources to address only some fraction each year. The experimental prerequisites of replication and randomization can be used to establish cause-and-effect linkages between remediation actions and improvements in survival and fecundity responses of salmonids. Environmental covariates concerning water quality, biotic responses of invertebrate populations, and habitat quality would be systematically measured to interpret variation in stream responses to remediation actions (Framework Concept Paper 23).

Re-establish sources of large woody debris for each stream adequate to maintain long term supply and to meet the structure and nutrient needs of the stream (Framework Concept Paper 10).

Operate fish weirs on spawning tributaries to assess adult escapement and potential introgression of hatchery fish into the spawning population. Weir tributaries to allow only wild fish pass above the weir to spawn (Framework Concept Paper 13).

For those BOR projects located in the Columbia River and its tributaries downstream from Chief Joseph Dam (Table 9.6-2), BOR shall, as appropriate, work with NMFS in a timely manner to complete supplemental, project-specific consultations. These supplemental consultations shall address effects on tributary habitat and tributary water quality, as well as direct effects on salmon survival (e.g., impingement, entrainment in diversions, false attraction to return flows, and others). These supplemental consultations shall address effects on mainstem flows only to the extent to which they reveal additional effects on the in-stream flow regime not considered in this biological opinion (e.g., flood control) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall, in coordination with NMFS, experiment with innovative ways to increase tributary flows by, for example, establishing a water brokerage. BPA will begin these experiments as soon as possible and submit a report evaluating their efficacy at the end of 5 years (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Fund technical support for 2001-2006 plan implementation; identify in annual and 5-year implementation plan appropriate habitat actions and implement them (Final All-H Paper Dec. 2000).

Fix flow, screening and passage problems in priority subbasins, beginning in 2001 in the Methow, Upper John Day

and Lemhi (Final All-H Paper Dec. 2000).

Fund land acquisitions and conservation easements (BPA) (Final All-H Paper Dec. 2000).

Provide permanent protection for riparian areas in agricultural areas by supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000).

Develop and implement TMDLs for anadromous fish tributaries within five years (Final All-H Paper Dec. 2000).

Establish in-stream flows for anadromous fish tributaries within five years (Final All-H Paper Dec. 2000).

During sturgeon recruitment flow periods, the Action Agencies shall allow local inflow to supplement Libby Dam releases to the maximum extent feasible (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to determine the movements of bull trout from the Hood River and other tributaries into Bonneville Dam reservoir (FWS Biological Opinion Dec. 2000).

The Action Agencies shall [develop research/study plans with FWS, USFS, state agencies, the tribes, and PacifiCorp, as appropriate, and] cooperate in studies to evaluate potential habitat use of the White Salmon River subsequent to removal of Condit Dam (FWS Biological Opinion Dec. 2000).

For those BOR projects located in the Columbia River and its tributaries downstream from Chief Joseph Dam (Table 9.6-2), BOR shall, as appropriate, work with NMFS in a timely manner to complete supplemental, project-specific consultations. These supplemental consultations shall address effects on tributary habitat and tributary water quality, as well as direct effects on salmon survival (e.g., impingement, entrainment in diversions, false attraction to return flows, and others). These supplemental consultations shall address effects on mainstem flows only to the extent to which they reveal additional effects on the in-stream flow regime not considered in this biological opinion (e.g., flood control) (NMFS Biological Opinion Action Table Dec. 2000).

1-8 Mainstem Columbia

Emphasize upper Columbia River spring chinook and steelhead, middle Columbia River steelhead, Willamette steelhead and other ESA-listed species; reduce hydro peaking (apply to more than mainstem Columbia). Use gravel from upstream to replenish mainstem spawning areas (Sample Actions).

Provide habitat and conditions in the mainstem rivers to result in a high rate of survival for juvenile and adult migrating salmon and other fish species (Framework Alternative 2,3; orig. Framework Alternative 5). Protect, conserve, and enhance identified habitats, particularly wetlands, on the mainstem of the lower Columbia River. (LCREP). Restore productive normative river segments in the mainstem Columbia and Snake Rivers (Framework Concept Paper 5). Use drawdown to test restoration effects on mainstem habitat (Framework Alternative 4).

Possibilities for a mainstem habitat implementation plan: create shallow-water habitat by excavating backwater sloughs, alcoves, and side channels and other measures add large woody debris to these systems; re-connect alcoves, sloughs, and side channels to the main channel; establish emergent aquatic plants in shallow water areas; re-establish or enhance historic or existing wetlands; mimic natural hydrographs to the extent practicable; dredge or excavate lateral channels that have silted in; acquire and protect a belt of lands adjacent to the mainstems (Draft All-H paper Dec. 1999).

Set aside the Hanford Reach as an ecological preserve (Framework Alternative 5).

BPA, working with BOR, the Corps, EPA, and USGS, shall develop a program to 1) identify mainstem habitat sampling reaches, survey conditions, describe cause-and-effect relationships, and identify research needs; 2) develop improvement plans for all mainstem reaches; and 3) initiate improvements in three mainstem reaches. Results shall be reported annually (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000).

Assess opportunities for mainstem habitat improvements (BPA) (Final All-H Paper Dec. 2000).

Implement restoration programs (BPA) (Final All-H Paper Dec. 2000).

Evaluate opportunities to improve spawning habitat in the Ives Island area (Final All-H Paper Dec. 2000).

Protect Hanford Reach (FWS, DOE) (Final All-H Paper Dec. 2000).

1-9 Reservoirs

Operate reservoirs and modify water diversions to provide optimum instream flows needed by salmon and other native aquatic species. (Framework Concept Paper 1). Provide instream and reservoir environmental conditions necessary to provide adequate survival of resident fish and other aquatic species. Explore ways to stabilize reservoir levels (Draft All-H paper Dec. 1999).

By October 1, 2002, the Corps shall develop and, if feasible, implement a revised storage reservation diagram for Libby Reservoir that replaces the existing fall draft to a fixed end-of-December elevation. One option is to evaluate variable drafts based on the El Niño Southern Oscillation Index (SOI) predictions or other forecast methodologies of runoff volume. To implement this change, the Corps shall complete successful coordination with Canada under the Columbia River Treaty (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

1-10 Estuary and Ocean

Re-establish normative estuarine conditions to expand the size of the estuary and increase its productivity (Draft Framework Alternative 2,3,5). Restore estuarine habitats by removing dikes and managing dredging and other navigational measures consistent with prudent safety considerations. Investigate, and where feasible implement, measures to restore normative input of sediment and organic matter into the estuary. Manage dredging in the estuary to minimize creation of habitats that artificially increase predation or have other adverse ecological effects (Draft Framework Alternative 5).

Protect and restore critical estuary habitat (Framework Concept Paper 3; Spirit of the Salmon). Restore 3,000 acres of tidal wetlands along the lower 46 river miles to return tidal wetlands to 50 percent of the 1948 level (LCREP). Restore 13,000 acres of tidal wetlands in the lower 46 miles of river and adjoining tributaries; take additional actions based on recommendations of LCREP, EPA and Corps study (to be conducted). Coordinate federal and state threatened and endangered species recovery activities in the lower Columbia River and estuary and help local communities meet species recovery requirements (LCREP).

Provide public information and education efforts about the lower river and estuary that focus on endangered species, habitat loss and restoration, biological diversity, and lifestyle practices and connections to the river (LCREP). *[Implement more]* public education and outreach (Final All-H Paper Dec. 2000).

During 2001, the Corps and BPA shall seek funding and develop an action plan to rapidly inventory estuarine habitat, model physical and biological features of the historical lower river and estuary, identify limiting biological and physical factors in the estuary, identify impacts of the FCRPS system on habitat and listed salmon in the estuary relative to other factors, and develop criteria for estuarine habitat restoration (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA and the Corps, working with LCREP and NMFS, shall develop a plan addressing the habitat needs of salmon and steelhead in the estuary (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA, working with LCREP, shall develop and implement an estuary restoration program with a goal of protecting and enhancing 10,000 acres of tidal wetlands and other key habitats over 10 years, beginning in 2001, to rebuild productivity for listed populations in the lower 46 river miles of the Columbia River. The Corps shall seek funds for the federal share of the program, and BPA shall provide funding for the non-federal share. The Action Agencies shall provide planning and engineering expertise to implement the non-federal share of on-the-ground habitat improvement efforts identified in LCREP, Action 2 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Between 2001 and 2010, the Corps and BPA shall fund a monitoring and research program acceptable to NMFS and closely coordinated with the LCREP monitoring and research efforts (Management Plan Action 28) to address the estuary objectives of this biological opinion (NMFS Biological Opinion 2000 Action Table Dec. 2000).

During 2000, BPA, working with NMFS, shall continue to develop a conceptual model of the relationship between estuarine conditions and salmon population structure and resilience. The model will highlight the relationship among hydropower, water management, estuarine conditions, and fish response. The work will enable the agencies to identify information gaps that have to be addressed to develop recommendations for FCRPS management and operations (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop a physical model of the lower Columbia River and plume. This model will characterize potential changes to estuarine habitat associated with

modified hydrosystem flows and the effects of altered flows where they meet the California Current to form the Columbia River plume (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to develop an understanding of juvenile and adult salmon use of the Columbia River estuary [*and Columbia River Plume*]. These studies support the actions to develop criteria for estuarine restoration (Action 158), restoration planning (Action 159), and implementation (Action 160) in Section 9.6.2.2 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Conduct habitat mapping inventory in early 2001; develop and implement modeling and restoration criteria beginning early 2001 (BPA, Corps, LCREP) (Final All-H Paper Dec. 2000).

Prioritize habitats for protection and restoration (2001) (LCREP; Final All-H Paper Dec. 2000). Facilitate Lower Columbia River Estuary Program implementation (LCREP, EPA; Final All-H Paper Dec. 2000). Strengthen Lower Columbia River Estuary Program authority (Final All-H Paper Dec. 2000).

Seek authorization for Lower Columbia River Greenway Program (DOI/DOA); establish Greenway Habitat Protection Fund to protect wetlands and uplands (Final All-H Paper Dec. 2000). Implement the Lower Columbia Greenway Project (Final All-H Paper Dec. 2000):

- Habitat mapping and priorities for protection or restoration
- Habitat acquisition/protection
- COE habitat restoration
- Monitoring.

Develop conceptual model of estuary conditions and fish population structure and resilience (Final All-H Paper Dec. 2000).

Authorize and fund expanded Corps of Engineers Restoration Program (Final All-H Paper Dec. 2000).

Authorize and fund FEMA buybacks of floodplain structures in priority habitats (Final All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

Implement monitoring and evaluation program (Final All-H Paper Dec. 2000).

Dedicate research funding to investigate ocean conditions and impacts on salmon including adequacy of the ocean food chain (Framework Concept Paper 27).

Expand knowledge and understanding of the ocean and Columbia River estuary (Framework Concept Paper 27).

1-11 Water Quality

Emphasize a substantial and explicit tie between water quality compliance efforts (already under court orders in three states) and salmon recovery (Draft All-H Paper Habitat Option 2, Dec. 1999). Determine water quality standards for fish habitat -- for example, water temperatures can be no higher than 60°F. If standards are not met, land and water managers must take action that will achieve compliance (Spirit of the Salmon).

Manage the river and river uses for seasonal flows and water quality consistent with the needs of salmon, steelhead, and resident fish species (Framework Alternative 1). Monitor and evaluate potential effects of pollutants on human health, and fish and wildlife. Develop a basin-wide strategy for identified toxic and conventional pollutants that defines their sources, fate, and effects and reduces their discharge (LCREP). Manage human activities to meet regional and federal air and water quality standards (Framework Alternative 1,2,3,4).

Establish a sediment threshold for spawning areas that is not limiting to salmonid egg development and fry emergence (Framework Concept Paper 10).

Establish a temperature standard that is not limiting to salmonid adults, juveniles, and eggs (Framework Concept Paper 10).

Implement the Clean Water Act, including the timely development of total maximum daily load regimes and enforcement of state ambient water quality standards and designated waterway uses in Idaho, Montana, Oregon, and Washington (Framework Concept Paper 5).

Use stored cold water, additional ladders, ladder improvements and ladder maintenance to enhance mainstem adult passage; incorporate 24-hour video fish counting (Framework Concept Paper 3).

Improve water quality by eliminating sources of toxic pollution that accumulates in fish tissue and by reducing discharges of other contaminants to meet water quality criteria for anadromous fish (Framework Concept Paper 3; Spirit of the Salmon). Remove toxic pollution sources and other contaminants. At a minimum, meet applicable water

quality criteria (Tribal Vision). Prevent lethal temperature rises (Framework Concept Paper 1). Limit the amount of sediment in spawning habitat and in streams generally (Spirit of the Salmon).

Enforce existing pollution control laws and meet the standards of the Clean Water Act (Framework Concept Paper 1). Implement increased regulation by the federal agencies under the CWA and ESA (Draft All-H Paper Habitat Option 2, Dec. 1999). Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). Establish a transboundary board in coordination with the International Joint Commission to improve water quantity and quality (Tribal Vision).

Acquire in-stream water rights/conservation easements to improve stream flows (Tribal Vision). Maximize irrigation efficiency; protect riparian vegetation via fencing or other methods; change land use activities/practices that degrade water quality (Tribal Vision). Restrict new dredging and improve existing dredging practices (Tribal Vision).

Stream and river reaches throughout the Columbia River Basin have flow and water quality problems that impede regional fish recovery efforts. The states are setting water quality standards and preparing implementation plans in accordance with previously established schedules. The states are also reviewing instream flow levels to address biological requirements for ESA-listed aquatic species. We are concerned, however, that the timelines for these tasks be fully consistent with the timeline required for salmon recovery. Therefore, we recommend federal assistance and support be made available to the states to better coordinate these timelines and, where necessary, to accelerate water quality improvements and to establish instream flows that benefit listed aquatic species in the Columbia Basin (Governors' Recommendations, July 2000).

The Action Agencies, coordinating through the Water Quality Team, shall annually develop a 1- and 5-year water quality plan for operation and configuration measures at FCRPS projects (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and federal law to ensure that a reasonable portion of any water conserved will benefit listed species (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall evaluate the water quality characteristics of each point of surface return flows from the Columbia Basin Project to the Columbia River and estimate the effects these return flows may have on listed fish in the Columbia River and in the wasteways accessible to listed fish. By June 1, 2001, BOR shall provide NMFS with a detailed water quality monitoring plan, including a list of water quality parameters to be evaluated. If the water quality sampling reveals enough water quality degradation to adversely affect listed fish, BOR shall develop and initiate implementation of a wasteway water quality remediation plan within 12 months of the completion of the monitoring program (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Support TMDL development and implementation (BPA) (Final All-H Paper Dec. 2000).

The Action Agencies will work with FWS and Montana Department of Fish, Wildlife, and Parks to re-establish appropriate vegetation in the 20 foot drawdown zone of Hungry Horse Reservoir. A schedule should be developed for plans and funding to be secured by 2003, with implementation by 2005 (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

Monitor existing water withdrawals; enforce existing regulations (Tribal Vision).

2 HARVEST

Significantly reduce or eliminate harvest of weak fish stocks and wildlife species (Sample Action).

Manage fisheries for the resource, not harvest (Framework Concept Paper 5). Develop selective harvest to ensure reasonable fishing opportunities while reducing impacts to native stocks (Framework Concept Paper 5). Weak stock management reforms are permanent. Future increases in mixed stock area fisheries will depend almost entirely on increased production of weak natural populations and/or greater harvest selectivity (Draft All-H paper Dec. 1999). Target strong stocks [for harvest] and minimize impacts on weak and imperiled stocks (Framework Concept Paper 1).

Initially, harvest rates would be low in tributary, mainstem and ocean fisheries until measurable responses were obtained from combined actions, and then harvest rates would increase consistent with recovery and rebuilding goals (Framework Concept Paper 6).

Continue development of selective fisheries where there are no adverse effects on wild stocks (Framework Concept Paper 5).

Expand genetic diversity by allowing sufficient escapement to achieve full seeding of each protected stock's spawning habitat (Framework Concept Paper 25).

Improve gear for selective harvests (Framework Concept Paper 27).

Manage harvest to protect weakest protected stocks (currently, ESA-listed stocks) to achieve adequate spawning ground escapement and seeding (Framework Concept Paper 26).

Manage for escapement to spawning grounds (Framework Concept Paper 27).

Place a moratorium on harvest of wild stocks in the mainstem, with tributary-by-tributary escapement goals for protected wild stocks. Mainstem harvest can be allowed only to the extent that the weakest wild stock subject to protection has adequate spawning escapement for adequate seeding (Framework Concept Paper 26).

Implement harvest actions that protect weak stocks (Framework Concept Paper 4).

Ensure adequate natural spawner escapement to streams (Framework Concept Paper 20).

Utilize production/harvest regimens that minimize impacts on naturally spawning populations, including mixed stock conflicts (Framework Concept Paper 20).

Implement region-wide and international management of harvest, including ocean (Framework Concept Paper 20).

We commit to support a recovery approach designed not only to achieve ESA de-listing levels but also to rebuild the runs to levels that support treaty and non-treaty harvest. But we believe rebuilding requires that All-Harvest may have to be reduced in the short term, together with aggressive actions taken to address mortality in the other life stages. We respect the legal status and cultural importance of Indian treaty fishing rights. Changes in harvest management suggested below must be developed in partnership with the treaty tribes so they are consistent with the ongoing harvest and production litigation under *U.S. v. Oregon*, and also with federal and state governments to comply with the Pacific Salmon Treaty (Governors' Recommendations, July 2000).

2-1 Anadromous Fish

Maintain escapements: the escapement goal is the annual number of adults, or a range of values, that the management entity intends to successfully spawn within a designated watershed (Framework Concept Paper 19). Allow enough wild salmon from each stock to escape harvest to spawn naturally and perpetuate the run (Framework Concept Paper 1).

Harvest rates should be set to ensure the productivity of the associated natural population. Manage salmon harvest to meet spawning and ecological escapement needs (Draft Framework Alternative 2,3).

Manage harvest to protect weak stocks by stopping All-Harvest of wild fish (Framework Alternative 7).

Where stock information is inadequate or absent, managers should acknowledge this uncertainty and manage conservatively. Harvest managers must acknowledge that salmon productivity varies over time and should act conservatively to account for limitations in assessment information and management capabilities (Council's 2000 Fish and Wildlife Program). Allow harvest only where impacts to wild fish are quantified and minimized (Framework Concept Paper 5). Develop selective harvest to ensure reasonable fishing opportunities while reducing impacts to native stocks (Framework Concept Paper 5). Fish would be caught in their rivers of origin to emphasize benefits to local communities and to minimize impacts on weak wild stocks (Framework Alternative 1). Continue development of selective fisheries where there are no adverse effects on wild stocks (Framework Concept Paper 5). Develop selective harvest to ensure reasonable fishing opportunities while reducing impacts to native stocks (Framework Concept Paper 5).

As part of the Pacific Salmon Treaty process, the Pacific Salmon Commission should adopt a coast-wide abundance-based regime for chinook to protect depressed and less productive natural stocks. This is extremely necessary for Columbia and Snake River chinook that traverse through and graze for much of their adult life in Gulf of Alaska or Canadian waters. Harvest impacts for chinook would be reduced to 50% total mortality throughout their range (Framework Concept Paper 5).

Conduct one-time purchase of replacement selective harvest gear for affected harvest interests with monies saved through operational changes at dams (Framework Concept Paper 26).

Establish a harvest management process that achieves escapement objectives and is accountable each year for those objectives (Framework Concept Paper 10).

Establish escapement objectives by population in each watershed that maintain natural selection and nutrient enrichment of streams with salmonid carcasses (Framework Concept Paper 10).

Redirect lower river mixed-stock commercial harvest to terminal harvest away from mainstem migration corridor. No improvement in upriver stocks is possible with present high levels of mixed stock harvest (Framework Concept Paper 26).

Redirect tribal mixed-stock commercial harvest to selective harvest at fish ladders and terminal harvest in tributaries (Framework Concept Paper 26).

Reduce mixed stock harvest and mark all hatchery fish to facilitate selective harvest. Eliminate or modify hatcheries and hatchery practices that negatively impact wild stocks (Framework Concept Paper 25).

Replace mixed stock fisheries with known stock fisheries with the purpose of achieving spawner abundance goals. The fisheries should be managed as a by-product of salmonid protection (Framework Concept Paper 10).

Selectively decrease commercial harvest of Columbia River salmon in the ocean by negotiating agreements with commercial fishing interests that provide economic incentives not to fish during return periods for designated stocks (Framework Concept Paper 27).

Shift to terminal fisheries to allow for selective stock harvest (Framework Concept Paper 27).

Work toward elimination of ocean salmon harvest, including treaty negotiations with Canada. If each country catches "its own" salmon, search, production and management costs of commercial salmon harvest will decrease, along with political friction (Framework Concept Paper 26).

Maintain salmon escapements within ranges necessary to conserve and protect potential salmon production and to maintain normal ecosystem functioning (Framework Concept Paper 19).

Harvest salmon in a manner consistent with the degree of uncertainty regarding the status and biology of the resource (Framework Concept Paper 19).

Maintain public support and involvement for sustained use and protection of salmon resources (Framework Concept Paper 19).

Geographic areas with the highest potential for increasing numbers of naturally spawning fish will be emphasized (Framework Concept Paper 20).

Mark All-Hatchery fish, so as to facilitate selective harvest. Weak stock management is impossible without selective harvest; selective harvest (other than terminal harvest) is impossible without marking All-Hatchery fish (orig. Framework Alternative 7).

Buy selective gear for harvesters and by improving harvest enforcement (Framework Alternative 7).

Limit fishing during the Pacific Decadal Oscillation period and stop hunting endangered species on the way to their breeding grounds (PM).³

Consolidate and unify harvest data -- both from marine and inriver fisheries, counts and samples -- into an accessible database. Provide real-time information for use by fisheries managers and planners. Conduct a regularly scheduled scientific review of harvest data and harvest practices (Council's 2000 Fish and Wildlife Program).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies in a multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target nonlisted fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way and/or methods deployed by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000)

The Action Agencies shall work with NMFS, USFWS, tribal and state fishery managers, and the relevant Pacific Salmon Commission and Pacific Fishery Management Council (PFMC) technical committees to develop and implement methods and analytical procedures (including revising and/or replacing current fishery management and stock assessment models based on these methods and procedures) to estimate fishery and stock-specific management parameters (e.g., harvest rates). The Action Agencies shall place particular emphasis on current methods and procedures affected by the transition to mass marking of Columbia River basin hatchery produced fish and/or deployment of selective fishery regimes in the Columbia River basin, addressing these concerns within a time frame necessary to make the new selective fishing regimes feasible. Specifically, the Action Agencies shall facilitate the development of models, methods, and analytical procedures by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Provide sufficient funding for managing fisheries and contributing to the transition to selective fisheries, and for the 1999 Pacific Salmon Treaty Agreement (Final All-H Paper Dec. 2000).

OCEAN FISHERIES:

³ Pasco Public Meeting

Work toward elimination of ocean salmon harvest (Framework Alternative 7). Reduce ocean harvest to increase numbers of returning adults (Framework Alternative 4). Eliminate certain fisheries, such as that in Southeast Alaska (Framework Alternative 4). Reduce ocean harvest to increase numbers of returning adults (Framework Alternative 4). Implement the recently negotiated Pacific Salmon Treaty conditions for Alaskan and Canadian fisheries, except that additional voluntary reductions would be sought in these fisheries. All other harvest impacts on listed populations would be reduced to conservation crisis levels for a period of years, after which harvest could be adjusted (Draft All-H Paper Harvest Option 3, Dec. 1999). Renegotiate international treaties to prevent overfishing, provide conservation incentives, and impose sanction on nations whose fleets illegally catch salmon and steelhead (Framework Concept Paper 1).

Given that long-term, biologically based management for the ocean is now in place, other steps can be explored to reduce ocean impacts on listed fish through use of more selective fishing techniques and a license buyback program that can reduce the current excess fishing capacity. Additional opportunities may exist to align viable fisheries with the opportunities available through a license buyback program given the excess fishing capacity that currently exists.

Finally, a random-observer program is needed to ensure the collection of information necessary for managers and the industry to reduce salmon bycatch mortality (Governors' Recommendations, July 2000).

RIVER FISHERIES:

Improve harvest data and stock information to promote better harvest management and protect weaker stocks (Sample Action).

Implement conservation crisis levels, defined as levels similar to the 1999 harvest rates for listed spring/summer chinook, and comparable conservation crisis levels for listed Snake River fall chinook and listed steelhead. All of these rates would be frozen until recovery goals are achieved (Draft All-H Paper Harvest Option 3, Dec. 1999).

Ban harvest in the mainstem (Framework Alternative 7).

Implement the recently negotiated Pacific Salmon Treaty (PST) conditions in all ocean fisheries and, as contemplated in that agreement, further constrains U.S. fisheries south of Canada 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 salmon. When abundance of listed stocks is similar to 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 (Draft All-H Paper Harvest Option 1, Dec. 1999).

The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies to develop improved methods for estimating incidental mortalities in fisheries, with particular emphasis on selective fisheries in the Columbia River basin, doing so within the time frame necessary to make new marking and selective fishery regimes feasible. The Action Agencies shall initiate studies and/or develop methods by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Constrain harvest impacts on listed ESUs to no more than recently established current levels (Final All-H Paper Dec. 2000).

Manage mixed stock fisheries on the natural stocks and/or stock groups affected by the fishery (not on hatchery stocks) (NMFS) (Final All-H Paper Dec. 2000).

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states and tribes develop alternative fishing techniques and/or locations and by enabling more selective fisheries and helping to develop the necessary institutional mechanisms and analytical capabilities to support management of selective fisheries (BPA/NMFS/USFWS) (Final All-H Paper Dec. 2000).

Seek opportunities to increase harvest in ways that do not harm listed ESUs (NMFS/USFWS) (Final All-H Paper

Dec. 2000).

Pursue conservative harvest policies (weak stock management) (Final All-H Paper Dec. 2000).

Discourage non-selective fisheries and pursue selective fisheries (support mass marking and other tools and take a lead role in developing the necessary analytical capabilities to support management of selective fisheries) (Final All-H Paper Dec. 2000).

2-2 Resident Fish

Eliminate bag limits on exotic predator fish in the mainstem; eliminate resident rainbow trout harvest in steelhead streams; harvest exotics and limit harvest on natives (rainbow trout seasons in anadromous streams) [Define or identify weak stocks.] (Sample Action).

Mark All-Hatchery fish, so as to facilitate selective harvest. Weak stock management is impossible without selective harvest; selective harvest (other than terminal harvest) is impossible without marking All-Hatchery fish (orig. Framework Alternative 7).

2-3 Wildlife

Protect fragile populations and their food sources. Enforce prohibitions on harvesting listed or candidate species (Sample Actions).

Continue monitoring wildlife populations to determine success of measures; establish post-enhancement recovery goals and limits on harvest (Tribal Vision).

3 HATCHERIES

Enhance production of harvestable populations of salmon resources to the extent they can be harvested by means that do not interfere with quantitative stream escapement goals for naturally spawning salmon populations (Framework Concept Paper 14). Do not harm wild salmon stocks (Framework Concept Paper 1). Use hatcheries and other propagation programs only as part of a broader, ecosystem-based plan (Framework Concept Paper 1).

Experimentally manipulate hatchery releases. In a reverse staircase, hatchery releases would be initially reduced, and then increased, to provide contrast to treatments (Framework Concept Paper 6).

All management and action plans should be review by independent scientists. All assumptions should be displayed and the scientific basis for the action should be carefully defined so that it is subject to peer review (Framework Concept Paper 10).

Complete the review of, and alter where necessary, all federal (e.g., Mitchell Act and Lower Snake River Compensation Plan) and private- and public utility-sponsored (dams operated according to FERC license terms) hatchery mitigation programs to secure consistency with basin-wide wild fish escapement and production goals and objectives (Framework Concept Paper 5).

Design artificial propagation programs as monitored experiments; ensure reporting protocols are consistently updated and all facility operations subject to periodic independent scientific review (Framework Concept Paper 5).

Determine genetic and life history diversity of fish populations as a benchmark for management and recovery actions (Framework Concept Paper 10).

Establish a basin-wide policy for the conservation of native wild populations, their population structure and biological diversity (Framework Concept Paper 10).

Establish a licensing and review process for state, tribal and federal hatcheries that are periodically reviewed for relicensing. This would allow adaptive management to influence the operations of the hatchery (Framework Concept Paper 10).

Focus on wild native fish, while recognizing appropriate roles of hatchery and non-native fish where ecologically prudent (Framework Concept Paper 9).

Focus on listed anadromous fish, while optimizing benefits and minimizing risks to resident and non-listed anadromous fish. Wherever possible, options should provide complementary benefits among resident and anadromous fish, as well as native wildlife populations (Framework Concept Paper 9).

Maintain and protect population structure including small, less productive populations (Framework Concept Paper 10).

Preserve or enhance existing native stock structures and genetic diversity (Framework Concept Paper 9).

The Program should give the highest priority to protecting the habitat for fish which reproduce in the wild. Lower priority should be given to hatchery programs for fisheries which need a temporary boost (< one generation) to fill newly created habitat. Lowest priority should be given to hatchery programs which are long term and provide fisheries with low potential for becoming self sustaining. Hatchery programs for endangered species should be reviewed on a case by case basis (Framework Concept Paper 22).

Utilize production/harvest regimens that minimize impacts on naturally spawning populations, including mixed stock conflicts (Framework Concept Paper 20).

The manner of use and value of artificial production must be considered in the context of the environment in which it will be used (Council's Artificial Production Review, October 1999, Section II.D; Council's 2000 Fish and Wildlife Program). 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. Appropriate risk management needs to be maintained in using the tool of artificial propagation (Council's 2000 Fish and Wildlife Program).

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. This approach will allow the region to address the remaining uncertainties on a case-by-case basis and quickly make adjustments in artificial production activities where warranted (Council's 2000 Fish and Wildlife Program).

Over the next three years, every artificial production program and facility in the basin, federal and non-federal, should undergo a review to determine its consistency with these strategies, scientific principles, and policies. After five years, the Council, 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 (Council's 2000 Fish and Wildlife Program).

Artificial production programs might be used to rebuild populations of fish that spawn naturally and also provide fish for tribal, sport and commercial harvest. In doing so, they should minimize the adverse impacts from interactions between artificially produced fish and those that spawn naturally. Interactions can adversely impact the unique genetics of fish that spawn naturally and, over time, dilute or weaken the unique genetic makeup of those populations (Council's Artificial Production Review, October 1999, Executive Summary Section III.B; Council's 2000 Fish and Wildlife Program).

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. Those populations and their associated spawning and early rearing habitat should be preserved and protected (Council's 2000 Fish and Wildlife Program).

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 (Council's 2000 Fish and Wildlife Program).

The Action Agencies and NMFS shall work within regional prioritization and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for a hatchery research, monitoring, and evaluation program consisting of studies to determine whether hatchery reforms reduce the risk of extinction for Columbia River basin salmonids and whether conservation hatcheries contribute to recovery (NMFS Biological Opinion 2000 Action Table Dec. 2000)

Use hatcheries and other propagation programs only as part of a broader, ecosystem-based plan (Framework Concept Paper 1).

Research, Monitoring, and Evaluation:

Establish an annual status review for each wild native population in the basin (Framework Concept Paper 10).

Review the hatchery program and its effect on native, wild salmonids and the ecosystem that supports them (Framework Concept Paper 10).

Increase the resources devoted to collecting and analyzing natural production information and data (Framework Concept Paper 5).

3-1 Anadromous Fish

Make careful use of some artificial methods such as hatcheries (Framework Alternative 3). Increase programs to conserve genetic resources, and significantly decrease mitigation programs below currently planned levels (Draft All-H Paper Hatcheries Option 3, Dec. 1999). For re-creating self-sustaining populations, stock fish that are as locally adapted and undomesticated as possible in as small an amount as possible for as few years as possible. Use hatcheries and other propagation programs only as part of a broader, ecosystem-based plan (Framework Concept Paper 1). Do not accept artificial production in lieu of habitat protection. Use funds saved by downsizing hatchery programs to restore habitat (Framework Concept Paper 1).

Allow hatchery programs to continue only where there is no impact to wild salmonids. Where hatchery programs continue, adopt dramatically different hatchery practices that mimic natural conditions in broodstock selection, rearing, feeding, acclimation, and release (Framework Concept Paper 5).

Develop and test the concept of a conservation hatchery where the purpose is to conserve wild, native salmonid populations including their evolutionary potential, locally adapted gene pools, and characteristic phenotypes and behaviors (Framework Concept Paper 10).

Establish a biodiversity institute for the basin with the purpose of attracting scientists from many disciplines and given the time to evaluate and analyze information and develop a science based salmonid rebuilding program (Framework Concept Paper 10).

Maintain genetic and life history diversity represented by each population in each watershed (Framework Concept Paper 10).

Mark all hatchery fish [*with an identifiable external mark*] to facilitate selective harvest (Framework Concept Paper 26; Framework Concept Paper 27).

[*End*] the transfer of salmonids among hatcheries and subbasins (Framework Concept Paper 10).

Set performance standards based upon returning fish, with an emphasis on wild fish (Framework Concept Paper 27).

Terminate hatcheries that contribute to the decline of native salmonid populations through disruption of genetic and life history diversity and have negative ecological effects on target and non-target native populations (Framework Concept Paper 10).

Allow use of hatcheries in areas below dams that block salmon migration, but require that the fish release closely match those lost (Framework Alternative 3,4; orig. Framework Alternative 5). Adopt safeguards to prevent stocking programs from harming wild salmon, and if stocking will harm a wild population, do not stock (Framework Concept Paper 1). Eliminate or modify hatcheries and hatchery practices that negatively impact wild stocks (Framework Concept Paper 25).

Mark all-hatchery fish to enable selective harvest (Framework Concept Paper 5; Framework Concept Paper 27). To facilitate a robust harvest program for hatchery fish in a way that does not impact wild fish, we endorse a program that results in the marking of hatchery fish that pose threats to ESA-listed fish, to the fullest extent consistent with the Pacific Salmon Treaty. We also urge tribal, state and federal fish managers to put such a program in place promptly, as it will be difficult to implement many improved harvest techniques until it is possible to identify hatchery-reared fish (Governors' Recommendations, July 2000).

The Action Agencies shall work with NMFS, USFWS, tribal and state fishery managers, and the relevant Pacific Salmon Commission and Pacific Fishery Management Council (PFMC) technical committees to develop and implement methods and analytical procedures (including revising and/or replacing current fishery management and stock assessment models based on these methods and procedures) to estimate fishery and stock-specific management parameters (e.g., harvest rates). The Action Agencies shall place particular emphasis on current methods and procedures affected by the transition to mass marking of Columbia River basin hatchery produced fish and/or deployment of selective fishery regimes in the Columbia River basin, addressing these concerns within a time frame necessary to make the new selective fishing regimes feasible. Specifically, the Action Agencies shall facilitate the development of models, methods, and analytical procedures by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall fund the development of NMFS-approved HGMPs for implementation, including plans for monitoring and revising them as necessary as new information becomes available. HGMPs have to be completed first for the facilities and programs affecting the most at-risk species (Upper Columbia and Snake River ESUs), followed by those affecting mid-Columbia, and then the Lower Columbia ESUs. HGMPs for all the Columbia basin hatchery programs and facilities should be completed (and approved by NMFS) by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall implement the reforms identified in the HGMP planning process for the Grand Coulee mitigation anadromous fish hatchery programs, beginning immediately following completion of the relevant (NMFS approved) HGMPs and completing the work as expeditiously as feasible. BPA shall fund the operations and maintenance costs of the reforms and shall reimburse the federal Treasury for an appropriate share of the capital costs. BOR shall have begun to implement reforms for programs affecting the most at-risk species by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall implement the reforms identified in the HGMP planning process for the Corp's Columbia River basin mitigation anadromous fish hatchery programs, beginning immediately after the relevant HGMPs are completed and are approved by NMFS. The work shall be completed as expeditiously as feasible. BPA shall fund the operations and maintenance costs of the reforms and shall reimburse the federal Treasury for an appropriate share of the capital costs. The Corps shall have begun to implement reforms for the programs affecting the most at-risk species by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall implement the reforms identified in the HGMP planning process for federal and federally funded hatcheries, beginning immediately after the relevant HGMPs are completed and approved by NMFS. The work shall be completed as expeditiously as possible. BPA shall have begun to implement reforms for the programs affecting the most at-risk species by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Working through regional prioritization processes to the extent feasible and in coordination with NMFS, BPA shall collaborate with the regional, state, tribal, and federal fish managers and the Pacific States Marine Fisheries Commission to enable the development and implementation of a comprehensive marking plan. Included in this action are the following four steps (NMFS Biological Opinion 2000 Action Table Dec. 2000):

1. Develop a comprehensive marking strategy for all salmon and steelhead artificial production programs in the Columbia River basin by the end of 2001.
2. Provide funding by March 1, 2001, to begin marking all spring chinook salmon that are currently released unmarked from federal or federally funded hatcheries.
3. Provide funding, beginning in FY 2002, to implement the Action Agencies' share of the comprehensive marking plan for production not addressed in (2) above.
4. Obtain funding contributions as appropriate for additional sampling efforts and specific experiments to determine relative distribution and timing of hatchery and natural spawners.

BPA shall, in coordination with NMFS, USFWS, and the relevant state and tribal co-managers, fund the four-step planning process described above as quickly as possible and, if so determined by that process, implement safety-net projects as quickly as possible at least for the following salmon and steelhead populations: 1) A-run steelhead populations in the Lemhi River, main Salmon River tributaries, East Fork Salmon River, and Lower Salmon River; 2) B-run steelhead populations in the Upper Lochsa River and South Fork Salmon River; and 3) spring/summer chinook populations in the Lemhi, East Fork, and Yankee Fork Salmon rivers, and Valley Creek (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall, in coordination with NMFS, USFWS, and the relevant state and tribal co-managers, fund the development of HGMPs for the Grande Ronde and Tucannon spring/summer chinook safety-net programs (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA shall commit to a process whereby funds can be made quickly available for funding the planning and implementation of additional safety-net projects for high-risk salmon and steelhead populations NMFS identified during the term of this biological opinion (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Develop approved HGMPs for all hatchery facilities in the Columbia Basin (Final All-H Paper Dec. 2000).

Implement HGMPs at federal, state and tribal facilities by making necessary operational improvements and capital changes in programs and facilities (Final All-H Paper Dec. 2000).

Expand the safety net program for the most at-risk populations; use a variety of conservation hatchery techniques to aid the recovery effort (NMFS/BPA/USFWS) (Final All-H Paper Dec. 2000). In 2002, BPA shall begin to implement and sustain NMFS-approved, safety-net projects (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Implement aggressive monitoring and evaluation programs to reduce uncertainties e.g., hatchery/wild fish interactions, the effectiveness of hatchery spawners, etc., and assess performance of conservation efforts (Final All-H Paper Dec. 2000).

Prepare and implement HGMPs for state-run hatcheries (Final All-H Paper Dec. 2000).

3-2 Resident Fish

Eliminate non-native species; eliminate hatchery outplanting of non-native species of resident fish into anadromous fish streams; support weak native species with production facilities; retrofit existing hatcheries or build new facilities

to supplement weak stocks (Sample Action).

Attempt to restore and enhance conditions to increase and maintain native resident fish species wherever possible. Allow mitigation with non-native species only in limited situations. Depending upon the results of research and study of population dynamics, the effort should be placed on the enhancement of wild spawning rather than on the use of hatchery production to increase target populations (Framework Concept Paper 12).

Terminate hatcheries that contribute to the decline of native salmonid populations through disruption of genetic and life history diversity and have negative ecological effects on target and non-target native populations (Framework Concept Paper 10).

The Action Agencies shall continue to maintain the preservation stocking program [of Kootenai River white sturgeon] operated by the Kootenai Tribe of Idaho, and associated rearing facilities operated by B.C. Ministry of Environment, Lands and Parks (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

The Action Agencies shall maintain the current level(s) of monitoring associated with all stages of natural recruitment, and the preservation stocking program (FWS Biological Opinion Dec. 2000).

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 (Council's 2000 Fish and Wildlife Program).

4 HYDRO

Emphasize breaching Lower Snake dams (Sample Action).

The federal agencies would seek increased funding to pursue more aggressive implementation of measures to improve passage survival (Draft All-H Paper Hydro Option 2, Dec. 1999).

If the population-level analysis indicates that the combination of actions affecting all life stages of a species will not result in a high probability of survival and a moderate to high likelihood of recovery, mortality caused by the hydrosystem must be reduced to no more than the level that would occur if the hydrosystem was not in place. The FCRPS can achieve this goal through off-site mitigation, if it is not feasible to achieve through FCRPS improvements (Draft Biological Opinion, page 14, July 2000).

Each state commits, by October 1 this year (2000) and annually thereafter, to provide a list of priority fish passage projects to the Council for proposed funding. The list could include such things as screening diversions and replacing culverts, as well as removal of, or passage at, tributary dams, as is being done at Condit, Wapatox and Marmot dams (Governors' Recommendations, July 2000).

The Action Agencies shall coordinate with NMFS, USFWS, and the states and tribes in preseason planning and in-season management of flow and spill operations. This coordination shall occur in the Technical Management Team process (see Section 9.4.2.2) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Use relicensing and ESA consultation to improve flows, passage, etc. at non-federal dams on the Deschutes, Lewis, Cowlitz, and other basins (FERC) (Final All-H Paper Dec. 2000).

4-1 Dam Modifications and Facilities

Breach dams if necessary to recover weak stocks (Sample Action).

Breach one or more dams (Framework Alternative 1,2,3). Breach Lower Snake River Dams (Draft All-H Paper Hydro Option 3 Dec. 1999; Framework Concept Papers 1,2,3,4,5,6, 7a,7b). Achieve natural river-level drawdown of lower Snake projects (partially dismantling Lower Granite, Little Goose, Lower Monumental, and Ice Harbor by removing the earthen portion of each dam by spring 2005) (Framework Concept Paper 5). Pass legislation to effectuate the drawdown of the four Lower Snake River Dams and John Day Dam (Framework Concept Paper 7a,7b). Operate the John Day reservoir at spillway crest (Framework Concept Papers 1,3,4,5,6; Tribal Vision). Implement hydropower actions under time-line requirements of ESA, and drawdown feasibility studies of John Day Dam (Framework Concept Paper 6).

Breach the four lower Snake River dams and draw down John Day Reservoir to spillway crest. Restore normative river conditions and reduce reliance on the short-term technological fixes such as the federal juvenile fish transportation program and additional water from upstream storage reservoirs in Montana and Idaho (Framework Concept Paper 5).

Every hydroelectric dam, whether federally owned or operated by a public or private utility licensed by the Federal Energy Regulatory Commission (FERC), operates according to the following conditions: (a) flows required of

sufficient quality and quantity, and at the ecologically appropriate time as dictated by the natural hydrograph; (b) minimal unnatural daily flow variations; (c) installation and maintenance of state of the art fish passage facilities; and (d) consistency with correlative watershed protection and restoration efforts (Framework Concept Paper 5).

Restore natural river levels to the lower Snake River (below Hells Canyon complex) and draw down John Day dam to spillway crest level; and restore natural river ecosystem components throughout the basin. Keep water levels in Libby, Roosevelt, Dworshak, and Hungry Horse reservoirs relatively full and stable (Framework Concept Paper 4).

Restore normative river habitat conditions by breaching the four lower Snake River dams and drawing down John Day Reservoir to spillway crest (Framework Concept Paper 5).

Set up a systematic process whereby other dams (irrigation, navigation, flood control, etc.) in the Columbia River Basin and the impacts of such projects on ecological processes are identified, quantified, and addressed (Framework Concept Paper 5).

Pass legislation to effectuate the drawdown of the four Lower Snake River Dams and John Day Dam. Strictly enforce the Clean Water Act throughout the Columbia River Basin (Framework Concept Papers 7A,7B).

The incremental drawdown strategy should incrementally invoke drawdown. That is, drawdown two dams and evaluate (for some pre-determined period of time with some pre-determined incremental objectives), then drawdown the next group of dams if monitoring results meet expectation. So long as evaluation meets interim goals, proceed with rest of dam breaching approach. This incremental approach would be used for all actions taken (Framework Concept Paper 7B).

To insure that proposed hydro system changes are focused on documented sources of fish mortality the entire hydropower system will undergo a detailed fish mortality audit. This audit will document the major sources of mortality for both adults and juvenile salmon and steelhead as they move through the system. Changes in system configuration and operation will be designed to rectify the highest sources of fish mortality with the goal of improving the overall cumulative survival rates with priority given to adults over juveniles because of their biological significance to the propagation of future generations of salmon and steelhead (Framework Concept Paper 14).

This alternative consists of breaching the four [Lower Snake] dams and creating a free-flowing 140-mile stretch of river. This would involve removing the earthen embankment section of each dam and eliminating the reservoirs behind the dams. Under this alternative, all facilities for transporting fish would cease to operate. A free-flowing river can be achieved by removing only the embankment. The powerhouses, spillways, and navigation locks would not be removed, but would no longer be functional, eliminating power production and commercial navigation (The Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement Executive Summary, US Army Corps of Engineers).

Experiment with limited drawdown of the reservoir behind McNary Dam (Framework Alternative 4,5).

Capital improvements at the mainstem dams designed to approximate natural conditions (e.g., surface bypass). (Framework Alternative 5). Replace old turbines with fish-friendly turbines (Framework Alternative 7).

Build no new dams in salmon and steelhead habitat (Framework Concept Paper 1).

Remove existing extended length turbine intake screens; halt construction of new screens; consider removing existing standard length screens (*to avoid injury and mortality of lamprey and salmonids associated with collection and barging program*) (Tribal Vision).

The Corps shall complete the design of debris removal facilities for the Bonneville First Powerhouse forebay (NMFS Biological Opinion Action Table Dec. 2000).

Some mainstem and run-of river FCRPS reservoirs on the lower Snake River and John Day Reservoir would be lowered during the spring and summer migration periods to increase water velocity. Three of the lower Snake projects (Little Goose, LM, IH) would be operated within one foot of MOP from April 3 until adult fall chinook begin to enter the Snake River, as determined in season by the TMT. Lower Granite Dam would be operated within one foot of MOP from April 3 to November 15 each year. After November 15, all four reservoirs would be operated within their normal 5-foot operating ranges. McNary, The Dalles, and Bonneville dams would be operated within their normal ranges. From April 20 to September 30 each year, John Day would be operated within a 1.5-foot range above elevation 262.5 feet as long as irrigation withdrawal was unaffected and if additional space was not needed for flood control. The pool elevation would be raised if irrigation pumping problems occurred. During the fall and winter months, all four lower Columbia River projects would be operated within their normal operating range, with the exception of temporary flood control storage at John Day, if needed (Draft Biological Opinion, July 2000).

The Corps and BPA, through the annual planning process, shall develop and implement 1- and 5-year operations and maintenance (O&M) plans and budgets that enhance the capability to operate and maintain fish facilities at FCRPS

projects for listed salmonid stocks (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall investigate the attraction of listed salmon and steelhead into wasteways and natural streams receiving waste water from the Columbia Basin Project. If listed fish are found to be attracted into these channels, BOR shall work with NMFS to identify and implement structural or operational measures to avoid or minimize such use, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By March 1, 2002, BOR shall install screens meeting NMFS' screen criteria at the canal intakes to the Burbank No. 2 and Burbank No. 3 pump plants. BOR shall connect the Burbank No. 3 intake canal to Burbank Slough to provide juvenile fish egress. BOR shall coordinate with NMFS on each of the actions identified above (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue design development and 2001 prototype testing of upper turbine intake occlusion devices at The Dalles, with a goal of increased non-turbine passage rates through either the sluiceway or the spillway. The Corps shall install occlusion devices across the entire powerhouse, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue design development of a prototype RSW and extended deflector for testing at John Day in 2002. The Corps should synthesize evaluation results, determine the fish survival benefits of one or more RSWs or a skeleton bay surface bypass, and install the units as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Corps shall continue John Day prototype development and investigations of extended submerged intake screens, gatewell vertical barrier screens, and, if necessary, orifices to optimize guidance and safe passage through the system, including a gatewell debris cleaning plan. This work shall include an assessment of fry passage. The Corps shall design and construct new screen systems for safe passage of juvenile salmonids, as warranted. Juvenile bypass outfall survival investigations shall also be conducted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue evaluations to assess the need for improvements of the existing intake screens, gatewell vertical barrier screen cleaning system, and bypass facilities (including debris containment and removal systems, separation, sampling, loading, and outfall facilities) at McNary to determine where improvements are necessary to reduce problems experienced during the 1996 flood, increase fish survival, and resolve holding and loading facility problems, including raceway jumping by juvenile salmon and steelhead and debris plugging of bypass lines. Additionally, the Corps shall evaluate whether the existing juvenile bypass system outfall should be relocated (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Corps shall investigate a surface bypass RSW at McNary Dam, based on prototype results at other locations, and shall install the unit in multiple spillway bays, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue high-flow outfall investigations to determine whether it is appropriate to modify bypass outfall criteria in the context of high-discharge bypass discharges (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue to develop and evaluate improved fish-tracking technologies and computational fluid dynamics (numerical modeling). The ability to integrate these technologies and fluid dynamics shall be assessed as a potentially improved means of determining fish responses to forebay hydraulic conditions (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall assess less-intrusive, PIT-tag interrogation methods at FCRPS juvenile bypass systems with interrogation sites, including McNary, John Day, and Bonneville dams. The Corps and BPA shall also assess providing a similar detection capability for the Ice Harbor juvenile bypass system (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA, in coordination with the Fish Facility Design Review Work Group and the Fish Passage Improvement Through Turbines Technical Work Group, shall continue the program to improve turbine survival of juvenile and adult salmonids (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall investigate hydraulic and behavioral aspects of turbine passage by juvenile steelhead and salmon through turbines to develop biologically based turbine design and operating criteria. The Corps shall submit a report to NMFS stating the findings of the first phase of the Turbine Passage Survival Program by October 2001. Annual progress reports will be provided after this date (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall examine the effects of draft tubes and powerhouse tailraces on the survival of fish passing through turbines (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Action Agencies shall remove all unnecessary obstructions in the higher velocity areas of the intake-to-draft tube sections of the turbine units (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Action Agencies shall consider all state-of-the-art turbine design technology to decrease fish injury and mortality before the implementation of any future turbine rehabilitation program (including any major repair programs, the ongoing rehabilitation program at The Dalles Dam, and any future

program at Ice Harbor Dam). The Action Agencies shall coordinate within the annual planning process before making decisions that would preclude the use of fish-friendly technologies and to minimize any adverse effects of project downtime (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall complete the extended submerged intake screen system-wide letter report and implement recommended improvements (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By January 2002, the Action Agencies shall develop an analysis that compares the relative passage survival benefits of an extended-length, intake screen bypass system, a surface-collection bypass system, and hybrid alternatives at Bonneville First Powerhouse. Through the annual planning process, the Corps shall determine which of these configurations to implement (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By January 2003, the Action Agencies shall develop an analysis that compares the relative passage survival benefits of replacing existing standard-length intake screens with extended-length screens at the John Day Dam powerhouse to surface collection at one or more skeleton or spillway bays. Through the annual planning process, the Action Agencies shall then determine the need for, and the implementation priority of, these configuration alternatives (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue design development and, subsequently, construct an emergency auxiliary water supply system at The Dalles Dam's east ladder (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Corps shall continue to investigate alternatives to dewater adult auxiliary water system floor diffusers for inspection at The Dalles adult fishway powerhouse collection channel. The Corps shall implement design and construction of needed changes, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall develop and implement an automated monitoring and alarm system at appropriate FCRPS projects, as determined in the NMFS Regional Forum, to monitor changes in head differential remotely between the primary auxiliary water supply conduits/channels and the adult collection channels and to minimize diffuser damage due to excessive differentials. The Corps shall ensure that diffuser gratings for all auxiliary water supply systems are securely fastened. The Corps shall work through FPOM to develop a monitoring program for inspecting diffuser gratings and grating fasteners (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall include evaluations of divider walls at each FCRPS project in the spillway deflector optimization program. Design development and construction of divider walls would begin only after coordination within the annual planning process, and only if warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall design the spillway Number 1 (end bay) deflector at John Day Dam, and implement as warranted, in coordination with the annual planning process (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps, in coordination with the Regional Forum, shall maintain juvenile and adult fish facilities within identified criteria and operate FCRPS projects within operational guidelines contained in the Corps' Fish Passage Plan. The Corps shall coordinate with NMFS on the development of these criteria and operational guidelines before the start of each fish passage season (generally February 1) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall develop and implement preventative maintenance programs for fish passage facilities that ensure long-term reliability, thereby minimizing repair costs (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall address debris-handling needs and continue to assess more efficient and effective debris-handling techniques to ensure that the performance of both new and old fish passage facilities will not be compromised (NMFS Biological Opinion 2000 Action Table Dec. 2000).

As set out in Action 50 (Section 9.6.1.3.4), BPA and the Corps shall install necessary adult PIT-tag detectors at appropriate FCRPS projects before the expected return of adult salmon from the 2001 juvenile outmigration. These adult PIT-tag detectors shall be used as needed for calculating transport benefits, conversion rates, and SARs for listed salmon and steelhead (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Conduct advance planning for possible future actions, including dam breaching (Final All-H Paper Dec. 2000).

Fund full COE capital and O&M programs (Final All-H Paper Dec. 2000).

4-2 Hydro Operation

To avoid jeopardy to the Snake River ESUs, the Action Agencies must improve FCRPS-project configurations and operations to the extent practical in the immediate five year term, while also laying the groundwork for and seeking Congressional authority in 2006 to drawdown projects in the Snake River. At the same time, they should experiment with and begin to implement measures outside the FCRPS that may be required in addition to drawdown or which may be sufficient, without drawdown, to ensure long-term survival...of all listed ESUs in the basin (Draft Biological Opinion, July 2000).

This alternative consists of breaching the four [Lower Snake] dams and creating a free-flowing 140-mile stretch of river. This would involve removing the earthen embankment section of each dam and eliminating the reservoirs behind the dams. Under this alternative, all facilities for transporting fish would cease to operate. A free-flowing river can be achieved by removing only the embankment. The powerhouses, spillways, and navigation locks would not be removed, but would no longer be functional, eliminating power production and commercial navigation (The Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement Executive Summary, US Army Corps of Engineers).

Operate the John Day reservoir at spillway crest (Framework Concept Papers 1). Drawdown John Day reservoir to MOP immediately, and to spillway crest or natural river on a year-round basis in the near term (Tribal Vision). On the lower Columbia, operate John Day at minimum irrigation pool (MIP) year-round while JDA studies are completed. Although changes at JDA (MOP, spillway crest, etc.) may be desired in the future, it appears that operation of JDA below MIP in BPA's next rate period (2002-2006) is constrained by incomplete studies and NEPA processes. Accordingly, complete JDA studies while implementing and assessing configuration changes on the lower Snake (Framework Concept Paper 5).

Prioritize research funding to document project-specific effects on anadromous fish, and effects of operational changes. Make decisions based on best available quantification of effects of operational changes (Framework Concept Paper 26).

Use flow, spill, drawdowns, peak efficiency turbine operation, new turbine technology, and predator control projects to improve inriver juvenile salmon survival; avoid fluctuations caused by power peaking operations (Framework Concept Paper 3).

Manage attraction flows, spill, and ladder entrances and exits and in-ladder conditions to minimize adult migrational delay and maximize adult passage survival (Framework Alternative 1,2,3).

Manage the river to return seasonal flow pattern for salmon and steelhead while also protecting upriver populations that don't migrate to the ocean (Framework Alternative 1,2,3).

4-3 Spill

[Implement] more aggressive operational measures for flow and spill. The federal agencies would seek increased flow augmentation from Canadian reservoirs and improved water quantity and quality from the upper Snake River. Spill at many projects may be expanded to daylight hours (Draft All-H Paper Hydro Option 2, Dec. 1999).

The Corps and BPA shall continue (pending results of the McNary Transport Evaluation) to bypass juvenile spring migrants collected at McNary Dam and shall provide the spring spill levels described for that project (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall evaluate adult fallback and juvenile fish passage under daytime spill to the gas cap at Bonneville Dam in 2002 and 2003, after deflector optimization improvements allow for increased spill above current levels. Research results will be considered, in consultation with NMFS through the annual planning process, to determine implementation of additional changes in spill to further improve fish survival (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall continue spill and passage survival studies at The Dalles Dam in 2001. Research results shall be considered, in consultation with NMFS through the annual planning process, to assess the need for additional changes in spill to further improve fish survival by 2002, if possible, but no later than 2005 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall continue investigation of 24-hour spill at John Day Dam in 2001. Research results will be considered, in consultation with NMFS through the annual planning process, to determine implementation of daytime spill to further improve juvenile fish survival as needed for its contribution to the performance standard (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue to investigate RSWs, in conjunction with extended spillway deflectors, as a means of optimizing safe spillway passage of adult steelhead kelts and juvenile migrants (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall provide at least 10,000 cfs of increased release capacity at Libby Dam in two increments of at least 5,000 cfs each under the following conditions, sequence, and schedule (FWS Biological Opinion Dec.

2000):

- a) [Test] spillway in 2001 to reliably estimate the maximum spillway flow dilution capability and compliance with the state water quality standard of 110 percent gas saturation. Possible changes in dissolved gas concentrations throughout the Kootenai River shall be evaluated [and] effects of the spill on bull trout and other fish in the Kootenai River [shall be monitored]. Investigate and restore, if necessary, Kootenai River channel capacity to accommodate the increased release capacities at Libby Dam (35,000 cfs). By spring 2002, the Action Agencies will begin routine use of the existing spillway for sturgeon flow augmentation. This spillway option shall only be considered a viable long term conservation measure if VarQ, or a comparable flood control/storage procedure, is in effect which assures the reservoir surface routinely exceeds the spillway elevation by the time sturgeon flows are needed. The timing of spillway use shall be determined in part by the ability to maintain 10 degrees Celsius at Bonners Ferry with the selective withdrawal facilities at Libby Dam. If, by December 30, 2001, it is determined that at least 5,000 cfs can not be routinely passed over the spillway within the total dissolved gas criteria of 110%, or VarQ or some other flood control/storage procedure has not been adopted, the Action Agencies shall immediately begin preparation of NEPA documentation and seek funding for installation of one turbine or spillway flow deflectors, which are to be operational by spring 2004.
- b) By spring 2007, the Action Agencies will seek means and be prepared to release an additional 5,000 cfs (total of at least 10,000 cfs) at Libby Dam for sturgeon conservation.

Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS Biological Opinion Dec. 2000).

4-4 Flow

Meet all established flow targets every year established under the Endangered Species Act by securing additional water from storage in the upper Snake and Columbia systems until [*Snake River dams*] are removed (Framework Concept Paper 1). After dams are bypassed, eliminate Snake River flow augmentation. Adjust system operations to normalize Snake River flows below Hells Canyon complex (Framework Concept Paper 2).

Establish, or modify minimum flows (including Columbia River flows) to meet instream fish and wildlife needs. Evaluate the cumulative impact of all proposed water withdrawals, diversions, or instream structures to ensure that established minimum flows are maintained (LCREP). Provide daily and seasonal flow patterns to prevent stranding of juvenile fish and to ensure successful salmonid spawning and hatching (Framework Alternative 1). Rebuild Mid-Columbia spring/summer chinook, sockeye, and summer steelhead by improving smolt survival in the mainstem portion of the Columbia Plateau ERU, using flow augmentation from the upper Columbia and a normalized hydrograph (Framework Concept Paper 5). From Priest Rapids downstream, *normative* steps include meeting flow minimums and 24-hour spill during the spring migration (Framework Concept Paper 2).

Continue current flow programs, with some protection for upstream reservoirs. Secure use of water from Canadian storage reservoirs to meet flow needs (Framework Alternative 5,6). More water from the Snake River Basin and possibly Canada would be left in the river for fish (Framework Alternative 4).

In the Columbia, the development of normative flow conditions with flow augmentation from the Upper Columbia and IRCs at storage projects (would) create a more natural hydrograph (Framework Concept Paper 5). Rebuild Mid-Columbia spring/summer chinook, sockeye, and summer steelhead by improving smolt survival in the mainstem portion of the Columbia Plateau ERU, using flow augmentation from the upper Columbia and a normalized hydrograph (Framework Concept Paper 5). Adjust system operations to normalize Snake River flows below Hells Canyon complex (Framework Concept Paper 5).

Evaluate flow augmentation components of options (e.g., A3 vs. A5; B1 vs. B2) (Framework Concept Paper 6).

Direct management actions include restoring free-flowing river reaches and associated riparian habitats, and reducing existing conflicts of flow augmentation between resident and anadromous fish. Indirect benefits to freshwater ecosystems would accrue from management to restore anadromous populations (Framework Concept Paper 6).

Objectives: The water management strategy for fish should be restructured to improve biological benefits and reduce societal cost measures. Water management must be consistent with state authority over water rights. New strategies of water management are promoted that have an anticipated beneficial impact for threatened fish stocks, including river watershed projects and water transfer programs (Framework Concept Paper 27).

Snake River summer flow targets must be analyzed to determine if there are tangible biological benefits (Framework Concept Paper 27).

Establish adequate instream flow conditions for salmon by using, for example, the Instream Flow Incremental Methodology (Framework Concept Paper 28).

There would be a reduction in the fluctuation of flows from Priest Rapids to reduce fry stranding and stabilize

riparian areas. federal agencies would continue to use the existing volume of water for management of flows for the benefit of various fish stocks and species of concern (Draft All-H Paper Hydro Option 1, Dec. 1999).

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS to provide flows to support chum salmon spawning in the Ives Island area below Bonneville Dam (NMFS Biological Opinion 2000 Action Table Dec. 2000). The Action Agencies shall operate the FCRPS to provide access for chum salmon spawning in Hamilton and Hardy creeks (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall regulate flows from Libby Dam to achieve water volumes, water velocities, water depths, and water temperature at a time to maximize the probability of allowing significant [Kootenai River white] sturgeon recruitment (FWS Biological Opinion Dec. 2000).

During water year 2001, (October 1, 2000 - September 30, 2001) the Action Agencies shall store water and supply, at a minimum, water volumes during May, June and July based upon a water availability or "tiered" approach (in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam) to enhance survival of [Kootenai River white Sturgeon] eggs, yolk sac larvae, or larvae reared under the preservation stocking program and released into the Kootenai River (FWS Biological Opinion Dec. 2000).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA and the Corps shall continue to request and negotiate agreements to annually provide 1 Maf of Treaty storage from January through April 15, release the water during the migration season, and seek additional storage amounts (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA and the Corps shall continue to request, and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring for subsequent release in July and August for flow enhancement, as long as operations forecasts indicate that water stored in the spring can be released in July and August (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA and the Corps shall continue to evaluate, request, and negotiate with BC Hydro the shaping and release of water behind Canadian Treaty storage projects in addition to the non-Treaty storage water previously discussed during July and August (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Before entering into any agreement to commit currently uncontracted water or storage space in any of its reservoirs covered by this biological opinion to any other use than salmon flow augmentation, BOR shall consult with NMFS under ESA Section 7(a)(2). Such consultations shall identify the amount of discretionary storage or water being sought, the current probability of such storage or water being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment. Also, BOR shall consult with NMFS before entering into any new contract or contract amendment to increase the authorized acreage served by any irrigation district receiving BOR-supplied water. NMFS' criterion in conducting such reviews is to ensure that there be zero net impact from any such BOR commitment on the ability to meet the seasonal flow objectives established in this biological opinion. Replacement supplies should have at least an equal probability of being available for salmon flow augmentation as the storage space or water that is being committed (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Improved Flows: improved flow operations to provide water conditions beneficial to migrating juvenile and adult fish. Improvements in Canadian flows with a potential of up to 2 MAF over time. Flood control study to allow further flow improvements. Implementation of flood control adjustments to reduce risks to listed resident fish from salmon flows (Final All-H Paper Dec. 2000).

The Action Agencies shall regulate flows from Libby Dam to achieve water volumes, water velocities, water depths, and water temperature at a time to maximize the probability of allowing significant [Kootenai River white] sturgeon recruitment (FWS Biological Opinion Dec. 2000).

During water year 2001, (October 1, 2000 - September 30, 2001) the Action Agencies shall store water and supply, at a minimum, water volumes during May, June and July based upon a water availability or "tiered" approach (in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam) to enhance survival of [Kootenai River white Sturgeon] eggs, yolk sac larvae, or larvae reared under the preservation

stocking program and released into the Kootenai River (FWS Biological Opinion Dec. 2000).

The Action Agencies have proposed to seek opportunities to reduce the second peak flow created by July/August salmon flow through Kootenay Lake [by October 2001]. One such opportunity for consideration to reduce the second peak is retention of July/August water in Lake Koocanusa under a Libby-Arrow water exchange (FWS Biological Opinion Dec. 2000). [Note: This action favors sturgeon over Columbia River Listed salmonids migrating in the summer.]

The Action Agencies have proposed to seek funding to conduct biological studies, in consultation with FWS, to both determine the effectiveness of increased flows in improving sturgeon recruitment and to determine any adverse effects to bull trout in the Kootenai River below Libby Dam. If, as a result of these increased releases, in any year during the 10-year life of this biological opinion, a new year class of at least 20 naturally recruited yearling or older sturgeon is documented, the Action Agencies shall reinitiate consultation with FWS before proceeding with any additional facilities or improvements at Libby Dam for sturgeon flow augmentation (FWS Biological Opinion Dec. 2000). By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

By May 2004 the Action Agencies shall seek means to restore, maintain, or enhance levees throughout the Kootenai Valley to the greater of: 1) the PL 84-99 Corps' 1961 levee specifications, or 2) the levee elevations needed to contain the flows/river stages of the 100 year event as authorized for the Libby Project, which is now defined as 1,770 feet at Bonners Ferry. The Action Agencies shall also seek means to incorporate conservation measures for sturgeon, including self maintaining rocky spawning substrates, as a component and federal purpose of any new levee project above. In the interim, FWS and Corps will coordinate efforts to attempt to limit sturgeon spawning flows so they do not exceed a levee elevation of 1,764 feet at Bonners Ferry (FWS Biological Opinion Dec. 2000).

By December 1, 2001, the Action Agencies shall report specifically on the effects of load following on levee integrity throughout the Kootenai Valley over the last 26 years. The Action Agencies shall limit daily load following in the outflow from Libby Dam to the extent that levees in Kootenai Valley are no longer damaged (FWS Biological Opinion Dec. 2000).

During sturgeon recruitment flow periods, the Action Agencies shall allow local inflow to supplement Libby Dam releases to the maximum extent feasible (FWS Biological Opinion Dec. 2000).

By December 1, 2002, the Action Agencies shall complete an evaluation and report on any changes in depth, water velocity and substrate in the vicinity of Bonners Ferry which have occurred since Libby Dam became operational. [If] spawning/incubation habitat changes [are] documented, the report shall be expanded to include all feasible remedies such as channel constrictions or other physical habitat modification(s) to restore and maintain suitable spawning/incubation substrate, water velocities, and depths between RKM 228 and 246, or greater water depths above RKM 246 (FWS Biological Opinion Dec. 2000).

Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS Biological Opinion Dec. 2000).

If Koocanusa Reservoir elevations are below salmon guidelines (2439 ft) on July 1, and salmon augmentation will not occur for that year, the Action Agencies shall provide 6,000 cfs for the bull trout minimum flow during July and August (FWS Biological Opinion Dec. 2000).

The Action Agencies shall provide to FWS an annual operational schedule to be supplemented on a monthly basis. The annual schedule shall include month-end estimates of water surface elevation at Koocanusa Reservoir and estimates of monthly discharge from Libby Dam. The monthly supplement shall include a report of actual operations over the previous month and shall include daily water surface elevation at Koocanusa Reservoir and hourly spill and releases at Libby Dam (FWS Biological Opinion Dec. 2000).

The Action Agencies shall provide to FWS an annual operational schedule to be supplemented on a monthly basis. The annual schedule shall include month-end estimates of water surface elevation at Hungry Horse Reservoir and estimates of monthly discharge from Hungry Horse Dam. The monthly supplement shall include a report of actual operations over the previous month and shall include daily water surface elevation at Hungry Horse Reservoir and hourly spill and releases at Hungry Horse Dam (FWS Biological Opinion Dec. 2000).

It is recommended that the Action Agencies seek cooperation of West Kootenai Power and other involved agencies and parties in Canada to negotiate higher Kootenay Lake/Kootenai River stages within the 1938 IJC order during sturgeon spawning flows. This may promote sturgeon recruitment with less stored water and fewer configuration improvements at Libby Dam during intermediate and low water years (FWS Biological Opinion Dec. 2000).

As U.S. representatives on the Kootenay lake board of control, and operators of Libby Dam, it is recommended that

the Action Agencies seek opportunity to provide low flows in the Kootenai River during January or February for burbot migration and spawning (FWS Biological Opinion Dec. 2000).

[Develop research/study plans with FWS, USFS, state agencies, and the tribes as appropriate, and] initiate studies to determine the effect of flow fluctuations on river or reservoir water surface elevations and on stranding or entrapment of bull trout and other aquatic life related to the prey base of bull trout (FWS Biological Opinion Dec. 2000).

4-5 Reservoir Levels

Use the system to manage flows to a natural regime for weak stock streams (Sample Action). Reservoir rule curves give priority to the needs of listed species (Sample Action).

Reduce the amount of water stored for hydropower production to provide for more natural flows, including periodic flooding and droughts to restore native plants (Framework Alternative 1). Coordinate reservoir operation across the watershed subbasins to achieve a protracted runoff event to aid anadromous species recovery while protecting and restoring aquatic ecosystems in the headwaters (Framework Concept Paper 8).

Efforts would continue to acquire additional water from Canadian reservoirs, implementation of “Variable Q” flood control operations at Libby and Hungry Horse dams to protect resident fish, and meet minimum discharge requirements for fall chinook and chum salmon spawning and rearing needs in the Hanford reach and below Bonneville Dam. In addition, fluctuation of flows from Priest Rapids would be reduced to limit fry stranding and stabilize riparian areas. Integrated Rule Curve (IRC) operation at storage dams would be further evaluated and implemented based on tradeoffs in benefits to resident fish and effects on salmon habitat and other system operation purposes (Draft All-H Paper Hydro Option 2, Dec. 1999).

Implement the IRCs at all storage projects incorporating the Libby Dam approach of tiered flows and careful use of the VARQ flood control strategy. Reduce reservoir drawdown and improve reservoir refill probability to assure a sustainable basin-wide operation for all native species and their prey in the Columbia River watershed. Replace static flow targets in the lower Columbia with attainable normative-type flow targets resulting from basin-wide application of IRCs (Framework Concept Paper 8).

Reservoir drafting to 10 feet from full pool during summer for anadromous fish recovery is shaped to achieve a gradual drawdown from the spring peak and to eliminate flow fluctuation in the rivers downstream. This reduces the width of the varial zone and enhances riverine productivity. Environmental conditions in storage reservoirs and downstream river reaches improve biological productivity and complement mitigation efforts. Site-specific environmental concerns are addressed by fine-tuning the overall system plan (Framework Concept Paper 8).

Move away from an emphasis on minimum flows toward a regime that would include periodic flooding and droughts between years and smooth ramping to and away from the spring freshet within a year. Provide daily and seasonal flow patterns to prevent stranding of juvenile fish and to ensure successful salmonid spawning and hatching (Draft Framework Alternative 2,3).

The Action Agencies shall operate FCRPS dams and reservoirs with the intent of meeting the flow objectives (Table 9.6-1) on both a seasonal and weekly average basis for the benefit of migrating juvenile salmon (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall operate the lower Snake River reservoirs within 1 foot of MOP from approximately April 3 until small numbers of juvenile migrants are present and shall operate the John Day pool within a 1½-foot range of the minimum level that provides irrigation pumping from April 10 to September 30 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall routinely identify opportunities to shift system flood control evacuation volumes from Brownlee and Dworshak reservoirs to Lake Roosevelt and identify such opportunities for the Technical Management Team. The Corps shall implement flood control shifts as necessary to best protect listed fish, as called for by NMFS in coordination with the Technical Management Team, taking into account water quality issues and the concerns of all interested parties (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood

control at Libby (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall operate Banks Lake at an elevation 5 feet from full during August by reducing the volume of water pumped from Lake Roosevelt into Banks Lake by about 130 kaf during this time (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall assess the likely environmental effects of operating Banks Lake up to 10 feet down from full pool during August. The assessment and NEPA compliance work shall be completed by June 2002 to determine future operations at this project by the summer of 2002 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).

During water year 2001, (October 1, 2000 - September 30, 2001) the Action Agencies shall store water and supply, at a minimum, water volumes during May, June and July based upon a water availability or "tiered" approach (in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam) to enhance survival of [Kootenai River white Sturgeon] eggs, yolk sac larvae, or larvae reared under the preservation stocking program and released into the Kootenai River (FWS Biological Opinion Dec. 2000).

The Action Agencies have proposed to seek opportunities to reduce the second peak flow created by July/August salmon flow through Kootenay Lake [by October 2001]. One such opportunity for consideration to reduce the second peak is retention of July/August water in Lake Koocanusa under a Libby-Arrow water exchange (FWS Biological Opinion Dec. 2000). [Note: This action favors sturgeon over Columbia River Listed salmonids migrating in the summer.]

If Koocanusa Reservoir elevations are below salmon guidelines (2439 ft) on July 1, and salmon augmentation will not occur for that year, the Action Agencies shall provide 6,000 cfs for the bull trout minimum flow during July and August (FWS Biological Opinion Dec. 2000).

The Action Agencies shall continue the lake winter elevation/kokanee egg-to-fry survival study on Lake Pend Oreille for the next six years. The study shall begin in 2001 by drafting the lake to fall/winter water levels of elevation 2051 feet. This is intended to allow winter storms to improve the condition of spawning gravel along the shore of Lake Pend Oreille. During the fall/winter of 2002, maintain the Lake Pend Oreille at elevation 2055 until fry emerge from shoreline gravels. By September 2003 FWS will secure independent scientific review relative to the appropriate duration (one to three years) of maintaining winter lake elevations at 2055 feet and provide written recommendations to the Action Agencies for fall/winter operations for 2003 through 2006. During this six year period, the Action Agencies, in coordination with FWS and IDFG, shall evaluate the effects of varying winter lake level elevations on all life stages of kokanee in Lake Pend Oreille, and predator/prey dynamics. If, in September 2007, it is determined that this action is effective in significantly improving kokanee production as bull trout forage, FWS will provide written recommendations on the frequency of varying Lake Pend Oreille winter lake elevations for the remainder of this biological opinion. The Action Agencies, FWS, and IDFG shall meet annually to evaluate Lake Pend Oreille kokanee monitoring results and make necessary adjustments through subsequent in-season management (FWS Biological Opinion Dec. 2000).

It is recommended that the Action Agencies seek cooperation of West Kootenai Power and other involved agencies and parties in Canada to negotiate higher Kootenay Lake/Kootenai River stages within the 1938 IJC order during sturgeon spawning flows. This may promote sturgeon recruitment with less stored water and fewer configuration improvements at Libby Dam during intermediate and low water years (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

Experiment with limited drawdown of the reservoir behind McNary Dam (Framework Alternative 4).

The Action Agencies shall evaluate potential benefits to adult Snake River steelhead and fall chinook salmon passage by drafting Dworshak Reservoir to elevation 1,500 feet in September. An evaluation of the temperature effects and adult migration behavior should accompany a draft of Dworshak Reservoir substantially below elevation 1,520 feet (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

[Develop research/study plans with FWS, USFS, state agencies, and the tribes as appropriate, and] initiate studies to determine the effect of flow fluctuations on river or reservoir water surface elevations and on stranding or entrapment of bull trout and other aquatic life related to the prey base of bull trout (FWS Biological Opinion Dec. 2000).

4-6 Water Quality

Avoid or correct both point and non-point source water pollution in weak stock spawning streams and migratory routes (Sample Action).

Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision).

Manage spill at dams to keep dissolved gas levels within federal clean water guidelines (orig. Framework Alternative 2,3).

Establish a temperature standard that is not limiting to salmonid adults, juveniles, and eggs (Framework Concept Paper 10).

Implement physical measures and operational actions to optimize water quality conditions (temperature and dissolved gas) where consistent with overall objectives and other strategies (Draft All-H paper Dec. 1999). Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). Prevent lethal temperature rises (Framework Concept Paper 1).

The Corps and BPA shall implement an annual spill program, consistent with the spill volumes and TDG limits identified in Table 9.6-3, at all mainstem Snake and Columbia River FCRPS projects as part of the annual planning effort to achieve the juvenile salmon and steelhead performance standards (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall complete its DGAS by April 2001. The results of this study will be used to guide future studies and decisions about implementation of some long-term structural measures to reduce TDG (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall monitor the effects of TDG. This annual program shall include physical and biological monitoring and shall be developed and implemented in consultation with the Water Quality Team and the Mid-Columbia PUDs' monitoring programs (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall develop a plan to conduct a systematic review and evaluation of the TDG fixed monitoring stations in the forebays of all the mainstem Columbia and Snake river dams (including the Camas/Washougal monitor). The evaluation plan shall be developed by February 2001 and included as part of the first annual water quality improvement plan. The Action Agencies shall conduct the evaluation and make changes in the location of fixed monitoring sites, as warranted, and in coordination with the Water Quality Team. It should be possible to make some modifications by the start of the 2001 spill season (NMFS Biological Opinion 2000 Action Table Dec. 2000).

As part of DGAS, the Corps shall complete development of a TDG model to be used as a river operations management tool by spring 2001. Once a model is developed, the applications and results shall be coordinated through the Water Quality Team. The Corps shall coordinate the system-wide management applications of gas abatement model studies with the annual planning process, the Transboundary Gas Group, the Mid-Columbia Public Utilities, and other interested parties (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue the spillway deflector optimization program at each FCRPS project and implement it, as warranted. The Corps and BPA shall conduct physical and biological evaluations to ensure optimum gas abatement and fish passage conditions. Implementation decisions will be based on the effect of spill duration and volume on TDG, spillway effectiveness, spill efficiency, forebay residence time, and total project and system survival of juvenile salmon and steelhead passing FCRPS dams (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue to develop and construct spillway deflectors at Chief Joseph Dam by 2004 to minimize TDG levels associated with system spill (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate TDG abatement options at Libby Dam, including the installation of spillway deflectors and/or additional turbine units. The Corps shall construct gas abatement improvements at Libby on the Kootenai River, as warranted, to reduce TDG levels below the project (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate TDG abatement options at Dworshak Dam and implement options, as warranted, in coordination with the annual planning process (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By June 30, 2001, the Action Agencies shall develop and coordinate with FWS, NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations, including Libby and Hungry Horse Dams. The modeling plan shall include a temperature data collection strategy developed in consultation with EPA, NMFS, and state and tribal water quality agencies. The data collection strategy shall be sufficient to develop and operate the model and to document the effects of the project operations (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall evaluate and report to FWS on total dissolved gas concentrations downstream of Albeni Falls Dam in the Pend Oreille River which may occur within the full range of operations of the facility, including forced spills (FWS Biological Opinion Dec. 2000).

Investigate, and in coordination with FWS, implement as appropriate, structural and operational measures to reduce TDG production. The Corps has recently installed flow deflectors at John Day Dam and, through its Gas Abatement Study, is investigating other potential measures at other FCRPS projects to reduce gas supersaturation. Measures recommended in this study to reduce gas supersaturation should be implemented as soon as possible (FWS Biological Opinion Dec. 2000).

The Service recommends that the Corps continue monitoring TDG levels, and invest in facility improvements to keep TDG levels at or below 110% (or other applicable state water quality standards) (FWS Biological Opinion Dec. 2000).

The Corps shall work through the regional forum process to identify and implement measures to address juvenile fish mortality associated with high summer temperatures at McNary Dam. As a starting point, the Corps shall assemble and analyze the temperature data that have been recorded in the McNary forebay, collection channel, and juvenile facilities. The Corps shall examine relationships among juvenile mortality, temperatures, river flow rates, and unit operations in detail. The Corps shall investigate the feasibility of developing a hydrothermal computational fluid dynamics model of the McNary forebay to evaluate the potential to determine optimal powerhouse operations or structural modifications for minimizing thermal stress of juvenile salmon collected in the summer and to conduct a modeling program, if warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall investigate the attraction of listed salmon and steelhead into wasteways and natural streams receiving wastewater from the Columbia Basin Project. If listed fish are found to be attracted into these channels, BOR shall work with NMFS to identify and implement structural or operational measures to avoid or minimize such use, as warranted (NMFS Biological Opinion Action able Dec. 2000).

4-7 Juvenile Fish Passage and Transportation

Make use of fish transportation as appropriate (Framework Alternative 5). Transport juvenile salmon from mainstem collector projects when conditions in the river are judged to be adverse due to low flow, high temperatures, high spill or other conditions (orig. Framework Alternative 5).

Provide safe passage for juveniles moving down stream and adults moving upstream at all hydro projects (federal and non-federal) in the basin (Framework Concept Paper 1).

Eliminate the federal juvenile fish transportation program except where necessary- until breaching and drawdown occurs- during extremely low flows or as dictated by other deleterious conditions caused by existing FCRPS operations (Framework Concept Paper 5).

Provide safe passage for juveniles moving down stream and adults moving upstream at all hydro projects (federal and non-federal) in the basin (Framework Concept Paper 5).

[A]id juvenile salmon migration by drawing down reservoirs at four lower Snake River projects, permitting the lowering of reservoirs approximately 100 feet to near original riverbed levels (SOR FEIS Alternative 5c).

The Corps shall not initiate collection of subyearling fall chinook for transportation at McNary Dam until inriver migratory conditions are deteriorating (i.e., no longer spring-like) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

By the end of 2001, the Corps shall develop, in coordination with NMFS and the other federal, state, and tribal salmon managers, a McNary Dam transportation evaluation study plan specifically focusing on the response of UCR spring chinook and steelhead to transportation. Approved research should begin by 2002, if feasible (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA, in coordination with NMFS through the annual planning process, shall evaluate transport to inriver return ratios for wild SR yearling chinook salmon and steelhead. In addition, the Corps and BPA shall also evaluate the effects of transportation on summer-migrating subyearling SR chinook salmon (NMFS Biological Opinion 2000 Action Table Dec. 2000).

During all transport evaluations, the Corps and BPA, in coordination with NMFS through the annual planning process, shall include an evaluation of delayed mortality (D) of transported versus inriver migrating juvenile anadromous salmonids (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall continue to fund and expand, as appropriate, fish marking and recapturing programs aimed at defining juvenile migrant survival for both transported and nontransported migrants and adult returns for both groups. These studies shall also compare the SARs of transported and nontransported fish to calculate the

differential delayed mortality (D), if any, of transported fish (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall extend the period of barge transportation from the lower Snake River dams and McNary to further reduce reliance on trucking (FCRPS Biological Opinion).

The Corps and BPA shall assess less-intrusive, PIT-tag interrogation methods at FCRPS juvenile bypass systems with interrogation sites, including McNary, John Day, and Bonneville dams. The Corps and BPA shall also assess providing a similar detection capability for the Ice Harbor juvenile bypass system (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall not initiate collection of subyearling fall chinook for transportation at McNary Dam until inriver migratory conditions are deteriorating (i.e., no longer spring-like) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

If results of Snake River studies indicate that survival of juvenile salmon and steelhead collected and transported during any segment of the juvenile migration (i.e., before May 1) is no better than the survival of juvenile salmon that migrate inriver, the Corps and BPA, in coordination with NMFS through the annual planning process, shall identify and implement appropriate measures to optimize inriver passage at the collector dams during those periods (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Fish transportation: Continue "spread the risk" approach; reduce trucking; continue to study delayed mortality issue (Final All-H Paper Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for comparative evaluations of the behavior and survival of transported and downstream migrants to determine whether causes of D can be identified for the reach between Bonneville Dam and the mouth of the Columbia River (NMFS Biological Opinion 2000 Action Table Dec. 2000).

If it is determined that there is a significant bull trout population in the Lower Columbia River that is affected by the FCRPS then performance standards and appropriate measures shall be developed to ensure that upstream and downstream passage for bull trout is not impeded at FCRPS dams. If the information from these studies warrants consideration of additional modifications to facilities or operations, then FWS will work with the Action Agencies to implement these measures, as appropriate, or to reinitiate consultation, if necessary (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for research to determine up- and downstream passage needs of bull trout. The Action Agencies shall [develop research/study plans with FWS, state agencies, the tribes, and] initiate research to determine the upstream and downstream passage requirements of bull trout at FCRPS dams. Based on [the] research, implement any interim and long term measures found to be needed to provide suitable up- and downstream passage conditions for bull trout at FCRPS dams (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for evaluation to determine the extent of bull trout entrainment and shall assess the extent of bull trout entrainment at FCRPS Dams. If entrainment is determined to be significant, the Action Agencies will explore techniques to deter bull trout entrainment (e.g., the expansion of strobe light research) (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall conduct a feasibility study for reestablishment of two- way passage of adult and sub-adult bull trout at Albeni Falls Dam. This study must include observations of movement and survival of radio tagged bull trout from Lake Pend Oreille, and survival of adult and subadult bull trout passing through or over Albeni Falls Dam. The study must also analyze the feasibility of structural improvements such as fish ladders and measures to guide fish away from turbines. If fish passage is determined to be necessary the Action Agencies will seek appropriations for the construction of the facility by October 1, 2008 (FWS Biological Opinion Dec. 2000).

Research, Monitoring, and Evaluation:

The Corps shall continue to evaluate the need for improvements of the existing intake screens, gateway vertical barrier screens' cleaning system, and bypass facilities (including debris containment and removal systems, separation, sampling, loading, and outfall facilities) at the four lower Snake River hydropower projects (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall evaluate the effects of prior transport as smolts on the homing of adults (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall evaluate strategies to enhance post-release survival of transported fish; examples of such strategies

include timing releases so that fish arrival at the estuary corresponds to minimal interactions with predators and maximum availability of forage and locating releases so as to decrease passage time through areas of high predation (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate a surface bypass RSW at McNary Dam, based on prototype results at other locations, and shall install the unit in multiple spillway bays, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall initiate design development and testing of extended submerged intake screens and vertical barrier screens at Lower Monumental Dam and construct units as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall identify and implement improvements to the transportation program (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall evaluate and implement structural and operational alternatives to improve juvenile transportation at the collector dams (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall include bull trout in the species to be counted and recorded at Bonneville, The Dalles, John Day, and McNary dams (FWS Biological Opinion Dec. 2000).

The Corps shall record the occurrence of bull trout in the smolt monitoring facilities at the Lower Columbia River dams (FWS Biological Opinion Dec. 2000).

4-8 Adult Fish Passage

Provide a variety of passage routes at the remaining mainstem dams...including surface bypass, submerged screens and spill (Framework Alternative 1,2,3). Provide safe passage for juveniles moving down stream and adults moving upstream at all hydro projects (federal and non-federal) in the basin (Framework Concept Paper 1). Replace old turbines with fish-friendly turbines (Framework Alternative 7).

Provide safe passage for juveniles moving down stream and adults moving upstream at all hydro projects (federal and non-federal) in the basin (Framework Concept Paper 1). Enforce existing federal laws that provide for protection of fish, wildlife and their habitats (e.g., The Fort Bridger Treaty, Clean Water Act, Clean Air Act, Endangered Species Act, National Pollution Discharge Emissions System, wild and scenic river designations, wilderness areas, etc.) (Framework Concept Paper 4).

Minimize the impact of the hydro system on fish and wildlife populations, including passage of anadromous fish downstream and upstream (Framework Concept Paper 20).

The Corps shall continue biological and engineering investigations and design of a composite ice and trash sluiceway outfall relocation and adult ladder auxiliary water system at The Dalles Dam and shall construct such devices as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue to investigate a way to increase entry rates of fish approaching surface bypass/collector entrances (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA, in coordination with the Fish Facility Design Review Work Group and the Fish Passage Improvement Through Turbines Technical Work Group, shall continue the program to improve turbine survival of juvenile and adult salmonids (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall examine the effects of draft tubes and powerhouse tailraces on the survival of fish passing through turbines (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall consider all state-of-the-art turbine design technology to decrease fish injury and mortality before the implementation of any future turbine rehabilitation program (including any major repair programs, the ongoing rehabilitation program at The Dalles Dam, and any future program at Ice Harbor Dam). The Action Agencies shall coordinate within the annual planning process before making decisions that would preclude the use of fish-friendly technologies and to minimize any adverse effects of project downtime (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall determine the number of adults passed through turbines, then, if warranted, investigate the survival of adult salmonid passage through turbines (including steelhead kelts) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall conduct a comprehensive evaluation to assess survival of adult salmonids migrating upstream and factors contributing to unaccounted losses (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall conduct a comprehensive evaluation to investigate the causes of headburn in adult

salmonids and shall implement corrective measures, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall initiate an adult steelhead downstream migrant (kelt) assessment program to determine the magnitude of passage, the contribution to population diversity and growth, and potential actions to provide safe passage. The Corps shall use information from previous and ongoing investigations regarding the problem of adult steelhead holding and jumping in the fish ladders at John Day Dam, develop a proposed course of action, and implement it, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate and enumerate fallback of upstream migrant salmonids through turbine intakes at all lower Snake and lower Columbia River dams. The Corps shall implement corrective measures to reduce turbine mortality, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate measures to reduce adult steelhead and salmon fallback and mortality through the Bonneville Dam spillway. A final report shall be submitted to NMFS stating the findings of these investigations and recommending corrective measures. Potential remedies shall be included in the annual planning process (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall examine existing fish-ladder water temperature and adult radio-telemetry data to determine whether observed temperature differences in fishways adversely affect fish passage time and holding behavior. If non-uniform temperatures are found to cause delay, means for supplying cooler water to identified areas of warmer temperatures should be developed and implemented in coordination with the annual planning process (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BPA shall conduct a comprehensive depth and temperature investigation to characterize direct mortality sources at an FCRPS project considered to have high unaccountable adult losses (either from counts and/or previous adult evaluations) (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate adult fish delay and fallback at ladder junction pools and implement remedies to reduce this problem, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall evaluate adult count station facilities and rehabilitate where necessary at all projects to either minimize delay of adults or minimize counting difficulties that reduce count accuracy (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall develop and implement a program to better assess and enumerate indirect prespawning mortality of adult upstream-migrating fish. Such mortality may be due to, or exacerbated by, passage through the FCRPS hydro projects. If measures are identified which will reduce the unaccountable adult loss rate and/or the prespawning mortality rate, the Corps shall implement these measures as warranted. The program should also enhance efforts to enumerate unaccountable losses associated with tributary turnoff, harvest, or other factors in FCRPS mainstem reservoirs and upstream of FCRPS projects (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall ensure that alterations to fish ladders and adult passage facilities to accommodate Pacific lamprey passage do not adversely affect salmonid passage timing and success (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall develop improved operations for adult fishway main entrances at FCRPS dams so that the best possible attraction conditions are provided for adult migrants, both at the four Columbia River hydro projects and the four lower Snake hydro projects (where reservoir elevations are held near MOP). The Corps shall report the findings of fishway entrance flow-balancing investigations in a report to NMFS by the end of 2001 and shall continue to work through FPOM to evaluate and implement, as warranted, structural changes to satisfy fish passage plan fishway entrance criteria (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall develop and maintain an auxiliary water-supply, emergency-parts inventory for all adult fishways where determined necessary, in coordination with NMFS (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate methods to provide additional emergency auxiliary water to The Dalles Dam north fishway when the normal auxiliary water supply is interrupted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall initiate an investigation and prepare a report on the Bonneville First Powerhouse Bradford Island and Cascade Island adult fishway auxiliary water system by the end of 2001. In the report, the Corps shall identify measures that will improve or replace aging components, thereby enhancing current and long-term performance and reliability (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue its investigation of the Bonneville Second Powerhouse adult fishway auxiliary water system and shall identify measures to satisfactorily address emergency backup auxiliary water needs (NMFS Biological

Opinion 2000 Action Table Dec. 2000).

The Corps shall initiate an engineering study to evaluate existing limitations relating to its inability to satisfy fish passage plan operating criteria at the John Day Dam north shore ladder (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue to investigate RSWs, in conjunction with extended spillway deflectors, as a means of optimizing safe spillway passage of adult steelhead kelts and juvenile migrants (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall conduct a comprehensive evaluation to assess survival of adult salmonids migrating upstream and factors contribution to unaccounted losses (FCRPS Biological Opinion).

The Corps shall develop and implement a program to better assess and enumerate indirect prespawning mortality of adult upstream-migrating fish. Such mortality may be due to, or exacerbated by, passage through the FCRPS hydro projects. If measures are identified which will reduce the unaccountable adult loss rate and/or the prespawning mortality rate, the Corps shall implement these measures as warranted. The program should also enhance efforts to enumerate unaccountable losses associated with tributary turnoff, harvest, or other factors in FCRPS mainstem reservoirs and upstream of FCRPS projects (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall investigate methods to provide additional emergency auxiliary water to The Dalles Dam north fishway when the normal auxiliary water supply is interrupted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall initiate an investigation and prepare a report on the Bonneville First Powerhouse Bradford Island and Cascade Island adult fishway auxiliary water system by the end of 2001. In the report, the Corps shall identify measures that will improve or replace aging components, thereby enhancing current and long-term performance and reliability (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall continue its investigation of the Bonneville Second Powerhouse adult fishway auxiliary water system and shall identify measures to satisfactorily address emergency backup auxiliary water needs (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for comparative evaluations of the behavior and survival of transported and downstream migrants to determine whether causes of D can be identified for the reach between Bonneville Dam and the mouth of the Columbia River (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies and NMFS shall work within the annual planning and congressional appropriation processes to establish and provide the appropriate level of FCRPS funding for studies to investigate the causes of discrepancies in adult return rates for juvenile salmonids that have different passage histories through the hydrosystem (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall continue to implement adult salmonid counting programs at FCRPS dams, but shall improve the reporting of these counts (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall use information from previous and ongoing investigations regarding the problem of adult steelhead holding and jumping in the fish ladders at John Day Dam, develop a proposed course of action, and implement as warranted (FCRPS Biological Opinion 2000).

If it is determined that there is a significant bull trout population in the Lower Columbia River that is affected by the FCRPS then performance standards and appropriate measures shall be developed to ensure that upstream and downstream passage for bull trout is not impeded at FCRPS dams. If the information from these studies warrants consideration of additional modifications to facilities or operations, then FWS will work with the Action Agencies to implement these measures, as appropriate, or to reinstate consultation, if necessary (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for research to determine up- and downstream passage needs of bull trout. The Action Agencies shall [develop research/study plans with FWS, state agencies, the tribes, and] initiate research to determine the upstream and downstream passage requirements of bull trout at FCRPS dams. Based on [the] research, implement any interim and long term measures found to be needed to provide suitable up- and downstream passage conditions for bull trout at FCRPS dams (FWS Biological Opinion Dec. 2000).

By September 1, 2001, in coordination with FWS, the Action Agencies shall develop a priority list of the FCRPS dams for evaluation to determine the extent of bull trout entrainment and shall assess the extent of bull trout entrainment at FCRPS Dams. If entrainment is determined to be significant, the Action Agencies will explore techniques to deter bull trout entrainment (e.g., the expansion of strobe light research) (FWS Biological Opinion Dec. 2000).

By October 1, 2004, the Action Agencies shall conduct a feasibility study for reestablishment of two-way passage of adult and sub-adult bull trout at Albeni Falls Dam. This study must include observations of movement and survival of radio tagged bull trout from Lake Pend Oreille, and survival of adult and subadult bull trout passing through or over Albeni Falls Dam. The study must also analyze the feasibility of structural improvements such as fish ladders and measures to guide fish away from turbines. If fish passage is determined to be necessary the Action Agencies will seek appropriations for the construction of the facility by October 1, 2008 (FWS Biological Opinion Dec. 2000).

The Corps shall include bull trout in the species to be counted and recorded at Bonneville, The Dalles, John Day, and McNary dams (FWS Biological Opinion Dec. 2000).

4-9 Flood Control

Flood control operations are modified from current operations to allow for variable releases during the runoff period to simulate a naturally shaped spring freshet (Framework Concept Paper 8).

The Action Agencies shall operate the FCRPS during the fall and winter months in a manner that achieves refill to April 10 flood control elevations, while meeting project and system minimum flow and flood control constraints before April 10. During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps shall routinely identify opportunities to shift system flood control evacuation volumes from Brownlee and Dworshak reservoirs to Lake Roosevelt and identify such opportunities for the Technical Management Team. The Corps shall implement flood control shifts as necessary to best protect listed fish, as called for by NMFS in coordination with the Technical Management Team, taking into account water quality issues and the concerns of all interested parties (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Corps and BOR shall implement VARQ flood control operations, as defined by the Corps (1999d), at Libby by October 1, 2001, and at Hungry Horse by January 1, 2001. By February 1, 2001, the Corps shall develop a schedule to complete all disclosures, NEPA compliance, and Canadian coordination necessary to implement VARQ flood control at Libby (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Improved Flows: improved flow operations to provide water conditions beneficial to migrating juvenile and adult fish. Improvements in Canadian flows with a potential of up to 2 MAF over time. Flood control study to allow further flow improvements. Implementation of flood control adjustments to reduce risks to listed resident fish from salmon flows (Final All-H Paper Dec. 2000).

Authorize system-wide flood control review (Final All-H Paper Dec. 2000).

Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).

By June 2003, the Action Agencies shall evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam, based on various alternative long range forecasting procedures and any opportunities arising from operational or configuration changes (additional turbines or spillway flow deflectors) addressed elsewhere in this biological opinion to be adopted by October 2003 if deemed feasible (FWS Biological Opinion Dec. 2000).

By spring 2001, the Corps shall evaluate flood levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means (FWS Biological Opinion Dec. 2000).

By May 2004 the Action Agencies shall seek means to restore, maintain, or enhance levees throughout the Kootenai Valley to the greater of: 1) the PL 84-99 Corps' 1961 levee specifications, or 2) the levee elevations needed to contain the flows/river stages of the 100 year event as authorized for the Libby Project, which is now defined as 1,770 feet at Bonners Ferry. The Action Agencies shall also seek means to incorporate conservation measures for sturgeon, including self maintaining rocky spawning substrates, as a component and federal purpose of any new levee project above. In the interim, FWS and Corps will coordinate efforts to attempt to limit sturgeon spawning flows so they do not exceed a levee elevation of 1,764 feet at Bonners Ferry (FWS Biological Opinion Dec. 2000).

Prior to implementation of VARQ [at Libby Dam], the Action Agencies shall seek a means to store and release sufficient water to provide for bull trout base flow prior to salmon flows and associated ramping volumes (FWS

Biological Opinion Dec. 2000).

The Service recommends that the Action Agencies initiate section 7 consultation on the proposed Columbia River Treaty Flood Control Operating Plan, October 1999. Proposed changes contained in this Plan may affect sturgeon spawning/rearing habitat conditions necessary for the survival and recovery of those species (FWS Biological Opinion Dec. 2000).

The Corps shall routinely identify opportunities to shift system flood control evacuation volumes from Brownlee and Dworshak reservoirs to Lake Roosevelt and identify such opportunities for the Technical Management Team. The Corps shall implement flood control shifts as necessary to best protect listed fish, as called for by NMFS in coordination with the Technical Management Team, taking into account water quality issues and the concerns of all interested parties (NMFS Biological Opinion Action Table Dec. 2000).

COMMERCE

5. POWER

5-1. Existing Generation

Hydropower generation is mostly eliminated in the Lower Snake and reduced in the Columbia River (Framework Alternative 1). Provide a hydropower backbone for the power system (albeit reduced from current levels) (Framework Alternative 2,3).

Avoid fluctuations caused by power peaking operations (Framework Concept Paper 3).

Provide support for increased electrical costs (Framework Concept Paper 5).

Snake River dams are breached as soon as Congressional authorization and appropriation occur (Draft All-H Paper Dec. 1999).

5-2. New Generation

Invest in new sources of generation to replace hydroelectric power. Renewable and non-polluting technologies would receive first priority (i.e., wind and solar power, fuel cells); however, thermal power generation would be used to replace most of lost hydropower capacity, at least in the short term (Sample Action).

Replace lost generation capacity through a least-cost mix of power purchases aggressive energy conservation programs, the development of cost-effective renewable power sources, and high-efficiency thermal generation. Mitigate incremental production of carbon dioxide through offsets (Framework Concept Paper 7B).

5-3. Transmission Reliability

Major changes to transmission system will be required if the Snake River dams are breached (refer to the Lower Snake Drawdown EIS). New power plants that are constructed to provide replacement power may also require transmission additions, depending upon their location (Sample Action).

Changes in vegetation management maintenance practices to meet habitat requirements will require constant monitoring and reductions in transmission capability. Transmission reliability could be sacrificed as un-maintained areas become widespread and effective monitoring becomes impractical. Public safety is a direct concern, both at individual sites and for power users that may be affected by the blackouts (Sample Action).

Reduced road densities on public lands could affect access to transmission facilities, which impairs the ability to perform maintenance in a timely manner, causing the potential for longer outages in emergencies (Sample Action).

Costs increase for routine maintenance practices are less compared to the Natural Focus Policy Direction, as fewer additional objectives are met (Sample Action).

To improve the future flexibility of the transmission system, BPA's Transmission Business Line shall initiate planning and design necessary to construct a Schultz-Hanford 500-kV line or an equivalent project, with a planned schedule for implementation by 2004 or 2005 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA's Transmission Business Line shall continue efforts to evaluate, plan, design, and construct a joint transmission project to upgrade the west-of-Hatwai cutplane and improve the transfer limitations from Montana (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BPA's Transmission Business Line shall continue to evaluate strategically located generation additions and other transmission system improvements and report progress to NMFS annually. BPA's Transmission Business Line shall also limit future reservations for transmission capacity, as needed, to enable additional spill to meet performance standards, while minimizing effects on transmission rights holders (NMFS Biological Opinion 2000 Action Table

Dec. 2000). The Action Agencies shall seek redundancy in transformers at Libby Dam to assure that sturgeon flows can be released. Loss of one transformer can result in the loss of use of two turbines, or 10,000 cfs of release capacity (FWS Biological Opinion Dec. 2000).
6. INDUSTRY
6-1. Industrial Growth
<i>Some industry management changes identified and regulated through watershed assessment and jurisdictional authorities, especially in weak stock watersheds (Sample Action).</i> Protect high quality aquatic habitat on private lands while allowing restricted use. Urban storm runoff control. Municipal waste management. Obstruction removal. Road management (Human Effects Analysis Appendix D). Manage public lands, which provide critical wild salmon habitat, for the benefit of the salmon. Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1). State water resource agencies throughout the Columbia River Basin enforce existing water laws, including those relating to the doctrine of waste, individual water right terms and conditions, measurement of existing uses, and ensuring instream water rights are protected (Framework Concept Paper 5). Use stored cold water, additional ladders, ladder improvements and ladder maintenance to enhance mainstem adult passage; incorporate 24-hour video fish counting (Framework Concept Paper 3).
6-2. Aluminum and Chemical
<i>Reduce water withdrawals and discharges that threaten weak stocks (Sample Action).</i> Use pollution prevention to reduce or eliminate toxic and conventional pollution generated during manufacturing and industrial processes (LCREP).
6-3. Mining
<i>Some restoration of abandoned mining sites on public lands, new mining limited on public lands, especially in weak stock watersheds (Sample Action).</i> Improve mining discharges. Improve mining practices. Rehabilitate marginal and closed mines (Human Effects Analysis Appendix D). Manage public lands, which provide critical wild salmon habitat, for the benefit of the salmon. Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).
6-4. Pulp and Paper
Use pollution prevention to reduce or eliminate toxic and conventional pollution generated during manufacturing and industrial processes (LCREP). Provide incentives for chlorine-free zero-discharge pulp mills, and modify facilities to be oxygen-based, closed-loop mills (http://www.rfu.org/PulpPrimer.htm).
7. TRANSPORTATION
7-1. Navigation and Barging
<i>Eliminate commercial navigation via the Lower Snake Dams, which will be removed (Sample Action).</i> Remove dikes and manage dredging and other measures to restore estuarine habitats. Manage dredging to avoid increased predation (Human Effects Analysis Appendix D) Maintain shipments from Port of Lewiston by moving to rail transportation. If rail capacity to Lewiston is inadequate, expand capacity to needed level to replace shipping capability lost through shutdown of Lower Snake barge transportation. Maintain barge transportation open through the drawdown of John Day Dam by using shallow draft vessels to the Tri-Cities area (Framework Concept Paper 7B).
7-2. Trucking and Railroads
<i>Upgrade infrastructure for trucking and increase railroad capacity to compensate for navigation and barging impacts of hydro modifications (Sample Action).</i> Maintain shipments from Port of Lewiston by moving to rail transportation. If rail capacity to Lewiston is

inadequate, expand capacity to needed level to replace shipping capability lost through shutdown of Lower Snake barge transportation. Maintain barge transportation open through the drawdown of John Day Dam by using shallow draft vessels to the Tri-Cities area (Framework Concept Paper 7B).

Provide support for alternative forms of transportation of agricultural and other products including improved rail service (Framework Concept Paper 5).

8. AGRICULTURE

Manage public lands, which provide critical wild salmon habitat, for the benefit of salmon. Actively restore watersheds where salmon populations are in imminent danger of extirpation (Sample Action).

Federal regulatory efforts would increase to ensure that nonfederal land and water use would not continue to degrade fish habitat. This would occur through a combination of increased ESA rule development, increased ESA enforcement and increased CWA enforcement (Draft All-H paper, Habitat Option 3, Dec. 1999).

BPA shall, working with agricultural incentive programs such as the Conservation Reserve Enhancement Program, negotiate and fund long-term protection for 100 miles of riparian buffers per year in accordance with criteria BPA and NMFS will develop by June 1, 2001 (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Provide permanent protection for riparian areas in agricultural areas by supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper Dec. 2000).

Reform and enforce land use statutes governing growth management, forestry practices, and agricultural practices (WA Forest & Fish model) (Final All-H Paper Dec. 2000).

Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

Expand on agricultural incentive programs (Final All-H Paper Dec. 2000).

By December 1, 2001, the Action Agencies shall quantify the effects of groundwater seepage associated with the magnitude and duration of sturgeon flows on crops in the Kootenai Valley relative to all other types high flow/stage events which occur in the Kootenai River. The effects of direct precipitation and runoff from small tributaries within the Kootenai Valley on both surface and ground water levels shall also be accounted for in this study. This shall include delineation of specific sites affected and identification of all feasible remedies specific to those sites such as, drainage, willing seller land purchases, and enrollment in the Department of Agriculture's Wetland Reserve Program (FWS Biological Opinion Dec. 2000).

8-1. Irrigation

Reduce irrigation withdrawals (Framework Concept Paper 23). Adopt strong water conservation programs and use saved water to replenish flows (Framework Concept Paper 1).

Irrigation - Provide mitigation to farmers affected by drawdown of reservoirs to extend pumps and replace diversion screens. Provide efficient, temporary mitigation to extend ground water well pumping for irrigators affected by lowered water table due to drawdown. Look for opportunities to promote water conservation and efficiencies (Framework Concept Paper 7B).

Objectives: The water management strategy for fish should be restructured to improve biological benefits and reduce societal cost measures. Water management must be consistent with state authority over water rights. New strategies of water management are promoted that have an anticipated beneficial impact for threatened fish stocks, including river watershed projects and water transfer programs (Framework Concept Paper 27).

Protect and increase instream flows by limiting additional consumptive water withdrawals, using the most efficient irrigation methods, preventing soil compaction and riparian vegetation removal and wetland destruction; where necessary, restore soil, restore riparian vegetation and re-create wetlands (Framework Concept Paper 3).

State water resource agencies throughout the Columbia River Basin enforce existing water laws, including those relating to the doctrine of waste, individual water right terms and conditions, measurement of existing uses, and ensuring instream water rights are protected (Framework Concept Paper 5).

Identify and use appropriate water conservation measures in accordance with state law (Framework Concept Paper 28).

Screen water diversions on all fish-bearing streams (Framework Concept Paper 28).

Protect and increase instream flows by limiting additional consumptive water withdrawals, using the most efficient irrigation methods, preventing soil compaction and riparian vegetation removal and wetland destruction; where

necessary, restore soil, restore riparian vegetation and re-create wetlands (Spirit of the Salmon). Implement soil and water conservation practices that control erosion and runoff in order to reduce stream sedimentation, flooding, and bank erosion and those that help to maintain or improve base streamflows (Draft All-H paper Dec. 1999).

Habitat objectives would be accomplished by land and water lease, purchase, subsidy and similar incentives (Human Effects Analysis).

Reduce existing permits for water withdrawal. Encourage cultivation of less water-intensive crops. Agricultural water conservation. Irrigation waste water treatment. Irrigation withdrawals screening (Human Effects Analysis Appendix D).

Before entering into any agreement to commit currently uncontracted water or storage space in any of its reservoirs covered by this biological opinion to any other use than salmon flow augmentation, BOR shall consult with NMFS under ESA Section 7(a)(2). Such consultations shall identify the amount of discretionary storage or water being sought, the current probability of such storage or water being available for salmon flow augmentation, and any plan to replace the storage volume currently available to salmon flow augmentation that would be lost as a result of the proposed commitment. Also, BOR shall consult with NMFS before entering into any new contract or contract amendment to increase the authorized acreage served by any irrigation district receiving BOR-supplied water. NMFS' criterion in conducting such reviews is to ensure that there be zero net impact from any such BOR commitment on the ability to meet the seasonal flow objectives established in this biological opinion. Replacement supplies should have at least an equal probability of being available for salmon flow augmentation as the storage space or water that is being committed (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall pursue water conservation improvements at its projects and shall use all mechanisms available to it under state and federal law to ensure that a reasonable portion of any water conserved will benefit listed species (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Within 2 years from the date this opinion is signed, BOR shall provide NMFS with a detailed progress report addressing possible instances where BOR-supplied water within the Columbia River basin is being used without apparent BOR authorization to irrigate lands. In the report, BOR shall indicate how it shall proceed to identify and address instances of unauthorized use (NMFS Biological Opinion 2000 Action Table Dec. 2000).

BOR shall investigate the attraction of listed salmon and steelhead into wasteways and natural streams receiving waste water from the Columbia Basin Project. If listed fish are found to be attracted into these channels, BOR shall work with NMFS to identify and implement structural or operational measures to avoid or minimize such use, as warranted (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

8-2. Pesticides and Agricultural Practices

Reduce the use of pesticides in agriculture to lower input to terrestrial and aquatic areas (Framework Alternative 1,2,3). Implement nutrient and pest management practices needed to limit delivery of pollutants that create eutrophic or toxic conditions for fish and other aquatic organisms (Draft All-H paper, Dec. 1999).

Lower irrigation pumps to adjust to changed river levels and provide support for increased electrical costs (Framework Concept Paper 5).

Restore damaged habitats (e.g., acquire water rights needed for sensitive and weak species; fence riparian areas, acquire conservation easements, rest lands that are over used, etc.) (Framework Concept Paper 4).

[Encourage] pesticide/herbicide reduction (Human Effects Analysis Appendix D).

Modify agricultural practices to benefit weak stocks through state programs (e.g., Healthy Streams Partnership [Oregon Senate Bill 1010, 1993 Or. Laws, ch. 263]). Develop Total Maximum Daily Loads (TMDLs) and Water Quality Management Area Plans (WQMAPs) in concert with the ESA (e.g., Executive Order No. EO 99-01 [The Oregon Plan For Salmon And Watersheds]).

In weak stock watersheds, use federal and state cost-share programs to reduce the impacts of agricultural practices through water quality and habitat improvement using more risk-averse agricultural practices (Sample Action).

8-3. Grazing

Manage grazing, especially on public lands to reduce riparian impacts and input of organic nutrients and pathogens into water sources (Framework Alternative 1,2,3). Install fencing to keep range animals away from stream sides (Framework Concept Paper 23). *[Encourage]* nutrient and pathogen load reduction from grazing/agriculture. Reduce grazing impacts to riparian/aquatic ecosystem (Human Effects Analysis Appendix D). Manage public lands, which provide critical wild salmon habitat, for the benefit of the salmon. Strengthen habitat protection through stricter

<p>standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).</p> <p>Maintain grazing through use of best management practices, while imposing riparian set-asides and fencing allotments in fish-bearing streams and sensitive wildlife refugia. Provide efficient, temporary mitigation to ease transition to different land management practices (Framework Concept Paper 7B).</p> <p>Increase the geographic extent and connectivity of rangeland cover types and structural stages (terrestrial source habitats) that have declined substantially in geographic extent from the historical to the current period (ICBSDEIS, R-O21).</p>
<p>8-4. Forestry</p>
<p><i>Reduce and constrain timber harvest in weak stock habitat, especially on public lands (Sample Action).</i></p> <p>Limit clearcuts for logging to sizes that are determined to result in retention of native species and ecological functions (Draft Framework Alternative 2,3).</p> <p>Promote sustainable cut while providing for 100-foot riparian set-asides for salmonid fish-bearing streams. Provide efficient, temporary mitigation to ease transition to different land uses where economic opportunities are reduced (Framework Concept Paper 7B).</p> <p>Reduce road densities on public forested lands, on or adjacent to critical habitat (Draft Framework Alternative 2,3).</p> <p>Manage logging on public forested lands to produce normative age stands. Manage logging on private forested lands to produce normative age stands using incentives and similar means (Draft Framework Alternative 2, 3).</p> <p>Reduce forestry impacts to riparian/aquatic ecosystem. Limit size and frequency of clearcuts. Normative fire frequency. Develop normative forest age structure. Provide gradual forest ecotones. Reduce forest road density (Human Effects Analysis Appendix D).</p> <p>Particularly in weak stock watersheds, restore vegetation patches, patterns, structure, and species composition to be more consistent with the landform, climate, and biological and physical characteristics of the ecosystem, and provide the source of habitat for terrestrial species. Manage disturbances to make vegetation patterns more consistent with their location in the landscape (ICBSDEIS, R-O2).</p>
<p>9. COMMERCIAL HARVEST</p>
<p><i>Significantly reduce or eliminate commercial harvest of weak fish stocks and wildlife species (Sample Action).</i></p> <p>Continue development of selective fisheries where there are no adverse effects on wild stocks (Framework Concept Paper 5). Implement harvest actions that protect weak stocks (Framework Concept Paper 4). Address incidental mortality (Spirit of the Salmon). Selective fisheries. Focus sport or C&S fisheries. Population unit and aggregate escapement goals. Use “new” harvest techniques, and weakest aggregate harvest rate (Human Effects Analysis Appendix D).</p> <p>Redirect tribal mixed-stock commercial harvest to selective harvest at fish ladders and in tributaries (Framework Alternative 7). (Human Effects Analysis Appendix D).</p> <p>Mark All-Hatchery fish, so as to facilitate selective harvest. Weak stock management is impossible without selective harvest; selective harvest (other than terminal harvest) is impossible without marking All-Hatchery fish (orig. Framework Alternative 7).</p> <p>Improve gear for selective harvests (Framework Concept Paper 27).</p> <p>Retire commercial fishing licenses through buy-outs (Framework Concept Paper 27).</p> <p>Buy selective gear for harvesters and by improving harvest enforcement (Framework Alternative 7). Expand marking and catch sampling programs for ocean and inriver fisheries where Columbia River stocks are caught. Limit fishing during the Pacific Decadal Oscillation period and stop hunting endangered species on the way to their breeding grounds (PM).⁴</p> <p>Improve harvest data and stock information to promote better harvest management and protect weaker stocks. Consolidate and unify harvest data -- both from marine and inriver fisheries, counts and samples -- into an accessible database. Provide real-time information for use by fisheries managers and planners. Conduct a regularly scheduled scientific review of harvest data and harvest practices (Council’s 2000 Fish and Wildlife Program).</p> <p>The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies in a</p>

⁴ Pasco Public Meeting

multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target nonlisted fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way and/or methods deployed by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

OCEAN FISHERIES:

Work toward elimination of ocean salmon harvest (Framework Alternative 7). Reduce ocean harvest to increase numbers of returning adults (Framework Alternative 4). Reduce ocean harvest to increase numbers of returning adults (Framework Alternative 4). All other harvest impacts on listed populations would be reduced to conservation crisis levels for a period of years, after which harvest could be adjusted (Draft All-H Paper Harvest Option 3, Dec. 1999). Renegotiate international treaties to prevent overfishing, provide conservation incentives, and impose sanction on nations whose fleets illegally catch salmon and steelhead (Framework Concept Paper 1).

RIVER FISHERIES:

Implement conservation crisis levels, defined as levels similar to the 1999 harvest rates for listed spring/summer chinook (5 to 7 percent), and comparable conservation crisis levels for listed Snake River fall chinook and listed steelhead. All of these rates would be frozen until recovery goals are achieved (Draft All-H Paper Harvest Option 3, Dec. 1999).

Ban harvest in the mainstem (Framework Alternative 7).

The Action Agencies shall work with NMFS, USFWS, tribal and state fishery managers, and the relevant Pacific Salmon Commission and Pacific Fishery Management Council (PFMC) technical committees to develop and implement methods and analytical procedures (including revising and/or replacing current fishery management and stock assessment models based on these methods and procedures) to estimate fishery and stock-specific management parameters (e.g., harvest rates). The Action Agencies shall place particular emphasis on current methods and procedures affected by the transition to mass marking of Columbia River basin hatchery produced fish and/or deployment of selective fishery regimes in the Columbia River basin, addressing these concerns within a time frame necessary to make the new selective fishing regimes feasible. Specifically, the Action Agencies shall facilitate the development of models, methods, and analytical procedures by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies to develop improved methods for estimating incidental mortalities in fisheries, with particular emphasis on selective fisheries in the Columbia River basin, doing so within the time frame necessary to make new marking and selective fishery regimes feasible. The Action Agencies shall initiate studies and/or develop methods by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Constrain harvest impacts on listed ESUs to no more than recently established current levels (Final All-H Paper Dec. 2000).

Manage mixed stock fisheries on the natural stocks and/or stock groups affected by the fishery (not on hatchery stocks) (NMFS) (Final All-H Paper Dec. 2000).

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states and tribes develop alternative fishing techniques and/or locations and by enabling more selective fisheries and helping to develop the necessary institutional mechanisms and analytical capabilities to support management of selective fisheries (BPA/NMFS/USFWS) (Final All-H Paper Dec. 2000).

Seek opportunities to increase harvest in ways that do not harm listed ESUs (NMFS/USFWS) (Final All-H Paper Dec. 2000).

Pursue conservative harvest policies (weak stock management) (Final All-H Paper Dec. 2000).

Discourage non-selective fisheries and pursue selective fisheries (support mass marking and other tools and take a lead role in developing the necessary analytical capabilities to support management of selective fisheries) (Final All-

H Paper Dec. 2000).

Provide sufficient funding for managing fisheries and contributing to the transition to selective fisheries, and for the 1999 Pacific Salmon Treaty Agreement (Final All-H Paper Dec. 2000).

10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Use tools and incentives in local planning ordinances and state laws to ensure that development is environmentally sensitive (LCREP). Develop floodplain management and shoreland zoning protection programs (LCREP).

Assess the potential impacts of proposed development. Identify cumulative impacts and habitat attributes that might be lost. Present alternatives that minimize impacts. The preferred alternative will have no adverse impacts. If impacts are unavoidable, mitigation shall take one of five forms in order of preference (LCREP):

- a) Restoration: returning a damaged habitat as closely as possible to its condition prior to damage
- b) Enhancement: making changes or improvements to habitat to replace functions or values lost or damaged
- c) Preservation: protecting habitat in adjacent areas that are equivalent to the area damaged and that might otherwise be subject to unregulated activity
- d) Creation: converting a non-functioning habitat area into one having all of the physical and biological characteristics of the area lost or damaged
- e) Cash mitigation: providing cash compensation for lost habitat to be used for habitat protection and restoration.

Protect high quality aquatic habitat on private lands while allowing restricted use. Urban storm runoff control. Municipal waste management. Obstruction removal. Road management. Manage land use and riparian conditions to maintain water quality (Human Effects Analysis Appendix D).

Restore terrestrial, riparian and aquatic habitats where adverse effects or pending risks to these habitats from roads can be quickly reduced (ICBSDEIS, R-O12).

11. RECREATION

Focus sport fisheries on hatchery stocks and healthy stocks (Human Effects Analysis Appendix D).

Improve gear for selective harvests (Framework Concept Paper 27).

TRIBES

12-1. Tribal Harvest

[Advocate for] habitat and production actions that promote and sustain fishing opportunities in all treaty reserved usual and accustomed fishing areas (Framework Concept Paper 3).

Conduct ceremonial, subsistence, and commercial fisheries consistent with court interpretations of Indian treaties (Framework Alternative 1,2,3).

Continue efforts to "put fish back in rivers" *[e.g., supplementation]* in order to move toward achievement of full treaty rights (Framework Concept Paper 3).

Decrease mixed stock commercial harvest; accept economic incentives not to fish during certain migration periods (Framework Concept Paper 27).

Mark All-Hatchery fish to enable selective harvest (Framework Concept Paper 5; Framework Concept Paper 27).

Improve gear for selective harvests (Framework Concept Paper 27).

Provide financial incentives for alternative commercial and economic activity for tribes with in river fishing rights that agree to temporarily suspend or reduce commercial fishing (Framework Concept Paper 27).

Shift to terminal fisheries to allow for selective stock harvest (Framework Concept Paper 27).

Manage harvest to achieve escapement of adults to spawning grounds; revise escapement goals (Framework Concept Paper 27).

Substitute resident fish and wildlife, plus enhance their habitats in blocked areas (Framework Concept Paper 13; Framework Concept Paper 8).

Support habitat protection and enhancement through land acquisitions, land trusts, conservation easements, etc. (Tribal Vision).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies in a multiyear program to develop, test, and deploy selective fishing methods and gear that enable fisheries to target nonlisted fish while holding incidental impacts on listed fish within NMFS-defined limits. The design of this

program and initial implementation (i.e., at least the testing of new gear types and methods) shall begin in FY 2001. Studies and/or pilot projects shall be under way and/or methods deployed by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, tribal and state fishery managers, and the relevant Pacific Salmon Commission and Pacific Fishery Management Council (PFMC) technical committees to develop and implement methods and analytical procedures (including revising and/or replacing current fishery management and stock assessment models based on these methods and procedures) to estimate fishery and stock-specific management parameters (e.g., harvest rates). The Action Agencies shall place particular emphasis on current methods and procedures affected by the transition to mass marking of Columbia River basin hatchery produced fish and/or deployment of selective fishery regimes in the Columbia River basin, addressing these concerns within a time frame necessary to make the new selective fishing regimes feasible. Specifically, the Action Agencies shall facilitate the development of models, methods, and analytical procedures by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, and tribal and state fishery management agencies to implement and/or enable changes in catch sampling programs and data recovery systems, including any required changes in current databases (e.g., reformatting) and associated data retrieval systems, pursuant to the time frame necessary to implement and monitor mass marking programs and/or selective fishery regimes in the Columbia River basin. Specifically, the Action Agencies shall facilitate the revision of programs and systems, as needed, by the 3-year check-in (NMFS Biological Opinion 2000 Action Table Dec. 2000).

Constrain harvest impacts on listed ESUs to no more than recently established current levels (Final All-H Paper Dec. 2000).

Manage mixed stock fisheries on the natural stocks and/or stock groups affected by the fishery (not on hatchery stocks) (NMFS) (Final All-H Paper Dec. 2000).

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states and tribes develop alternative fishing techniques and/or locations and by enabling more selective fisheries and helping to develop the necessary institutional mechanisms and analytical capabilities to support management of selective fisheries (BPA/NMFS/USFWS) (Final All-H Paper Dec. 2000).

Seek opportunities to increase harvest in ways that do not harm listed ESUs (NMFS/USFWS) (Final All-H Paper Dec. 2000).

12-2. Tradition, Culture, Spirituality

Actively restore ecosystem health associated species. Improve tribal well being and the ability of tribes to exercise their respective rights and to enjoy traditional values. Improve conditions under which tribes can exercise sovereignty and self-determination (Sample Action).

There is no distinction between natural resources and cultural resources—all are necessary for culture, economy, religion and a way of life to be expressed, practiced and maintained (Tribal Vision).

Support marking of All-Hatchery fish to enable selective harvest (Framework Concept Paper 5; Framework Concept Paper 27).

Manage harvest to achieve escapement of adults to spawning grounds; revise escapement goals (Framework Concept Paper 27).

Re-negotiate Pacific Salmon Treaty (US-Canada) to prevent overfishing (Framework Concept Paper 1).

Recognize native plant communities as traditional resources that are important to tribes and an essential component to treaty-reserved gathering rights (ICBSDEIS, B-045). Support federally recognized tribes' and tribal communities' subsistence needs to the greatest extent practicable (ICBSDEIS, B-061). Better understand and incorporate into federal land management how places are valued by American Indians (ICBSDEIS, B-069).