

**SAMPLE IMPLEMENTATION ACTIONS**  
**FOR THE**  
**SUSTAINABLE USE FOCUS POLICY DIRECTION**

Emphasizes *human intervention as part of the life cycle*, working to restore and maintain sustainable stocks of fish and wildlife populations to insure substantially expanded harvest opportunities.

**FISH & WILDLIFE**

**1 HABITAT**

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).

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).

Protect, connect, and restore key habitats (Framework Alternative 3). Increase habitat connections throughout the basin (Framework Alternative 1,2,5). Strengthen habitat protection through stricter standards for logging, livestock grazing, mining and road building (Framework Concept Paper 1).

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).

Protect existing high quality habitat and improve degraded habitat. Actions will be judged on their ability to produce fish, reduce conflict and probability of success versus their cost. Actions that are the least expensive, but do the greatest goodwill be selected first. Apply management actions in a way that balances wildlife, anadromous and resident fish interests (Framework Concept Paper 20).

Continue protection of habitat that is already protected by local laws, such as water quality standards, discharge permits, fish and wildlife passage requirements, etc. 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).

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

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

Improved land management actions would be implemented on federal, state, tribal and private land to increase productivity and restore connectivity of populations. Major actions should be coordinated through the experimental management program (Framework Concept Paper 6).

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, ...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 computer metapopulation models to predict extinction probabilities for listed stocks, and annually reassess extinction probabilities to reconsider listing decisions (Framework Concept Paper 26). 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).

Goal: Restore sustainable, naturally-reproducing fish and wildlife populations to support tribal and non-tribal harvest, cultural practices, and economic benefits by restoring the biological integrity and genetic diversity of the Columbia River ecosystem (Framework Concept Paper 2).

Maintain and restore the natural ecosystem that includes all naturally producing indigenous species, their habitats and provides human sustenance, and acknowledging that this must also provide for cultural and spiritual needs (Framework Concept Paper 4).

Increased regulation by the federal agencies under the CWA and ESA would 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).<sup>1</sup>

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 basinwide 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).

Intact habitat: Where the habitat for a target population is largely intact, then the biological objectives for that habitat will be to preserve the habitat and restore the population of the target species up to the sustainable capacity of the habitat (Council's 2000 Fish and Wildlife Program).

Restorable habitat: Where the habitat for a target population is absent or severely diminished, but can be restored through conventional techniques and approaches, then the biological objective for that habitat will be to restore the habitat with the degree of restoration depending on the biological potential of the target population. Where the target population has high biological potential, the objective will be to restore the habitat to intact condition, and restore the population up to the sustainable capacity of the habitat. In this situation, if the target population had been severely reduced or eliminated as a result of the habitat deterioration, the use of artificial production in an interim way is a possible policy choice to hasten rebuilding of naturally spawning populations after restoration of the habitat. Where the target population has low biological potential -- for example, when downstream rearing conditions severely limit the survival of juveniles from a given spawning area -- the objective will be to restore the habitat to intact condition and consider sustained but limited supplementation as a possible policy choice (Council's 2000 Fish and Wildlife Program).

Compromised habitat: Where the habitat for a target population is absent or substantially diminished and cannot reasonably be fully restored, then the biological objective for that habitat will depend on the biological potential of the target species. Where the target species has high biological potential, the objective will be to restore the habitat up to the point that the sustainable capacity of the habitat is no longer a significant limiting factor for that population. The objective also is to restore the population of the target species up to the sustainable capacity of the restored habitat. Sustained supplementation in a limited fashion is a possible policy choice in this instance (Council's 2000 Fish and Wildlife Program).

Eliminated habitat: Where habitat for a target population is irreversibly altered or blocked, and therefore there are no opportunities to rebuild the target population by improving its opportunities for growth and survival in other parts of its life history, then the biological objective will be to provide a substitute. In the case of wildlife, where the habitat is inundated, substitute habitat would include setting aside and protecting land elsewhere that is home to a similar ecological community. For fish, substitution would include an alternative source of harvest (such as a hatchery stock) or a substitution of a resident fish species as a replacement for an anadromous species (Council's 2000 Fish and Wildlife Program).

Research, Monitoring, and Evaluation:

The Action Agencies, in coordination with NMFS, USFWS, and other federal agencies, Northwest Power Planning Council, states, and tribes, shall develop a common data management system for fish populations, water quality, and habitat data (NMFS Biological Opinion Action Table Dec. 2000). Use research and monitoring data to improve computer models to assemble existing data and relationships to predict effects on salmon and steelhead from

<sup>1</sup>Incentives for Species (by Brett Schaerer); Thoreau Institute:

<http://www.teleport.com/~rot/schaerer.html#RTFToC2>

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management actions (Framework Concept Paper 25).

#### 1-1 Anadromous Fish

Provide habitat capable of: (1) supporting viable populations of plant and animal species, (2) contributing to recovery of listed species, and (3) supporting productive and diverse plant and animal populations and communities to meet social needs (ICBSDEIS, B-O43). Maintain and restore aquatic and terrestrial habitat quality and quantity to support harvestable plants, fisheries, and aquatic and terrestrial species (ICBSDEIS, B-O44).

Reclaim the anadromous fish resource and the environment on which it depends for future generations... Restore anadromous fishes to historical abundance in perpetuity (Framework Concept Paper 3).

The Forest Service and BLM propose to develop and implement a coordinated, scientifically sound, broad-scale, ecosystem-based management strategy for lands they administer in the ICBEMP project area (ICBSDEIS). The action alternatives focus "on restoring and maintaining ecosystems across the project area and providing for the social and economic needs of people while reducing short- and long-term risks to natural resources from human and natural disturbances."

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

For the mainstem Columbia and Snake rivers, we must focus not only on currently accessible habitat, but also look for opportunities to increase the current level of habitat access with all dams remaining in place. A recent study by the Battelle Pacific Northwest National Laboratory and the U.S. Geological Survey (USGS) found a substantial percentage of the historic mainstem riverine habitat for Snake River fall chinook still remains unimpounded upstream of the Hells Canyon complex. Although there is still riverine environment where fall chinook historically spawned, it may not be capable of supporting fish today because of degraded quality. It must be better understood whether the present quality of the historic habitat is capable of supporting a self-sustaining population of fall chinook above the Hells Canyon complex. The feasibility of reintroduction, including an evaluation of the existing habitat, is being investigated as part of the Federal Energy Regulatory Commission (FERC) relicensing process for the Hells Canyon complex (Governors' Recommendations, July 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 Action Table Dec. 2000).

Manage federal lands to protect fish through ICBEMP's and the Northwest Forest Plan's aquatic strategies, provide a base for habitat protection (USFS, BLM). Implement seven watershed restoration initiatives targeting core populations most at risk (USFS, BLM).

Support BPA offsite mitigation strategy (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) (All-H Paper Dec. 2000).

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

Protect existing high quality habitat and accelerate restoration in high priority subbasins (USFS, BLM) (All-H Paper Dec. 2000).

Research, Monitoring, and Evaluation:

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

1-2 Resident Fish

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).

In areas below storage projects, protect, mitigate and enhance resident fish that are affected by altered annual flow regimes, daily load following, temperature modifications and nutrient trapping (Framework Concept Paper 13).

Protect, mitigate and enhance resident fish populations to the extent they were or are affected by construction and operation of dams (Framework Concept Paper 13).

Determine the characteristics of the resident fish food sources in terms of abundance, survival, ability to support proposed resident fish populations, and potential to maintain or increase in the future (Framework Concept Paper 12).

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 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

Maintain noxious-weed-free plant communities (cover types) or restore plant communities with noxious weed infestations through use of broad-scale integrated weed management strategies (ICBSDEIS, B-O11). Recognize native plant communities as traditional resources that are important to tribes and as an essential component to treaty-reserves gathering rights (ICBSDEIS, B-O45). Restore the native grass, forb, and shrub composition within the sagebrush and shrub steppe cover types (ICBSDEIS, R-O10). Manage land uses and reduce the extent of biological crust (microbiotic crust) development where potential for biological crust development is high (ICBSDEIS, R-O11).

Control nonnative, introduced (exotic) fish and wildlife species through state programs (e.g., Oregon's Wildlife Integrity Rules for importation, possession, confinement, transportation and sale of nonnative wildlife [OAR 635-056-0000]).

1-4 Wildlife

Restore sustainable, naturally reproducing fish and wildlife populations to support tribal and non-tribal harvest, cultural practices, and economic benefits by restoring the biological integrity and genetic diversity of the Columbia River ecosystem (Framework Concept Paper 2).

Manage for native species, protecting existing range, expanding migratory corridors and providing habitat linkages to promote genetic diversity and provide for human use and enjoyment. Change the overall wildlife management strategy from one of quantitative habitat restoration to one of qualitative habitat creation and restoration and quantitative wildlife population restoration and enhancement. Implement the same protocols for use of non-native wildlife species as used in non-native fish species above (Framework Concept Paper 7B).

Determine problem areas for wildlife (blocked migration corridors, staging areas, etc); mitigate for displaced wildlife and their habitat (Tribal Vision). 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).

Manage for native species, protecting existing range, expanding migratory corridors and providing habitat linkages to promote genetic diversity and provide for human use and enjoyment (Framework Concept Paper 7).

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). Maintain and/or recruit adequate numbers, species and sizes of snags and levels of downed wood to meet the needs of wildlife (ICBSDEIS, B-O31). Manage species composition (diversity), structure and age class, cover, density and surface litter on native rangeland plant communities (ICBSDEIS, B-33). In the short term, maintain and secure terrestrial source habitats that have declined substantially in geographic extent from the historical to the current period and source habitats that have old-

forest characteristics (ICBSDEIS, T-O1).

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).

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).

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).

1-5 Predators of Anadromous Fish

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 the 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; PM<sup>2</sup>). Remove Rice Island (PM<sup>3</sup>).

Take direct action to control marine mammals and Northern pikeminnow that prey on salmon (Framework Alternative 7). Immediately authorize expanded predator controls (MMPA) (Final All-H Paper Dec. 2000). *[Change]* 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 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).

Increase amount of riparian vegetation to provide shade, which lowers water temperature and reduces threat of predators (Framework Concept Paper 1).

The Corps shall conduct a post-construction evaluation of the new debris containment boom at Little Goose to monitor populations and behavior of aquatic predators when debris accumulates at the log boom (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 Action Table Dec. 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 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

<sup>2</sup> Pasco Public Meeting

<sup>3</sup> Pasco Public Meeting

<sup>4</sup> Pasco Public Meeting

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 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, 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 Action Table Dec. 2000).

1-6 Watersheds

Actively restore watersheds where salmon are in imminent danger of extirpation (Framework Concept Paper 3; and 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). 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).

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

Management actions should sustain hydrologic processes characteristic of the geoclimatic settings. Hydrologic processes critical for balanced landscapes/ecosystems include, but are not limited to, streamflows and sediments in channels (ICBSDEIS, B-08).

Employ voluntary, multi-stakeholder collaborative approaches to protect, restore and monitor natural resources and to resolve natural resource conflicts. These approaches should be open and inclusive, based on existing laws, and conducted within a framework of natural systems--watershed, ecosystems, bioregions or other defining landforms--using the best available science. This recommendation is patterned after successful approaches used all across the country. It is intended to provide impetus for stakeholders and communities to work together in searching for common goals, resolving conflicts, becoming aware of and using best available science, meeting legal requirements for protecting the environment, monitoring natural resources and redeeming collective responsibility for conditions and trends of resources (Spirit of the Salmon).

If necessary, initiate land management designed to return a watershed to a natural hydrologic regime, e.g., re-vegetation of areas adversely affected by past land-disturbing activities (Spirit of the Salmon).

BPA shall work with the NPPC 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).

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 Action Table Dec. 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).

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).

#### 1-7 Tributaries

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).

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. Remediation actions may include such corrective actions as fencing to keep range animals away from stream sides, retaining stream flow and reducing irrigation withdraw, enhancing riffle zones and gravel beds, and returning nutrients in the form of fish carcasses to the streams. 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).

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).

Segregate habitat into "nature preserve" tributaries and "production/supplementation" (hatchery) tributaries to allow increased hatchery production (Framework Concept Paper 26).

Rationale: All plans for recovery of fisheries in the Columbia River Basin identify water quantity as a critical factor, including streamflows in the small streams and tributaries that provide significant habitat for anadromous and resident fish and serve as integral portions of the region's ecosystem. Water quantity is directly related to water quality as well, a relationship that is receiving increasing attention in meeting requirements of the Endangered Species Act and the Clean Water Act. While there is no easy "fit" between state water laws and federal requirements, recent modifications to state water laws have provided new mechanisms for reallocating some water resources to instream use, providing opportunities to restore and protect instream flows (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).

Maintain and improve egg-to-smolt survival in natal tributaries (Framework Concept Paper 2). Closely monitor tributary production and escapement to improve management (Spirit of the Salmon).

Maintain and improve physical integrity of aquatic ecosystems, including shorelines, banks and bottom configurations (ICBSDEIS, B-O37). Maintain and improve riparian and wetland vegetation to (ICBSDEIS, B-O38):

- a. Provide an amount and distribution of woody debris sufficient to sustain physical and biological complexity characteristics of natural aquatic and riparian ecosystems
- b. Provide adequate summer and winter thermal regulation within riparian and aquatic zones,
- c. Help achieve rates of surface erosion, bank erosion and channel migration characteristics off those under which plant communities developed, and
- d. Provide appropriate amounts and distributions of source habitats for riparian or wetland-dependent species.

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).

Work with states to secure and protect minimum flows with federal nexus (FS, BLM) (Final All-H Paper Dec. 2000).

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).

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).

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).

*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).

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, 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).

1-8 Mainstem Columbia

Restore productive normative river segments in the mainstem Columbia and Snake Rivers (Framework Concept Paper 5). Protect, conserve, and enhance identified habitats, particularly wetlands, on the mainstem of the lower Columbia River (LCREP).

Mainstem habitat must be returned to natural conditions, which are linked to a 71% downstream passage survival rate, closer to those that existed prior to construction of the dams. This can be done by providing additional spill and water flows, among other measures. Begin restoration of mainstem habitat, including provisions to address toxic pollution as well as provisions for additional spill and water flows (Spirit of the Salmon).

Assess opportunities for mainstem habitat improvements (BPA) (Final All-H Paper Dec. 2000). 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; 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). Designate Hanford Reach under the Federal Wild and Scenic Rivers Act; re-establish normative river conditions there (Tribal Vision).

Recolonize extinct populations once habitat conditions and connectivity improve. Therefore, if protected, areas such as the Hanford Reach of the mainstem Columbia River for fall chinook, and portions of the Clearwater and Salmon River subbasins in Idaho for westslope cutthroat trout, will serve as a foundation from which natural population and metapopulation structure can be re-established (Framework Concept Paper 5).

Set aside the Hanford Reach as an ecological preserve (FWS, DOE) (Final All-H Paper Dec. 2000; Framework Alternative 5). Enhance Mid-Columbia fall chinook by preserving existing habitat in the Hanford Reach, and implementing a normalized annual hydrograph below Priest Rapids (Framework Concept Paper 2).

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).

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

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

Provide adequate spawning and rearing flows under Vernita Bar Agreement (FERC) (Final All-H Paper Dec. 2000).

*Research, Monitoring, and Evaluation:*

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

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).

MANAGEMENT ACTION FOR STRATEGY #3: To minimize trial expense, again choose the shortest reservoir on the Columbia. Try out various ways (gravel cleaning barges, etc.) to provide the spawning conditions along the edges of reservoirs which, together with the newly induced accelerated movement of water along the river edges, will mimic the original river conditions for spawning (and possibly even improve on them) (Framework Concept Paper 18).

MANAGEMENT ACTION FOR STRATEGY #3: To minimize trial expense, again choose the shortest reservoir on the Columbia. Try out various ways (gravel cleaning barges, etc.) to provide the spawning conditions along the edges of reservoirs which, together with the newly induced accelerated movement of water along the river edges, will mimic the original river conditions for spawning (and possibly even improve on them) (Framework Concept Paper 18).

Mitigation for impacts to natural lakes should be given a high priority within the Councils Program (Framework Concept Paper 22).

Protect, mitigate and enhance resident fish in hydropower system storage projects to the fullest extent practicable from negative impacts associated with water releases (Framework Concept Paper 13).

Survey reservoir habitat for extant spawning locations and focus on expanding areas with existing populations (Framework Concept Paper 26).

Manage water resource to more closely mimic natural historic hydrograph (e.g., Canadian storage basin irrigation), but maintain to the extent practicable, full, stable, water levels in Lakes Roosevelt, Libby & Hungry Horse according to IRCs and Council's Fish and Wildlife Program (Tribal Vision).

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

*Limit development and use to preserve or restore natural conditions in estuaries. Provide flows to benefit estuaries in reservoir rule curves. Improve water quality. Control Caspian terns and other predators (Sample Actions).*

Protect critical estuary habitat and restore former estuary habitat (Tribal Vision). Increase the use of the estuary to allow transported smolts to mature and acclimate to fresh water conditions. Use mobile pens to hold smolts in the lower Columbia and estuary (Framework Concept Paper 27).

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).

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 (CEQ). Take additional actions based on recommendations of Lower Columbia River Estuary Program, EPA Estuary Program and Corps study (to be conducted) (CEQ).

*Remove Sand Island and Rice Island. Govern estuarine hydrology by upstream hydrology. Naturally restore estuarine habitats from shore to deep-water (Sample Action).*

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).

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 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 and analyses to evaluate relationships between ocean entry timing and SARs for transported and downstream migrants (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).

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

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

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

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):

1. Habitat mapping and priorities for protection or restoration
2. Habitat acquisition/protection
3. COE habitat restoration
4. Monitoring
5. Public education and outreach.

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

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

Research, Monitoring, and Evaluation:

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

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

1-11 Water Quality

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). Emphasize a substantial and explicit tie between water quality compliance efforts (already under court orders in three states) and salmon recovery (FC Habitat Option 2). 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).

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

Maximize the available spawning habitat of the target species by manipulation of water levels during the crucial periods of time of egg laying, incubation, and emergence of free swimming fry. Post emergence water levels must be monitored and controlled, if need be, to prevent stranding of fry and to maintain appropriate temperatures (Framework Concept Paper 12).

Maintain water quality and hydrologic processes necessary to support beneficial uses including healthy riparian, aquatic and wetland ecosystems. Water quality and hydrologic processes should be within the range of variability representative of the inherent capability of the watershed area that supports beneficial use (ICBSDEIS, B-O40). Strive to develop water quality restoration plans that apply to an entire watershed or subbasin (ICBSDEIS, B-O41). Use existing MOUs with state water quality agencies to develop partnerships that include other federal, state, local and tribal organizations, watershed councils, private citizens, and non-federal landowners, to maximize the benefits of existing efforts for water quality protection and restoration (ICBSDEIS, B-O42). Restore water quality, water quantity and hydrologic processes necessary to support healthy riparian, aquatic, and wetland ecosystems (ICBSDEIS, R-O31). Develop and implement water quality restoration plans for all impaired water bodies on Forest Service and BLM-administered lands by scheduling and implementing the 303(d) protocol (ICBSDEIS, R-O32).

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).

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 Action Table Dec. 2000).

Manage human activities to meet regional and federal air and water quality standards (Framework Alternative 1). 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). Establish a transboundary board in coordination with the International Joint Commission to improve water quantity and quality (Tribal Vision).

Research, Monitoring, and Evaluation:

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).

## 2 HARVEST

Establish harvest regimes based on escapement goals that enable recovery and restoration of all salmon and other fish and wildlife species (Tribal Vision).

Allow enough adults of each stock to escape harvest so that they can spawn and perpetuate harvestable runs over the long-term (Framework Concept Paper 1). 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).

Shift fishing effort to rivers of origin to emphasize benefits to local economies and to promote known stock fisheries (Framework Alternative 1,2,3).

Demonstrate the advantages to the other economic benefits as the salmon recovery reaches the regional goal

(Framework Concept Paper 15).

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

Secure and continue to provide harvest opportunities that meet treaty and cultural needs (Framework Concept Paper 4).

Reform the region's harvest policies to prohibit mixed stock harvest. This can be accomplished by shifting to live capture and release in areas where natural and hatchery stocks are intermingled and by emphasizing terminal fisheries where harvest can occur on known strong or hatchery stocks (Framework Concept Paper 14).

Use supplemented stocks in the mainstem to meet tribal harvest objectives (Framework Alternative 6). Meet non-Indian harvest objectives through artificial production (Framework Alternative 6).

Increase recreational and commercial harvests (Framework Alternative 2,3,4,5).

Provide ceremonial, subsistence and commercial fisheries consistent with court interpretations of Indian treaties (Framework Alternative 2,3).

Re-establish traditional tribal fisheries at all usual and accustomed fishing stations and sites (Spirit of the Salmon; Tribal Vision).

"Put fish back in the rivers" [e.g., *supplement using hatchery techniques*] in order to move toward full treaty rights (Framework Concept Paper 3).

Artificially produced fish created for harvest should not be produced unless they can be effectively harvested in a fishery (Council's 2000 Fish and Wildlife Program).

Integrate harvest management to assure that conservation efforts made in one fishery can be passed through subsequent fisheries. Revise harvest management to more adequately spread the risk of imprecision and error in predicted run size. Enact more conservative harvest limits on fisheries farthest from the spawning grounds, for which information is less adequate. Develop adequate escapement, catch and age data on important natural spawning populations. Establish in-season management protocols that can better estimate abundance and stock composition (Council's 2000 Fish and Wildlife Program).

(P)reserve, protect, and perpetuate such wildlife and provide for the citizens of this state and as by law permitted to others, continued supplies of such wildlife for hunting, fishing, and trapping (Title 36 Idaho Code).<sup>5</sup>

Opportunities for increased harvest: Each subbasin plan and hatchery management plan should identify (a) where there is an opportunity for a terminal fishery and (b) any instance in which increased harvest is possible but will not occur under the existing harvest regime, and the changes that would be necessary to allow the harvest to occur (Council's 2000 Fish and Wildlife Program).

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

Research, Monitoring, and Evaluation:

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).

## 2-1 Anadromous Fish

Reclaim the anadromous fish resource and the environment on which it depends for future generation. Restore anadromous fishes to historical abundance in perpetuity (Framework Concept Paper 3).

Within 7 years, halt the declining trends in salmon, sturgeon, and lamprey populations originating upstream of Bonneville Dam. Within 25 years, increase the total adult salmon returns of stocks originating above Bonneville Dam to 4 million annually and in a manner that sustains natural production to support tribal commercial as well as ceremonial and subsistence harvests. Within 25 years, increase sturgeon and lamprey populations to naturally sustainable levels that also support tribal harvest opportunities (Framework Concept Paper 3).

Establish Alaskan and Canadian ocean fisheries based on chinook abundance. Address incidental mortality (Spirit of the Salmon). 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). Decrease mixed stock harvest; accept economic incentives not to fish during certain migration periods (Framework Concept Paper 27).

<sup>5</sup> Idaho Department of Fish and Game fisheries management website:  
<http://www2.state.id.us/fishgame/fishplan.htm>

<b>2-2 Resident Fish</b>
<p><i>Development of a stable Upper Columbia River producing sustainable resident fish populations and harvest, equal to the level of historical (pre-dam) conditions (Sample Action).</i></p> <p>Recover fisheries within dammed natural lakes to within 75% of their historic levels prior to impoundment (Framework Concept Paper 22).</p> <p>Establish Alaskan and Canadian ocean fisheries based on chinook abundance (Framework Concept Paper 3).</p> <p>Increase the use of Youngs Bay for producing commercial and sport harvest (Framework Concept Paper 27).</p> <p>Manage harvest to protect treaty rights, and focus on meeting the needs of Zone 6 tribal fishery (Framework Concept Paper 27).</p> <p>Re-introduce anadromous salmon and steelhead above Chief Joseph and Grand Coulee dams to restore anadromous and resident fish abundance and harvest to historical levels through mitigation program or fish passage capability (Framework Concept Paper 13).</p> <p>Introduced game fish...provide sport fisheries where habitat conditions are unsuitable for native species and also provide a diversity of angling opportunity (Idaho DFG).<sup>6</sup></p>
<b>2-3 Wildlife</b>
<p><i>Support target species, especially game species, to expand hunting opportunities. Develop potential for making additional game species available for harvest. Implement and enforce state game management and hunting programs (Sample Actions).</i></p> <p>Continue monitoring wildlife populations to determine success of measures; establish post-enhancement recovery goals and limits on harvest (Tribal Vision).</p>
<b>3 HATCHERIES</b>
<p><i>Under this Policy Direction, hatchery production would be used to boost populations to sustain increased harvest. Ultimately, the goal would be to have naturally spawning populations large enough to sustain desired levels of harvest over the long term. Hatchery fish would not be marked, and the distinction between hatchery fish and wild fish would be abandoned (Sample Action).</i></p> <p>Increase reliance on careful use of hatcheries and other artificial methods of supplementation (Framework Alternative 2). Use hatcheries to make up for lost habitat (Framework Alternative 4). Use significantly more hatcheries to replace lost spawning areas (Framework Alternative 5).</p> <p>Evaluate flow augmentation components of options. 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 5).</p> <p>Use central entity to serve as clearinghouse for successful approaches to artificial production, such as spawning channels and egg boxes (Framework Concept Paper 26).</p> <p>Increase production of indigenous fish and wildlife species to full natural productivity (Framework Concept Paper 4).</p> <p>Artificial production should emphasize the protection and recovery of native stocks by using conservation management actions, such as supplementation to provide eggs and fish for out-planting (concrete to gravel to gravel) (Framework Concept Paper 4).</p> <p>Supplement under seeded natural spawning areas with hatchery production (Framework Concept Paper 27).</p> <p>Use low-cost, low technology hatchery techniques for supplementation actions (Framework Concept Paper 27).</p> <p>Use innovative release strategies to provide fishing opportunities (Framework Concept Paper 27).</p> <p>Abandon efforts to protect existing wild stocks in tributaries where there is already significant hatchery influence (Framework Alternative 7).</p> <p>Modify NMFS Evolutionarily Significant Unit (ESU) policy and increase flexibility to use artificial propagation consistent with sound conservation biology (Tribal Vision).</p>

<sup>6</sup> Idaho Department of Fish and Game fisheries management website:  
<http://www2.state.id.us/fishgame/fishplan.htm>

Except for wild salmon refuges or areas where the habitat is blocked or eliminated, supplementation of natural runs with artificially produced fish may be used for the purpose of rebuilding the natural runs, although the decision of whether to employ supplementation for this purpose is one that should be made locally, as part of the subbasin plan. The object of such supplementation is to restore and maintain a healthy fish population that eventually, after appropriate habitat improvements, will become self-sustaining. In areas where sufficient fish habitat exists but natural production is insufficient to meet demands, fish stocks may be rebuilt through supplementation. Appropriate wild stocks will be evaluated and utilized wherever possible (Council's 2000 Fish and Wildlife Program).

Use artificial production with an emphasis on protection and recovery of native fish, employing appropriate conservation management actions such as supplementation to provide eggs and juveniles for outplanting (Tribal Vision, Framework Concept Paper 4). Emphasize supplementation and captive brood programs to help maintain weak naturally spawning populations (Framework Concept Paper 27).

Discontinue current hatchery rearing and release methods. Use supplementation to help rebuild salmon populations at high demographic risk of extirpation. Use supplementation to reintroduce salmon to watersheds from which they have been extirpated (Spirit of the Salmon).

Production watersheds will be used to support artificial production through the use of modern hatcheries or other artificial methods (Framework Concept Paper 14).

Naturally selected populations should provide the model for successfully artificially reared populations, in regard to population structure, mating protocol, behavior, growth, morphology, nutrient cycling, and other biological characteristics (Council's 2000 Fish and Wildlife Program). The entities authorizing or managing an artificial production facility should explicitly identify whether the artificial propagation product is intended for the purpose of augmentation, mitigation, restoration, preservation, research, or some other combination of those purposes for each population of fish addressed (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).

Develop new hatchery production in the John Day pool to mitigate for lost habitat (Framework Alternative 2).

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).

It is time to recognize that hatcheries are used for multiple purposes, primarily producing fish for harvest but also for rebuilding naturally spawning populations through the technique of supplementation and for captive broodstock experiments. Careful thought must be given to how these techniques could maximize the efficiency of fish production to provide treaty, sport and commercial harvest opportunities while also protecting and rebuilding unique fish populations and complying with existing laws and legal processes, such as the *U.S. v. Oregon* litigation (Governors' Recommendations, July 2000).

Fully implement CRFMP (*Columbia River Fish Management Plan*) in terms of production provisions by calling upon the Policy Committee to initiate comprehensive production planning and an implementation process. The CRFMP contains authoritative provisions for production planning from both a policy and technical standpoint and includes detailed measures for dispute resolution. Because fisheries on the abundant runs produced from hatcheries are constrained by protection of weak natural stocks, and hatchery practices and funding is under attack, incentives exist to shift hatchery emphasis toward saving stocks particularly in danger of extirpation and restoring a more balanced level of production above Bonneville Dam. The tribes' technical recommendations and subbasin plans address the locations and means to accomplish this shift and the parties to *U.S. v. Oregon* are the sole parties with authority to develop comprehensive fish production plans (Spirit of the Salmon).

Reconsider the ESU interim policy on the use of propagation... While the ESU, developed in a more integrated format, may be an appropriate indicator of distinctiveness for listing purposes, it should not be used as a limitation on the recovery of a listed species in a particular habitat (Spirit of the Salmon).

Move hatcheries to tribal management, because tribes may have longer-term management focus, and will reap 50% of harvestable fish pursuant to Supreme Court Treaty interpretations, again establishing feedback loop for hatchery success (Framework Concept Paper 26). Transfer the Klickitat hatchery to the Yakama Indian Nation; the Kooskia, Clearwater, and Dworshak hatcheries to the Nez Perce Tribe; and the Lookingglass and Umatilla hatcheries to the Umatilla Tribes under authority of the Indian Self-Determination Act. Provide operation and maintenance funds for hatchery operation and for the transfer of other hatcheries as needed. Fund and implement Fish and Wildlife measures

to construct tribal production facilities. Redirect Mitchell Act propagation facility capacity and implement mitigation for John Day Dam...Because tribes retain the exclusive right to take fish on their reservations and because the hatcheries listed are located within the boundaries of their reservations or ceded areas and serve the purpose of protecting treaty fish resources, tribes are entitled to a transfer of hatchery properties along with the operation and maintenance funding to maintain them. The federal government should also transfer other hatchery facilities that may assist in restoring upper river anadromous fish populations (Spirit of the Salmon).

[F]unding of new tribal facilities required under the Fish and Wildlife Program as well as the reprogramming of the Mitchell Act and implementation of John Day mitigation are also necessary measures for restoration (Spirit of the Salmon).

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

**Intact habitat:** When the biological potential of a target population is high, biological risk should be avoided and restoration should be by means of natural spawning and rearing. When the biological potential of the target population is limited by external factors, such as the presence of mainstem dams or other factors, supplementation is a possible policy choice to augment natural capacity and productivity, in a limited fashion that ensures that the majority of production will be the result of natural spawning (Council's 2000 Fish and Wildlife Program).

**Restorable habitat:** Where the target population has low biological potential -- for example, when downstream rearing conditions severely limit the survival of juveniles from a given spawning area -- the objective will be to restore the habitat to intact condition and consider sustained but limited supplementation as a possible policy choice. Where the target population has high biological potential, the objective will be to restore the habitat to intact condition, and restore the population up to the sustainable capacity of the habitat. In this situation, if the target population had been severely reduced or eliminated as a result of the habitat deterioration, the use of artificial production in an interim way is a possible policy choice to hasten rebuilding of naturally spawning populations after restoration of the habitat (Council's 2000 Fish and Wildlife Program).

**Compromised habitat:** Where the target species has high biological potential, the objective will be to restore the habitat up to the point that the sustainable capacity of the habitat is no longer a significant limiting factor for that population. The objective also is to restore the population of the target species up to the sustainable capacity of the restored habitat. Sustained supplementation in a limited fashion is a possible policy choice in this instance. Where the target species has low biological potential, the objective will be to restore the habitat up to the point that the sustainable capacity of that habitat is no longer a significant limiting factor for that population. In this instance, a possible policy choice is expanded artificial production that utilizes the natural selection capabilities of the natural habitat to maintain fitness of both natural and artificial production (Council's 2000 Fish and Wildlife Program).

**Eliminated habitat:** Where habitat for a target population is irreversibly altered or blocked, and therefore there are no opportunities to rebuild the target population by improving its opportunities for growth and survival in other parts of its life history, then the biological objective will be to provide a substitute. In the case of wildlife, where the habitat is inundated, substitute habitat would include setting aside and protecting land elsewhere that is home to a similar ecological community. For fish, substitution would include an alternative source of harvest (such as a hatchery stock) or a substitution of a resident fish species as a replacement for an anadromous species (Council's 2000 Fish and Wildlife Program).

Research, Monitoring, and Evaluation:

Research and design artificial propagation strategies to supplement natural lamprey production, and sturgeon production above Bonneville Dam (Spirit of the Salmon; Framework Concept Paper 3). Research, develop artificial propagation actions to supplement natural lamprey production (Tribal Vision).

3-1 Anadromous Fish

*Improve hatchery operations for better survival. Coordinate operations among hatcheries to avoid conflicts and enhance survival. Add hatcheries as practicable to increase harvest (Sample Action).*

Conduct research on Pacific lamprey and design artificial propagation strategies to supplement natural production. Develop artificial propagation and management strategies for white sturgeon populations above Bonneville Dam. (Spirit of the Salmon). Make natural spawning the top priority, stocking only in accordance with the natural carrying capacities of each watershed (Framework Concept Paper 1).

Fund applied genetics research unit to restore lost size of salmonids, improve disease resistance, and improve tolerance for warmer habitat, as well as other genetic improvements that will increase salmonid abundance (Framework Concept Paper 26).

Substitution is appropriate for lost salmon and steelhead in areas that previously had anadromous fish, but where

anadromous fish access is now permanently blocked by hydropower development and where in-kind mitigation cannot occur. Substitution should occur in the vicinity of the salmon and steelhead losses being addressed, but substitution and mitigation measures may occur on or off-site (Framework Concept Paper 13).

Unify and standardize hatchery reporting obligations to single funding entity and require reporting concerning success in generate returning adults to applicable watersheds (Framework Concept Paper 26).

Use supplementation to help rebuild salmon populations at high demographic risk of extirpation and to reintroduce salmon to watersheds from which they have been extirpated (Framework Concept Paper 3).

The Corps, in coordination with USFWS, shall design and implement appropriate repairs and modifications to provide water supply temperatures for the Dworshak National Fish Hatchery that are conducive to fish health and growth, while allowing variable discharges of cold water from Dworshak Reservoir to mitigate adverse temperature effects on salmon downstream in the lower Snake River (NMFS Biological Opinion Action Table Dec. 2000).

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

Mitigation in areas blocked to salmon and steelhead by the development and operation of the hydropower system is appropriate, and flexibility in approach is needed to develop a program that provides resident fish substitutions for lost salmon and steelhead where in-kind mitigation cannot occur (Council's 2000 Fish and Wildlife Program).

[S]upplementation of natural runs with artificially produced fish may be used for the purpose of rebuilding the natural runs, although the decision of whether to employ supplementation for this purpose is one that should be made locally, as part of the subbasin plan. The object of such supplementation is to restore and maintain healthy fish populations, with sufficient genetic and life history diversity to ensure that eventually, after appropriate habitat improvements, they will become self-sustaining (Council's 2000 Fish and Wildlife Program).

### 3-2 Resident Fish

*Direct production toward most desirable game fish within limitations to maximize anadromous fish production. Maintain flexibility to alter production if consumer preferences change (Sample Action).*

Hatchery subcatchable (put-grow-and-take) and catchable (put-and-take) programs are used in other heavily-fished, public waters to provide recreational fishing opportunity, with emphasis on those areas that will allow a high proportion of hatchery-produced fish to be returned to the creel (Idaho DFG).<sup>7</sup>

Substitution: Mitigation in areas blocked to salmon and steelhead by the development and operation of the hydropower system is appropriate, and flexibility in approach is needed to develop a program that provides resident fish substitutions for lost salmon and steelhead where in-kind mitigation cannot occur (Council's 2000 Fish and Wildlife Program).

A comprehensive mitigation program of native resident fish restoration and native/non-native fish substitution; i.e., continuation and enhancement of the policies, goals and objectives documented in the Power Planning Council's 1995 Fish and Wildlife Program and the Columbia Fish & Wildlife Authority's (1997) Multi-Year Implementation Plan (Framework Concept Paper 13).

Develop adult and juvenile anadromous fish passage capabilities – exploring all possible engineering, technological, and societal means -- to circumvent the current barriers to anadromous salmon & steelhead migration at Chief Joseph and Grand Coulee dams. Concurrently re-introduce fish species and stocks that genetically and behaviorally resemble the assemblages present before the construction of the Upper Columbia River dams. Reestablishment of healthy anadromous fish populations will require artificial production facilities to establish populations while adequate habitat is filled and degraded habitat is rehabilitated (Framework Concept Paper 13).

Develop artificial propagation and management strategies for white sturgeon populations above Bonneville Dam (Framework Concept Paper 3).

For substitution purposes, resident fish may include landlocked anadromous fish (e.g., white sturgeon, kokanee and coho) as well as traditionally defined resident fish species (Framework Concept Paper 13).

Keep water levels in Libby, Roosevelt, Dworshak, and Hungry Horse reservoirs relatively full and stable (Framework Concept Paper 4).

Plant significant numbers of kokanee eggs collected by IDF&G and purchased from outside agencies in incubation protection systems throughout the southern parts of lake Pend Oreille until the gas saturation problem is corrected and

<sup>7</sup> Idaho Department of Fish and Game fisheries management website:  
<http://www2.state.id.us/fishgame/fishplan.htm>

then concentrate on restoring wild spawning in the northern part of the lake with similar strategies (Framework Concept Paper 12).

Purchase 10 million kokanee eggs from outside agencies each year until the recovery goal is reached. This would augment the Idaho Department of Fish and Game egg collection at Sullivan Springs. These eggs would increase the hatchery production of fry and provide for protected incubation planting of eggs (Framework Concept Paper 12).

Resident Fish (Non-Native) – Maintain and enhance populations in areas where native populations have been extirpated or reduced to such an extent that native species restoration is biologically or economically infeasible. Use of non-native populations as a substitute fishery serves only as a mitigative response to economic and social concerns over the uncompensable loss of native species (Framework Concept Paper 7B).

Restore native resident fish abundance and diversity by promoting a wide array of life history characteristics, maintaining, restoring and reestablishing the necessary resilience and persistence that allows human use and enjoyment of native resident populations in the face of natural environmental fluctuations and human induced sources of mortality. Restoration of native resident fish abundance occurs through (Framework Concept Paper 7B):

- Restoring depressed populations to sustainable, harvestable levels and enhancing healthy native resident fish stocks
- Reintroducing and reestablishing stocks in their traditional range, where biologically feasible and economically justifiable.

Revise the planting of fry from the Cabinet Gorge hatchery from release in the Clark Fork river to planting in the southern part of Lake Pend Oreille until the gas saturation problem that exists in the lower Clark Fork river is overcome (Framework Concept Paper 12).

Supplement wild incubation by the use of artificial protection devices [Vibrant boxes for example] to increase the egg to fry survival from normal wild survival percentages of less than 10% to over 80% survival of protected eggs to fry (Framework Concept Paper 12).

Supplement the quantity of target species eggs needed by hatcheries by purchasing eggs from other agencies. These eggs would be used in augmenting the number of emerging fry that would be expected to be produced from planting of hatchery fry and from the deposit of eggs in protected natural incubation environments. About 10 million eggs per year would need to be purchased (Framework Concept Paper 12).

Transport fry ready for release from the Cabinet Gorge hatchery to the southern parts of lake Pend Oreille whenever gas saturation in the Clark Fork river is over 100% including release at Sullivan Springs (Framework Concept Paper 12).

Protect, mitigate, enhance resident fish populations affected by construction and operation of dams. Mitigate hydrosystem effects through native fish restoration and native/non-native fish substitution (per MYIP) (Tribal Vision).

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). Conduct research on Pacific lamprey and design artificial propagation strategies to supplement natural production (Framework Concept Paper 3).

## 4 HYDRO

*Breach dams only if other measures fail to recover stocks to levels desired for harvest (Sample Action).*

The federal agencies would seek increased funding to pursue more aggressive implementation of measures to improve passage survival. This option would also include more aggressive operational measures for flow and spill (Draft All-H paper Hydro Option 2, Dec. 1999).

Apply management actions in a way that balances wildlife, anadromous and resident fish interests (Framework Concept Paper 20).

Consider all fish populations together when considering changes to hydropower system. Avoid benefiting one at the detriment of another. Fisheries must be viewed as an integrated whole, similar to the way flood control is viewed (Framework Concept Paper 22).

Our vision of the future includes the cost-effective generation of electricity in an environmentally responsible manner (Framework Concept Paper 20).

Use flow, spill, drawdowns, peak efficiency turbine operation, new turbine technology, and predator control projects to improve in-river juvenile salmon survival; avoid fluctuations caused by power peaking operations (Spirit of the Salmon). 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). *[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 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 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

At the time of the SOR, the Corps' System Configuration Study (SCS) was evaluating major structural modifications to some of the 14 federal projects in response to the NPPC's Phase 2 and Phase 3 amendments to its regional Fish and Wildlife Program. Structural measures were suggested for study during the SOR, but were not pursued because they were part of the SCS or otherwise considered beyond the scope of the SOR. These measures included:

- 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 (SOR FEIS at Chapter 4 (Detailed Fish Operating Plan (DFOP) -- SOS 9a)).

Capital improvements at the mainstem dams designed to approximate natural conditions (e.g., surface bypass) (Framework Alternative 5). Conduct advance planning for possible future actions, including dam breaching (Final All-H Paper Dec. 2000).

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

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).

Install irrigated spawning channels below dam tailraces and elsewhere to increase mainstem spawning habitat (Framework Concept Paper 26).

Remove existing extended length turbine intake screens *[at mainstem dams to reduce injury and mortality to salmonids and lamprey associated with handling, collection, barging, etc.]*; halt construction of new screens; consider removing existing standard length screens (Tribal Vision). Replace old turbines with fish-friendly turbines (Framework Alternative 7).

*[Further modify]* the configuration and operation of the hydrosystem where appropriate and necessary to benefit fish and so long as the modifications do not jeopardize the region's reliable electricity supply (Governors' Recommendations, 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, in coordination with the Regional Forum, shall determine the appropriate operating range of turbines equipped with minimum gap runners (MGRs) to increase survival of juvenile migrants passing through these new turbine designs (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete Bonneville First Powerhouse prototype evaluations of extended submerged intake and gatewell vertical barrier screens, including an assessment of fry passage (NMFS Biological Opinion Action Table Dec. 2000).

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 continue the investigation of minimum gap runners at the Bonneville First Powerhouse (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete Bonneville Second Powerhouse post-construction evaluation of the new juvenile fish bypass outfall and address design and operational refinements as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall continue Bonneville Second Powerhouse investigations of measures to improve intake screen fish guidance efficiency and safe passage through the gatewell environment. This work shall include an assessment of fry passage (NMFS Biological Opinion 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 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 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 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 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 Action Table Dec. 2000).

The Corps shall investigate surface bypass (e.g., RSW) at Lower Monumental Dam, based on prototype results at other locations, and install in multiple spillway bays, as warranted (NMFS Biological Opinion 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 Action Table Dec. 2000).

The Corps shall continue the design development, fabrication/deployment, and testing of a prototype RSW at Lower Granite, in conjunction with the existing prototype powerhouse occlusion devices, including the forebay behavioral guidance structure (BGS) and upper turbine intake occlusion devices. As warranted by prototype test results, the Corps shall install one or more permanent RSWs and occlusion devices at appropriate lower Snake hydro projects, in coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete design for new juvenile bypass facilities at Lower Granite Dam, including enlarged orifices and bypass gallery, open-channel flow bypass, improved separator for juvenile separation by size, and improved fish distribution flumes and barge-loading facilities and shall proceed to construction, as warranted (NMFS Biological Opinion 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 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 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 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 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 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 Action Table Dec. 2000).

The Corps shall continue to evaluate the need for improvements of the existing intake screens, gatewell 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 Action Table Dec. 2000).

The Corps shall complete the extended submerged intake screen systemwide letter report and implement recommended improvements (NMFS Biological Opinion 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 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 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 Lower Monumental Dam powerhouse turbines to a removable RSW surface bypass system (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall investigate ways to provide egress to adult fish that have fallen back into juvenile collection galleries and primary dewatering facilities at Ice Harbor and McNary dams. The Corps shall either install structural, or implement operational, remedies to minimize delay and injury of fish that fall back, as warranted (NMFS Biological Opinion 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 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).

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 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).

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 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 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 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 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 Action Table Dec. 2000).

The Corps shall complete the ongoing prototype powerhouse system surface collection evaluations at Bonneville First Powerhouse in 2000. The Corps shall compare the prototype with screened bypass systems and, if warranted, design and construct permanent facilities after full consideration and resolution of biological and engineering uncertainties, especially high-flow outfall investigations (NMFS Biological Opinion Action Table Dec. 2000).

Aggressive passage improvements, including specific passage upgrades for juvenile fish at individual dams. Improvements vary by location, including relocation of bypass outfalls, refined screens and bypass facilities, development of surface bypass, spillway modifications and more effective spill, improved turbine operations and design, predator management, mainstem and estuarine habitat (Final All-H Paper Dec. 2000).

Fund full COE capital and O&M programs (Final All-H Paper Dec. 2000).

The Corps shall continue design development and construction of a Bonneville Second Powerhouse permanent corner collector at the existing sluice chute, pending results of high-flow outfall investigations. The Corps shall construct new facilities if, and as soon as, evaluations confirm the optimum design configuration and survival benefits (NMFS Biological Opinion 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 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).

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).

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

#### 4-2 Hydro Operation

Maximize in-river juvenile survival via reservoir operations established in Council's 1994 Fish and Wildlife Program (Tribal Vision). Use flow, spill, drawdowns, peak efficiency turbine operations, new turbine technology and predator control to improve juvenile salmon survival. Avoid fluctuations caused by power peaking operations (Framework Concept Paper 3).

[P]rovide increased velocities for anadromous fish by establishing flow targets during the migration period (SOR FEIS Alternative 9c).

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).

*[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).

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).

#### 4-3 Spill

*Use spill as appropriate to improve survival. Increase emphasis on transport (Sample Action).*

*[Implement]* more aggressive operational measures for flow and spill. Spill at many projects may be expanded to daylight hours (Draft All-H Paper Hydro Option 2, Dec. 1999).

Use flow, spill, drawdowns, peak efficiency turbine operation, new turbine technology, and predator control projects to improve in-river juvenile salmon survival.; avoid fluctuations caused by power peaking operations (Framework Concept Paper 3).

View the cost of fishery recovery as an investment to an economic benefit for the entire regional population rather than a cost or loss of benefits of the hydroelectric projects (Framework Concept Paper 15).

Manage spill at dams to keep dissolved gas levels within federal clean water guidelines (Draft Framework Alternative 1).

Spill and/or surface bypass to achieve 80% FPE or better through non-powerhouse routes (Tribal Vision).

Specific spill percentages are established at run-of-river projects to achieve no higher than 120 percent daily average total dissolved gas (SOR FEIS Alternative 9a).

Spill is recognized as a highly effective means of passing juvenile salmon downstream, reducing the mortality associated with passage through many turbine sets and in most bypass systems. The use of spill should be improved -- in duration, timing and quantity -- at all the federal hydropower projects. Experiments testing spill benefits at different levels and times of year should be expanded, and the impacts on juvenile fish survival from these alternative spill operations, including summer spill, should be carefully monitored and evaluated (Governors' Recommendations, July 2000).

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 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 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 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 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 Action Table Dec. 2000).

The Corps shall investigate, design, and construct, as warranted, a new juvenile bypass outfall at Lower Monumental Dam. Investigations shall be conducted in conjunction with spillway deflector and spill pattern optimization studies (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies, in coordination with NMFS through the annual planning process, shall investigate the spillway passage survival of juvenile salmonids at appropriate FCRPS dams. These investigations shall assess the effect of spill

patterns and per-bay spill volumes on fish survival, across a range of flow conditions. The Action Agencies shall develop a phased approach (including costs and schedules) and set priorities, in consultation with NMFS in the annual planning process, to continue spillway passage survival studies in 2001 and future years (NMFS Biological Opinion Action Table Dec. 2000).

The Action Agencies, in coordination with NMFS through the annual planning process, shall evaluate the effect of spill duration and volume on spillway effectiveness (percent of total project passage via spill), spill efficiency (fish per unit flow), forebay residence time, and total project and system survival of juvenile steelhead and salmon passing FCRPS dams. Studies shall include both collector and non-collector projects. Adult passage considerations and potential adult fallback shall also be considered in study designs. Little Goose and Lower Granite dams shall be specifically considered for daytime spill studies. An overall phased study approach for spill evaluations will be determined in the 1- and 5-year implementation plans (NMFS Biological Opinion 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 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

Manage the river to return seasonal flow patterns for salmon and steelhead while also protecting upriver fish that don't migrate to the ocean (Framework Alternative 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).

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).

Flow augmentation should not impair resident fish program objectives in upper river system (Framework Concept Paper 27).

*[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 (Draft All-H Paper Hydro Option 2, Dec. 1999).

Alternative 9a establishes flow targets at The Dalles based upon the previous year's end-of-year storage content (SOR FEIS Alternative 9a).

Systemwide water management, including flow augmentation from storage reservoirs, should balance the needs of anadromous species with those of resident fish species in upstream storage reservoirs so that actions taken to advance one species do not unnecessarily come at the expense of other species (Council's 2000 Fish and Wildlife Program).

Flow management in the Columbia and Snake mainstems should continue as part of the mainstem strategy. Flow augmentation pursuant to state law, a key component of flow management, remains controversial. But there are ways

to reduce the controversy in the future. First, federal agencies must document the benefits of flow augmentation and the precise attributes of flow that may make it beneficial. Second, where the benefits of flow augmentation have been documented, migrating fish should be left in the river to benefit from it. Third, the region should review off-river storage for additional water if flow augmentation is going to continue to be a key strategy. Fourth, flow management should be designed to integrate all water-related statutory mandates, including not only the Endangered Species Act but also the Clean Water Act, and should consider impacts to non-anadromous listed and unlisted species. Fifth, implementation of flow management should fully account for actual water conditions so that, for example, if cool water is provided for temperature benefits, the benefits are not negated by simultaneous releases of warmer water from other sources. Sixth, additional water may be available for flow augmentation if flood control operations can be prudently altered. The Corps and NMFS should work with the region on a study to determine whether flood control rule curves can be reconfigured to allow shaping of flows to improve survival of migrating salmon and steelhead. Finally, the region should explore whether salmon benefits could be achieved through cooperative agreements regarding power peaking operations, such as those currently in place for the Hanford Reach stocks and listed chum salmon spawning below Bonneville Dam (Governors' Recommendations, July 2000).

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).

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 to provide flows to support chum salmon spawning in the Ives Island area below Bonneville Dam (NMFS Biological Opinion 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 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).

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).

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 Action Table Dec. 2000).

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 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).

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 (2,439 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).

[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).

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).

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).

Improve 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).

#### 4-5 Reservoir Levels

*Might draft lower in spring, but refill by start of summer to maximize benefits to returning adults (storage projects full by July 1). Reservoir rule curves give priority to needs of native species (Sample Action).*

*Specific volumes of releases are made from Dworshak, Brownlee, and Upper Snake River to try to meet Lower Granite flow targets. Lower Snake River projects are drawn down to near spillway crest level for 4.5 months (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). 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 5).

Install totalizing flow meters at major diversion points. For water withdrawn from reservoirs, install gauges that identify the water surface elevation range from full reservoir to dead pool elevation. Additionally, if the reservoir is located in-channel, install gauges upstream and downstream of the reservoir (Framework Concept Paper 28).

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).

Manage water resource to more closely mimic natural historic hydrograph (e.g., Canadian storage basin irrigation), but maintain to the extent practicable, full, stable, water levels in Lakes Roosevelt, Libby & Hungry Horse according to IRCs and Council's Fish & Wildlife Program (Tribal Vision). Operate reservoirs and modify water diversions to provide optimum instream flows needed by salmon and other native aquatic species (Framework Concept Paper 1).

Keep water levels in Libby, Roosevelt, Dworshak and Hungry Horse reservoirs relatively full and stable (Framework Concept Paper 4).

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)

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).

Keep water levels in Libby, Roosevelt, Dworshak and Hungry Horse reservoirs relatively full and stable (Framework Concept Paper 4).

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).

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).

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 Action Table 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).

If Koochanusa 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 Koochanusa 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 Koochanusa 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).

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).

[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).*

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).

Require Washington Water Power Company to install systems on Cabinet Gorge and Noxon Rapids dams to reduce nitrogen gas saturation to 110% by the year 2001 (Framework Concept Paper 12).

Require the installation of devices or modify dam operations that will result in the reduction of nitrogen gas saturation to a maximum of 110%. This strategy must be accompanied with a monitoring system that will verify the gas saturation does not exceed accepted levels. This must apply to all federal dams and dams that are not owned by a federal agency, but are installed on waters that fall within the definition of the Columbia river drainage basin regardless of which state or states the targeted body of water is in and the location of the dam (Framework Concept Paper 12).

Reduce water temperature and abate total dissolved gas to comply with CWA (Tribal Vision). 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). 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 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 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).

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 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 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).

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).

By June 30, 2001, the Action Agencies shall develop and coordinate with NMFS and EPA on a plan to model the water temperature effects of alternative Snake River operations. 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 project operations (NMFS Biological Opinion Action Table Dec. 2000).

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 Action Table Dec. 2000).

Improve water quality while meeting fish passage objectives, and development of a Water Quality Improvement Plan for dissolved gas and temperature (Final All-H Paper 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).

#### 4-7 Juvenile Fish Passage and Transportation

Make use of fish transportation as appropriate (Framework Alternative 5). Consistent with our preference to emphasize and build upon natural processes, we believe strategies and actions should be implemented that provide the best

possible survival for fish that migrate in the river through the reservoirs and past the dams. We recognize that in the short term there are survival benefits from continuing to use fish transportation as a transitional strategy. However, we believe that when ongoing research affirms that survival of listed salmon populations would increase from migration in an improved river environment, an increasing number of juvenile fish should then be allowed to migrate inriver. An immediate evaluation is also necessary of survival rates for fish transported by trucks compared to barges. If survival is lower in trucks and barging is an available alternative, then trucking should be discontinued (Governors' Recommendations, July 2000).

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).

Incorporate juvenile and adult salmon passage facilities on all water diversions (Framework Concept Paper 28).

Investigate the use of surface collectors and other devices to enhance guidance at dams (Framework Concept Paper 25).

**MANAGEMENT ACTION FOR STRATEGY #2:** To minimize trial expense, choose the shortest reservoir on the Columbia for testing the viability of artificially impelling a stream of water along both edges of the reservoir to simulate the movement of water that took place along the original river banks, both sweeping smolt downstream and guiding adult salmon upstream (Framework Concept Paper 18).

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 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 (NMFS Biological Opinion 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 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 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 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 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 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 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 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 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 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 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).

Research, Monitoring, and Evaluation:

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).

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 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 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).

#### 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; Framework Concept Paper 20).

Use stored cold water, additional ladders, ladder improvements and ladder maintenance to enhance mainstem adult passage; incorporate 24-hour video fish counting (Spirit of the Salmon). Restore salmon and steelhead passage into upper portions of the basin at Chief Joseph, Grand Coulee, and Hells Canyon dams (Framework Alternative 1).

The feasibility of reintroduction, including an evaluation of the existing habitat, is being investigated as part of the Federal Energy Regulatory Commission (FERC) relicensing process for the Hells Canyon complex. While mindful of the challenges involved, options and costs should continue to be assessed as part of the relicensing process. A similar challenge confronts reintroduction of migrating salmonids above Chief Joseph and Grand Coulee dams, particularly above Grand Coulee. Nevertheless, encourage work currently under way to assess the possibility (Governors' Recommendations, July 2000).

MANAGEMENT ACTION FOR STRATEGY #2: To minimize trial expense, choose the shortest reservoir on the Columbia for testing the viability of artificially impelling a stream of water along both edges of the reservoir to simulate the movement of water that took place along the original river banks, both sweeping smolt downstream and guiding adult salmon upstream (Framework Concept Paper 18).

Develop adult and juvenile anadromous fish passage capabilities—exploring all possible engineering, technological, and societal means—to circumvent the current barriers to anadromous salmon and steelhead migration at Chief Joseph and Grand Coulee dams. Concurrently re-introduce fish species and stocks that genetically and behaviorally resemble the assemblages present before the construction of the Upper Columbia River dams. Reestablishment of healthy anadromous fish populations will require artificial production facilities to establish populations while adequate habitat is filled and degraded habitat is rehabilitated (Framework Concept Paper 13).

Incorporate juvenile and adult salmon passage facilities on all water diversions (Framework Concept Paper 28).

MANAGEMENT ACTION FOR STRATEGY #1: To minimize trial expense, choose a low rise dam at the lower end of the Columbia for testing the viability of new kind of fish ladder which features side by side pool strings moving in opposite direction in which the weight of one string counterbalances the weight of the other to minimize the expenditure of energy needed to move adult salmon up and smolt down from reservoir to reservoir, past the dam. Once the best size/speed etc. has been found, apply it to the remaining dams on the Columbia (Framework Concept Paper 18).

Use new and existing information to expand salmon passage models to cover entire salmon lifecycle (Framework Concept Paper 26).

To benefit salmon migrants, both upstream and downstream, expedited schedules should be established to design and install passage improvements (Governors' Recommendations, July 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 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 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 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 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).

Research, Monitoring, and Evaluation:

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 Action Agencies shall conduct a comprehensive evaluation to assess survival of adult salmonids migrating upstream and factors contributing to unaccounted losses (NMFS Biological Opinion Action Table Dec. 2000).

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 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 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 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 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 (NMFS Biological Opinion 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 it, as warranted (NMFS Biological Opinion 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 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 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 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 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 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 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 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 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 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 Action Table Dec. 2000).

The Corps shall complete adult fishway auxiliary water supply evaluations at each lower Snake River hydro project and implement corrective measures as warranted (NMFS Biological Opinion 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 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 Action Table 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 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).

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).

Implement VarQ flood control/storage at Libby Dam by October 2001 (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 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).

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). 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).

#### Research, Monitoring, and Evaluation:

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 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).

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

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 six 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 four 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).

## COMMERCE

### 5. POWER

#### 5-1. Existing Generation

*Hydropower generation continues. Minimizing spill, which corresponds to maximum transport, may result in increased power generation; however, other measures implemented to aid fish may decrease power generation (Sample Action).*

Avoid fluctuations caused by power peaking operations (Framework Concept Paper 3).

On the Columbia, implement normative changes in operations (as defined by the Independent Scientific Advisory Board in "Return to the River"), improving in-river migration for salmon. Secure Canadian storage on upper Columbia to augment flows in spring and summer. From Priest Rapids downstream, normative steps include meeting flow minimums and 24-hour spill during the spring migration. Implement Integrated Rule Curves (IRCs) at all storage projects and 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. Shift regional energy "peaking" or "load following" to Upper Columbia projects, primarily Grand Coulee and Chief Joseph, and to other USACE facilities. Shape the timing and volume of combined discharges from the various projects to adhere to desired flood control requirements and the needs of resident fish, while simultaneously providing a protracted flow event to speed smolt outmigration. The more natural hydrograph enhances resident fish and wildlife in all affected waters. (OPR: NMFS/USACE) (Framework Concept Paper 2).

#### 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 (Sample Action).*

*Research and develop energy alternatives such as photovoltaics, wind energy, biomass-derived fuels and chemicals, energy-efficient buildings, advanced vehicles, solar manufacturing, industrial processes, solar thermal systems, hydrogen fuel cells, superconductivity, geothermal and waste-to-energy technologies (e.g., National Renewable Energy Laboratories programs) (Sample Action).*

#### 5-3. Transmission Reliability

*If spill is minimized and generation increases from the status quo, the transmission reinforcement actions that have been undertaken (Schultz-Hanford and West of Hatwai projects) would become unnecessary to maintain reliability. If the backstop option of dam removal were implemented, it would trigger the transmission projects listed above, plus others listed in the Natural Focus Policy Direction (Sample Action).*

*Changes in vegetation maintenance practices to meet habitat requirements would require constant monitoring and reductions in transmission capability. Transmission reliability could be sacrificed as unmaintained 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). Costs increase for routine maintenance practices as additional objectives are met, but less than under the Weak Stock Focus Policy Direction (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).

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 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).

Amend the Federal Power Act to require FERC to approve the formation of and oversee a private self-regulatory organization that prescribes and enforces mandatory reliability standards; to provide FERC with the authority to require transmitting utilities to turn over operational control of transmission facilities to an independent system operator; and to encourage the development of regional transmission planning and siting groups (e.g., DOE's Comprehensive Electricity Competition Plan).

## 6. INDUSTRY

### 6-1. Industrial Growth

*Incentives for clean industry, limit new development on riparian or natural lands by buying land or conservation easements (Sample Action).*

Encourage and facilitate programs for pollution credit trading (<http://www.thecarbontrader.com/news37.009.htm>).

### 6-2. Aluminum and Chemical

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

Encourage and facilitate programs for pollution credit trading (<http://www.thecarbontrader.com/news37.009.htm>).

### 6-3. Mining

*Actively restore mining sites to assist fish stocks. New mining operations would be sensitive to sustainable use (Sample Action).*

### 6-4. Pulp and Paper

*Manage or eliminate discharges to assist stocks (Sample Action).*

Provide incentives to modify facilities to be oxygen-based, closed-loop pulp mills so that they are chlorine-free zero-discharge (<http://www.rfu.org/PulpPrimer.htm>).

## 7. TRANSPORTATION

### 7-1. Navigation and Barging

*Manage channel dredging to assist stocks (Sample Action).*

### 7-2. Trucking and Railroads

*Maintain and improve existing railroads and trucking facilities to complement the barging industry along the rivers. Practice environmental impact avoidance, minimization, and mitigation when expanding transportation facilities to meet increasing demand. Compensate for navigation and barging losses in the event that hydro operations need to be modified to address threatened and endangered species (Sample Actions).*

## 8. AGRICULTURE

*Protect and enhance habitat to provide management, such as connecting fragmented habitats, obtaining conservation easements on private lands, and educating the public (Sample Action).*

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).

Halt any further impairment of wetlands. Prevent additional soil compaction. Prevent removal of riparian vegetation. Prohibit activities that would contribute to the creation or maintenance of peak flows earlier or greater than those that

would occur naturally (Spirit of the Salmon).

Implement actions to create wetlands, e.g., re-introduction of beavers. Implement actions needed to promote re-vegetation of riparian areas and de-compaction of soils where recovery is not occurring naturally. If necessary, initiate land management designed to return a watershed to a natural hydrologic regime, e.g., re-vegetation of areas adversely affected by past land-disturbing activities (Spirit of the Salmon).

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 *[expanding and]* 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 (e.g., Washington Forests & Fish model) (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).

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; Spirit of the Salmon). Support water acquisitions using federal funding (Final All-H Paper Dec. 2000).

Screen water diversions on all fish-bearing streams (Framework Concept Paper 28). Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

*Emphasize preservation, fallow, management, and active restoration. Limit new irrigation, especially on lands with hydrologic connectivity. Fallow land in dry years above dewatered tributaries. Use screening, improved efficiency, and positive incentives for management. Acquire conservation easements. Perform active restoration to connect fragmented habitats (Sample Action).*

Meter groundwater and surface water withdrawals (Spirit of the Salmon).

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 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 Action Table 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). 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).

*Use federal and state cost-share programs to (i) provide incentives for farmers to establish riparian buffers to protect and restore stream habitat; (ii) restore farmed wetlands that will benefit salmonids; and (iii) provide a mechanism for farmers to comply with state laws [e.g., Oregon's Senate Bill 1010 (1993 Or. Laws, ch. 263)].*

### 8-3. Grazing

Manage grazing 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).

*Use federal and state cost-share programs to (i) provide incentives for ranchers to establish riparian buffers to protect and restore stream habitat; (ii) restore grazed wetlands that will benefit salmonids; and (iii) provide a mechanism for ranchers to comply with state laws [e.g., Oregon's Senate Bill 1010 (1993 Or. Laws, ch. 263)].*

### 8-4. Forestry

*Reduce and manage timber harvest. Acquire conservation easements to connect habitat (Sample Action).*

Implement federal and state strategies to reduce the risk of catastrophic wildfires (e.g., the Western Governor's Association's draft Ten-year Comprehensive Strategy for Restoring Health to Fire-Adapted Ecosystems).

Promote sustainable [harvest] while providing for...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).

## 9. COMMERCIAL HARVEST

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).

Establish harvest regimes based on escapement goals that enable recovery and restoration of all salmon and other fish and wildlife species (Tribal Vision).

Allow enough adults of each stock to escape harvest so that they can spawn and perpetuate harvestable runs over the long-term (Framework Concept Paper 1).

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 fishing effort to rivers of origin to emphasize benefits to local economies and to promote known stock fisheries (Framework Alternative 1,2,3).

Impose sanctions on nations that illegally catch salmon and steelhead (Framework Concept Paper 1).

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).

## 10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Use tools and incentives in local planning ordinances and state laws to ensure that development is environmentally sensitive (LCREP).

Assess the potential impacts of proposed development. Identify cumulative impacts and habitat attributes that might be lost. Present preferred 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.

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).

## 11. RECREATION

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).

Establish harvest regimes based on escapement goals that enable recovery and restoration of all salmon and other fish and wildlife species (Tribal Vision).

Allow enough adults of each stock to escape harvest so that they can spawn and perpetuate harvestable runs over the long-term (Framework Concept Paper 1).

Determine the relationship of the targeted resident fish species population dynamics and its predators, including sports harvest. This should include an estimation of the level of harvest that could be sustained while the population is in the recovery stages, as well as at the recovery level (Framework Concept Paper 12).

Shift fishing effort to rivers of origin to emphasize benefits to local economies and to promote known stock fisheries (Framework Alternative 1,2,3).

## 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). Modify the existing basin-wide mechanisms of the Columbia River Fish Management Plan (CRFMP), the Fish and Wildlife Program, and FERC Orders to more fully implement treaty fishing rights to take fish at all usual and accustomed fishing places. Use the Endangered Species Act in a manner that is consistent with implementation of treaty rights to natural resources (Spirit of the Salmon).*

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).

Restore salmonid abundance and diversity to sustainable levels, allowing Columbia Basin populations to reach tribal treaty harvest objectives. Rebuild self-sustaining populations of sturgeon and lamprey throughout their historic range, if possible, to restore the cultural value of these populations (Framework Concept Paper 7B).

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).

Modify NMFS Evolutionarily Significant Unit (ESU) policy and increase flexibility to use artificial propagation consistent with sound conservation biology (Tribal Vision).

Manage harvest to achieve escapement of adults to spawning grounds; revise escapement goals (Framework Concept Paper 27).

Support habitat protection and enhancement through land acquisitions, land trusts, conservation easements, etc. (Tribal Vision).

### 12-2. Tradition, Culture, Spirituality

*Actively restore ecosystem health and 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).

Recognize native plant communities as traditional resources that are important to tribes and an essential component to treaty-reserved gathering rights (ICBSDEIS, B-O45). Support federally recognized tribes’ and tribal communities’ subsistence needs to the greatest extent practicable (ICBSDEIS, B-O61). Better understand and incorporate into federal land management how places are valued by American Indians (ICBSDEIS, B-O69).

**SAMPLE IMPLEMENTATION ACTIONS**  
**FOR THE**  
**STRONG STOCK FOCUS POLICY DIRECTION**

Emphasizes *human intervention to avoid declines* of healthy fish stocks and strong wildlife populations into weakened conditions requiring legal protection.

**FISH & WILDLIFE**

**1 HABITAT**

Emphasis (top priority) will be applied to protecting and expanding existing healthy core populations [*and the healthiest habitat*] (Framework Concept Paper 4; Framework Concept Paper 20). Continue protection of habitat that is already protected by local laws, such as water quality standards, discharge permits, fish and wildlife passage requirements, etc. (Framework Concept Paper 4). The ecosystem increases currently productive fish and wildlife species (Framework Alternative 2,3,4,5). Strong salmon and steelhead runs increase in number and inhabit more of the river system (Framework Alternative 6).

The first step towards moving back to a balanced ecosystem is recognition of the fact that it cannot be allowed to get any worse. This is the essence of taking a proactive, rather than reactive stance to ecosystem management. We define this as a 'no further impact' scenario. A 'no-further impact' scenario will have certain defined parameters. These are generally described by the regulations. For example, nitrogen concentrations cannot exceed the current value of x mg/L, and impervious surface in the Basin will not exceed current levels (Framework Concept Paper 16).

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 time has come to take a proactive versus reactive approach to ecosystem management. This translates into thinking about how to prevent degradation from occurring, rather than mitigating it after the damage has been done (Framework Concept Paper 16).

Use computer metapopulation models to predict extinction probabilities for listed stocks, and annually reassess extinction probabilities to reconsider listing decisions (Framework Concept Paper 25; Framework Concept Paper 26).

The first step towards moving back to a balanced ecosystem is recognition of the fact that it cannot be allowed to get any worse...this [*is*] a 'no further impact' scenario (Framework Concept Paper 16). Where there is no recovery plan, either because one has yet to be developed, or the species status is so dire that no feasible plan can be determined, the action must avoid adverse effects to listed individuals and their habitat to the greatest extent possible and provide offsetting mitigation for those adverse effects that could not be avoided (Draft Biological Opinion).

Enhance conditions for currently productive (as opposed to solely native) fish and wildlife populations (Framework Alternative 6). Protect remaining good quality habitat throughout the Columbia Basin (Framework Concept Paper 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). Stop government programs that allow or promote development in sensitive floodplains (Tribal Vision). Increase habitat connections throughout the basin (Framework Alternative 5). Protect existing high-quality habitats (Draft All-H paper, Dec. 1999). Prevent degradation from occurring, rather than mitigating it after the damage has been done (Framework Concept Paper 16).

Efforts to improve the status of fish and wildlife populations in the Basin should focus first on habitat that supports existing populations that are healthy and productive. Next, we should expand adjacent habitats that have been historically productive or have a likelihood of sustaining healthy populations by reconnecting or improving habitat. In a similar manner, this strategy applies to the restoration of weak stocks: the restoration should focus first on the habitat where portions of that population are doing relatively well, and then extend to adjacent habitats (Council's 2000 Fish and Wildlife Program).

Moderately increase efforts to protect and restore habitat. The federal agencies would focus on federal land management, federal immediate actions and on improved coordination of federal funding for non-federal actions.

This option does not seek significant new commitments from state, tribal and local governments. However, it would build on existing watershed efforts wherever available (Draft All-H Paper Habitat Option 1, Dec. 1999).

The Forest Service and BLM propose to develop and implement a coordinated, scientifically sound, broad-scale, ecosystem-based management strategy for lands they administer in the ICBEMP project area (ICBSDEIS). The actions focus "on restoring and maintaining ecosystems across the project area and providing for the social and economic needs of people while reducing short- and long-term risks to natural resources from human and natural disturbances." Conserve current aquatic and riparian habitats that support important native fish population centers. This includes maintenance of hydrologic, riparian and instream processes and functions; water quality; connectivity; and noxious weed control (ICBSDEIS, A1-O1).

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).<sup>1</sup>

The Action Agencies, in coordination with NMFS, USFWS, and other federal agencies, NPPC, states, and tribes, shall develop a common data management system for fish populations, water quality, and habitat data (NMFS Biological Opinion Action Table 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 basinwide 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).

Intact habitat: Where the habitat for a target population is largely intact, then the biological objectives for that habitat will be to preserve the habitat and restore the population of the target species up to the sustainable capacity of the habitat. When the biological potential of a target population is high, biological risk should be avoided and restoration should be by means of natural spawning and rearing (Council's 2000 Fish and Wildlife Program).

Restorable habitat: Where the habitat for a target population is absent or severely diminished, but can be restored through conventional techniques and approaches, then the biological objective for that habitat will be to restore the habitat with the degree of restoration depending on the biological potential of the target population. Where the target population has high biological potential, the objective will be to restore the habitat to intact condition, and restore the population up to the sustainable capacity of the habitat. In this situation, if the target population had been severely reduced or eliminated as a result of the habitat deterioration, the use of artificial production in an interim way is a possible policy choice to hasten rebuilding of naturally spawning populations after restoration of the habitat (Council's 2000 Fish and Wildlife Program).

#### 1-1 Anadromous Fish

"The truth is that there is no acceptable way that we can come into compliance with the Endangered Species Act as it relates to salmon in the entire Columbia River System. The truth is that we are simply unwilling to come to grips with the issue that we have, probably irrevocably, decided that the Columbia River is a working river harnessed to provide the cheapest electrical energy in the world—and, simply, we ain't about to give that up. The truth is that playing games with various combinations of attempts to assuage limiting factors for the salmon will not do the job—and we know it. If we frankly admit that we cannot obey the law, we are free to do the best we can to save the remnant populations. That can be done through a combination of directing money and resources to the places they will do the most good, and letting people off the hook who have nothing to do with those efforts" (Dr. Jack Ward Thomas, speaking to the Columbia River Conference IV, March 16 & 17, 2000).

No further hydroelectric development in habitat that supports anadromous or resident salmonids (Framework Concept Paper 5). Protect quality riverine, riparian, and upland habitat that currently sustains viable salmonid populations, and afford the highest protection to relatively undamaged habitats ("refuge" habitat) (Framework Concept Paper 5).

<sup>1</sup>Incentives for Species (by Brett Schaerer); Thoreau Institute:

<http://www.teleport.com/~rot/schaerer.html#RTFToC2>

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Protect quality riverine, riparian, and upland habitat that currently sustains viable salmonid populations (e.g., the Columbia River's Hanford Reach for fall chinook or the Clearwater and Salmon subbasins for westslope cutthroat and spring/summer chinook); afford the highest protection to pristine and relatively undamaged habitats ("refuge" habitat) whether through existing federal and state laws and regulations, or new legislation (Framework Concept Paper 5).

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. 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 (Dr. Jack Ward Thomas, speaking to the Columbia River Conference IV, March 16 & 17, 2000).

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).

These policies need to be considered in the context of the natural conditions of the Columbia River Basin as it now exists. In most places, this ecosystem is significantly altered from the time when Europeans began inhabiting the basin more than 150 years ago. This means that fish populations adapted to the original "natural" conditions of the Columbia basin may not be the same as those that are now or could be naturally produced. This does not mean that habitat will not be improved to be more productive for native fish populations and species, but only that the original habitat conditions are not achievable in the foreseeable future. Therefore, when these policies speak of natural conditions, they are referring to current or foreseeable improvements in the existing, altered ecosystem (Council's Artificial Production Review, October 1999, Section II.D).

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).

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).

BOR shall initiate programs in three priority subbasins (identified in the Conceptual Recovery Plan) per year over 5 years, in coordination with NMFS, USFWS, the states and others, to address all flow, passage, and screening problems in each subbasin over 10 years. The Corps shall implement demonstration projects to improve habitat in subbasins where water-diversion-related problems could cause take of listed species. Under the NPPC 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 NPPC process to complement BOR actions described in the action above (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 investigate the causes of discrepancies in adult return rates for juvenile salmonids that have different passage histories through the hydrosystem (NMFS Biological Opinion Action Table Dec. 2000).

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

1-2 Resident Fish
<p>Above the dams that block salmon and steelhead migration, tailor programs to provide resident fish and wildlife required by local conditions and management needs (Framework Alternative 2, 4, 5). Maximize the available spawning habitat of the target species by manipulation of water levels during the crucial periods of time of egg laying, incubation, and emergence of free swimming fry. Post emergence water levels must be monitored and controlled, if need be, to prevent stranding of fry and to maintain appropriate temperatures (Framework Concept Paper 12).</p> <p>Avoid further hydroelectric development in habitat that supports...resident salmonids (Framework Concept Paper 5).</p> <p>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).</p>
1-3 Introduced Species
<p><i>If introduced species are thriving (and not threatening other healthy native species), their habitat conditions would be maintained (Sample Action).</i></p>
1-4 Wildlife
<p><i>If wildlife species are thriving (and not threatening other healthy native species), their habitat conditions would be maintained (Sample Action).</i></p> <p>Protect, mitigate, and enhance wildlife populations with continual operations and maintenance; achieve little or no risk of long-term degradation (Tribal Vision).</p> <p>Select fish and wildlife measures for implementation based on cost-effectiveness analysis to maximize the public benefit from expenditures of finite salmon recovery funds (Framework Concept Paper 25).</p> <p>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).</p> <p>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).</p>
1-5 Predators of Anadromous Fish
<p>Increase the amount of riparian vegetation that will provide shade, which lowers water temperature and reduces threat of predators (Framework Concept Paper 1).</p> <p>Plant vegetation that discourages nesting of terns at Rice Island and the peninsula at the mouth of the Walla Walla River (Framework Concept Paper 11).</p> <p><u>Research, Monitoring, and Evaluation:</u></p> <p>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).</p>
1-6 Watersheds
<p><i>Manage watersheds to improve survival success of targeted species. Actively restore watersheds where currently productive populations exist. Coordinate reservoir operation across the watershed subbasins to achieve a protracted runoff event to aid anadromous species. Land and water users and managers should meet specified habitat conditions associated with salmon survival rates for targeted species (Sample Actions).</i></p> <p>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).</p> <p>Before entering into any agreement to commit currently uncontracted water or storage space in any of its reservoirs</p>

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 Action Table Dec. 2000).

BPA shall work with the NPPC 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).

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).

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).

#### 1-7 Tributaries

*Prioritize habitat restoration and maintenance at stream reaches inhabited by healthy stocks (Sample Action).*

Efforts to improve the status of fish and wildlife populations in the basin should focus first on habitat that supports existing populations that are healthy and productive. Next ...expand adjacent habitats that have been historically productive or have a likelihood of sustaining healthy populations by reconnecting or improving habitat. In a similar manner, this strategy applies to the restoration of weak stocks: the restoration should focus first on the habitat where portions of that population are doing relatively well, and then extend to adjacent habitats (Council's 2000 Fish and Wildlife Program).

For currently productive species and their associated habitats (Framework Alternative 1,4; Framework Concept Paper 2):

- Protect, connect, and restore habitat on the tributaries throughout the basin
- Test the effectiveness of restoring habitat in tributary watersheds
- Maintain and improve egg-to-smolt survival in natal tributaries.

Management Actions: Courses of action to protect instream flows in small streams and tributaries must recognize that control of these particular water resources often lies with individual water right holders, and that what the holder has a right to do is divert water from the stream. Other activities to restore streams and associated riparian and upslope conditions will have little if any effect on aquatic habitat if there is no water. Furthermore, even if such other activities result in more water in the stream, rights to divert the increased flow may be held by a prior appropriator. To meet the objectives of restoring and protecting instream flows, water right holders must take action under applicable state water laws to create instream water rights (Framework Concept Paper 17).

Declare specific tributaries (e.g., John Day River) "off-limits" to hatcheries to provide buffers against asserted genetics problems with hatchery production. Designate tributaries with extensive hatchery influence as "production/supplementation" tributaries and abandon efforts to protect existing wild stocks in such tributaries (Framework Concept Paper 26).

A simultaneous focus on both strong and weak stocks of fish will encourage natural straying that can be combined with managed supplementation to enhance weakened naturally spawning stocks in all watersheds where natural spawning is feasible. The needs of other fish and wildlife species need to be considered and balanced with management actions taken to protect and enhance threatened or endangered species (Framework Concept Paper 14).

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).

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).

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).

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).

Fund and evaluate innovative approaches to flow restoration (BPA) (Final All-H Paper Dec. 2000). Work with states to secure and protect minimum flows with a federal nexus (FS, BLM) (Final All-H Paper Dec. 2000). Provide technical assistance to state instream flow work (USGS, USBR) (Final All-H Paper Dec. 2000). Establish in-stream flows for anadromous fish tributaries within five years (Final All-H Paper Dec. 2000).

Support TMDL development and implementation (BPA) (Final All-H Paper Dec. 2000). Provide TMDL technical assistance to states (Final All-H Paper Dec. 2000). Develop and implement TMDLs for anadromous fish tributaries within five years (Final All-H Paper Dec. 2000). Coordinate TMDL and Water Quantity planning assessments with Northwest Power Planning Council program (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).

#### 1-8 Mainstem Columbia

Restore productive normative river segments in the mainstem Columbia and Snake Rivers (Framework Concept Paper 5). Protect, conserve, restore, and enhance identified habitats, particularly wetlands, on the mainstem of the lower Columbia River (LCREP; Final All-H Paper Dec. 2000).

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; Final All-H Paper Dec. 2000).

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).

#### 1-9 Reservoirs

*Run reservoirs seasonally to increase survival of currently productive populations (Sample Action).*

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 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

*Limit development. Maintain and preserve existing conditions and habitat quality in estuaries. Maintain water quality (Sample Actions).*

*Remove Sand Island and Rice Island. Govern estuarine hydrology by upstream hydrology. Restore natural estuarine habitats from shore to deep-water (Sample Action).*

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).

The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1- and 5-year plans for habitat measures that provide offsite migration (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).

Facilitate Lower Columbia River Estuary Program implementation and strengthen Lower Columbia River Estuary Program authority (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).

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
- Public education and outreach.

*Research, Monitoring, and Evaluation:*

Expand knowledge and understanding of the ocean and Columbia River estuary (Framework Concept Paper 27). Implement monitoring and evaluation program (Final All-H Paper Dec. 2000).

1-11 Water Quality

*Establish standards to protect healthy stocks. Identify and manage releases of cumulative toxins (Sample Actions).*

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 (Spirit of the Salmon).

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).

Work with states to secure and protect minimum flows w/federal nexus (FS, BLM) (Final All-H Paper Dec. 2000).

2 HARVEST

Maintain salmonid 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 adults of each stock to escape harvest so that they can spawn and perpetuate harvestable runs over the long-term (Framework Concept Paper 1).

“Put fish back in the rivers” (e.g., hatchery supplementation) in order to mover toward full treaty rights (Framework Concept Paper 3).

Use supplemented [salmon] stocks in the mainstem to meet tribal harvest objectives (Framework Alternative 6). Meet non-Indian harvest objectives through artificial production (Framework Alternative 6).

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).

Within 7 years, halt the declining trends in salmon, sturgeon and lamprey populations originating upstream of Bonneville Dam. Within 25 years, increase the total adult salmon returns of stocks originating above Bonneville Dam to 4 million annually and in a manner that sustains natural production to support tribal commercial as well as ceremonial and subsistence harvests. Within 25 years, increase sturgeon and lamprey populations to naturally sustainable levels that also support tribal harvest opportunities (Framework Concept Paper 3).

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

2-1 Anadromous Fish

*Set harvest levels to sustain healthy populations at least at current levels. Let weak stocks recover as they are able to benefit from actions to maintain healthy stocks (Sample Actions).*

A simultaneous focus on both strong and weak stocks of fish will encourage natural straying that can be combined with managed supplementation to enhance weakened naturally spawning stocks in all watersheds where natural spawning is feasible. The needs of other fish and wildlife species need to be considered and balanced with management actions taken to protect and enhance threatened or endangered species (Framework Concept Paper 14).

*[Manage]* Alaskan and Canadian ocean fisheries based on chinook abundance (Spirit of the Salmon). 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).

Set escapement objectives for fish by population per watershed (Framework Concept Paper 20).

Emphasis (top priority) will be applied to protecting and expanding existing healthy core populations (Framework Concept Paper 20).

Larger salmonid metapopulations will be used as the level of genetic organization to be conserved (Framework Concept Paper 20).

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 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 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 Action Table 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).

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).

Research, Monitoring, and Evaluation:

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

2-2 Resident Fish

*Maintain or increase populations of economically and/or culturally significant resident fish, including introduced species (Sample Action).*

Determine the relationship of the targeted resident fish species population dynamics and its predators, including sports harvest. This should include an estimation of the level of harvest that could be sustained while the population is in the recovery stages, as well as at the recovery level (Framework Concept Paper 12).

2-3 Wildlife

*Manage wildlife to keep existing species healthy for continued sport and tribal hunting (Sample Action).*

3 HATCHERIES

*Protect and expand existing healthy core populations (Sample Action).* Use hatcheries and other propagation programs only as part of a broader, ecosystem-based plan (Framework Concept Paper 1).

*Protect healthy stocks to maintain or increase population. Operate hatcheries to supplement healthy populations as necessary and to serve demand for harvest (Sample Actions).*

A simultaneous focus on both strong and weak stocks of fish will encourage natural straying that can be combined with managed supplementation to enhance weakened naturally spawning stocks in all watersheds where natural spawning is feasible. The needs of other fish and wildlife species need to be considered and balanced with management actions taken to protect and enhance threatened or endangered species (Framework Concept Paper 14).

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

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).

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

When the biological potential of a target population is high, biological risk should be avoided and restoration should be by means of natural spawning and rearing (Council's 2000 Fish and Wildlife Program). If the target population had been severely reduced or eliminated as a result of the habitat deterioration, the use of artificial production in an interim way is a possible policy choice to hasten rebuilding of naturally spawning populations after restoration of the habitat (Council's 2000 Fish and Wildlife Program).

### 3-1 Anadromous Fish

*Use hatcheries as practicable to strengthen (supplement) runs. Maintain or reduce hatcheries as necessary to supply fish for harvest without compromising healthy and potentially healthy stocks (Sample Action).*

Modify NMFS Evolutionarily Significant Unit (ESU) policy and increase flexibility to use artificial propagation consistent with sound conservation biology (Tribal Vision).

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).

The Corps, in coordination with USFWS, shall design and implement appropriate repairs and modifications to provide water supply temperatures for the Dworshak National Fish Hatchery that are conducive to fish health and growth, while allowing variable discharges of cold water from Dworshak Reservoir to mitigate adverse temperature effects on salmon downstream in the lower Snake River (NMFS Biological Opinion Action Table Dec. 2000).

### 3-2 Resident Fish

*Use hatcheries as practicable to strengthen (supplement) healthy populations. Maintain hatcheries as necessary to supply fish for harvest without competing with healthy stocks (Sample Actions).*

## 4 HYDRO

### 4-1 Dam Modifications and Facilities

*Retain existing dams (Sample Action).* Build no new dams in salmon and steelhead habitat (Framework Concept Paper 1).

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

#### Research, Monitoring, and Evaluation:

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 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 Action Table Dec. 2000).

4-2 Hydro Operation
<p><i>Continue existing operations, except to discontinue operations designed to aid weak stocks (Sample Action).</i></p> <p><i>SOR FEIS Alternative 1a represents operations as they existed from 1983 through 1990 to 1991 operating year, including Northwest Power Act provisions to restore and protect fish populations in the basin. Hydro operations to benefit fish and wildlife would likely be similar to those before the first fish populations in the basin were listed as endangered (i.e., prior to 1991) (Sample Action).</i></p>
4-3 Spill
<p><i>Meet current TDG standards. Spill if proved beneficial for healthy stocks (Sample Action).</i></p> <p>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 Action Table Dec. 2000).</p>
4-4 Flow
<p><i>Augment flows only if proved beneficial, then schedule flow augmentation to fit with migration of healthy stocks (Sample Action).</i></p> <p><i>Protect seasonal biological use, e.g., Vernita Bar (Sample Action). Provide adequate spawning and rearing flows under Vernita Bar Agreement (FERC) (Final All-H Paper Dec. 2000).</i></p> <p>Continue current flow programs, with some protection for upstream reservoirs (Framework Alternative 5, 6).</p> <p>Manage flows in the Hanford Reach to match natural seasonal and daily patterns (Framework Alternative 5).</p>
4-5 Reservoir Levels
<p>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).</p> <p>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).</p> <p>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).</p> <p>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 Action Table Dec. 2000).</p> <p>Implement VarQ flood control/storage at Libby Dam by October 2001 (FWS Biological Opinion Dec. 2000).</p>
4-6 Water Quality
<p><i>Bring water quality up to CWA standards and prevent deterioration from water meeting standards. Make changes if problems arise. Maintain or increase water quality enforcement in strong stock areas (Sample Action).</i></p> <p>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).</p> <p>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 Action Table Dec. 2000).</p> <p>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</p>

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 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).

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).

Improve water quality while meeting fish passage objectives, and development of a Water Quality Improvement Plan for dissolved gas and temperature (Final All-H Paper 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).

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).

#### 4-7 Juvenile Fish Passage and Transportation

Make use of fish transportation as appropriate (Framework Alternative 5). The Corps shall continue to transport all non-research juvenile salmonids collected at the Snake River collector projects. The Corps and BPA shall continue to implement voluntary spill at all three Snake River collector projects when seasonal average flows are projected to meet or exceed 85 kcfs (NMFS Biological Opinion Action Table Dec. 2000).

##### Research, Monitoring, and Evaluation:

The Corps shall identify and implement improvements to the transportation program (NMFS Biological Opinion 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 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 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 Action Table Dec. 2000).

#### 4-8 Adult Fish Passage

Focus mainstem research efforts on measurement of survival through alternate passage methods at dams to reduce "hot spots" for mortality (Framework Alternative 7).

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 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 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 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 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 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 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 Action Table 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 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).

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

### COMMERCE

#### 5. POWER

##### 5-1. Existing Generation

*Accept some hydropower effects for operations to sustain currently productive populations. Maintain current hydrosystems, but build no new hydro (Sample Action).*

On the Columbia, implement *normative* changes in operations (as defined by the Independent Scientific Advisory Board in “Return to the River”), improving in-river migration for salmon. Secure Canadian storage on upper Columbia to augment flows in spring and summer. From Priest Rapids downstream, *normative* steps include meeting flow minimums and 24-hour spill during the spring migration. Implement Integrated Rule Curves (IRCs) at all storage projects and 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. Shift regional energy “peaking” or “load following” to Upper Columbia projects, primarily Grand Coulee and Chief Joseph, and to other USACE facilities. Shape the timing and volume of combined discharges from the various projects to adhere to desired flood control requirements and the needs of resident fish, while simultaneously providing a protracted flow event to speed smolt outmigration. The *more natural hydrograph* enhances resident fish and wildlife in all affected waters(OPR: NMFS/USACE) (Framework Concept Paper 2).

##### 5-2. New Generation

Use tools and incentives in local planning ordinances and state laws to ensure that development is environmentally

sensitive (LCREP).
<b>5-3. Transmission Reliability</b>
<p><i>If spill is minimized and generation increases from the Status Quo, the transmission reinforcement actions that have been undertaken (Schultz-Hanford and West of Hatwai projects) would become unnecessary to maintain reliability (Sample Action).</i></p> <p><i>Changes in vegetation maintenance practices to meet habitat requirements would require constant monitoring and reductions in transmission capability. Transmission reliability could be sacrificed as unmaintained 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).</i></p> <p><i>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).</i></p> <p><i>Costs increase for routine maintenance practices as additional objectives are met, but much less than for the Natural Focus direction (Sample Action).</i></p> <p>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).</p> <p>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).</p> <p>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 Action Table Dec. 2000).</p>
<b>6. INDUSTRY</b>
<b>6-1. Industrial Growth</b>
<i>Little change required in industry. Industry might be limited near currently healthy populations (e.g., Hanford Reach) (Sample Action).</i>
<b>6-2. Aluminum and Chemical</b>
<i>Little change required. Manage industrial discharges to avoid harm to healthy stocks (Sample Action).</i>
<b>6-3. Mining</b>
<i>Limit new mining that would affect currently productive populations (Sample Action).</i>
<b>6-4. Pulp and Paper</b>
<i>Limit new pulp and paper production that would affect currently productive populations. Manage discharges to avoid harm to healthy stocks (Sample Action).</i>
<b>7. TRANSPORTATION</b>
<b>7-1. Navigation and Barging</b>
<i>No changes required in transportation (Sample Action).</i>
<b>7-2. Trucking and Railroads</b>
<i>No changes in roads and highways, except possible changes to construction practices near healthy populations (Sample Action).</i>
<b>8. AGRICULTURE</b>
<p><i>Emphasis (top priority) will be applied to protecting and expanding existing healthy core populations. Enhance conditions for currently productive fish and wildlife populations. Prevent degradation from occurring, rather than mitigating it after damage has been done (Sample Actions).</i></p> <p>Expand on agricultural incentive programs (Final All-H Paper Dec. 2000). Provide permanent protection for riparian</p>

areas in agricultural areas by supplementing agricultural incentive programs (BPA, with FSA and NRCS) (Final All-H Paper 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 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 Action Table Dec. 2000).

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).

#### 8-1. Irrigation

*Little change required in irrigation practices. Disincentives for new development in pristine habitat. Screening, management incentives used to reduce impacts to productive fish populations (Sample Actions).*

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 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 Action Table Dec. 2000).

Screen water diversions on all fish-bearing streams (Framework Concept Paper 28). Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H Paper Dec. 2000).

Identify and use appropriate water conservation measures in accordance with state law (Framework Concept Paper 28).

#### 8-2. Pesticides and Agricultural Practices

*Monitor pesticides for impacts on currently productive populations, use incentives where impacts are likely (Sample Action).*

#### 8-3. Grazing

Install fencing to keep range animals away from stream sides (Framework Concept Paper 23).

*Monitor and manage grazing to reduce impacts to currently productive populations (Sample Action).*

#### 8-4. Forestry

*Monitor and manage timber harvest to reduce impacts to currently productive populations (Sample Action).*

### 9. COMMERCIAL HARVEST

*Focus harvest on currently productive populations. Set harvest rates at levels that ensure that productivity of target populations is maintained. Modify fishing practices and locations (ocean and in-river) to promote stock-based management. Increase overall harvest in the long run (Sample Actions).*

*Manage for some over-escapement and straying to promote population expansion to restored, quality habitats (Sample Action).*

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, 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 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 Action Table Dec. 2000).

#### 10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

Assess the potential impacts of proposed development. Identify cumulative impacts and habitat attributes that might be lost. Present alternatives that minimize 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. Provide: urban storm runoff control; municipal waste management; obstruction removal; and road management. Manage land use and riparian conditions to maintain water quality (Human Effects Analysis Appendix D).

Support BPA offsite mitigation strategy (Final All-H Paper Dec. 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).

#### 11. RECREATION

*Recreation harvest would be consistent with preservation of productive stocks (Sample Action).*

*Focus harvest on currently productive populations. Set harvest rates at levels that ensure that productivity of target populations is maintained. Modify fishing practices and locations (ocean and in-river) to promote stock-based management. Increase overall harvest in the long run. Manage for some over-escapement and straying to promote population expansion to restored, quality habitats (Sample Actions).*

#### TRIBES

##### 12-1. Tribal Harvest

*[Support] habitat [and] production actions that promote and sustain fishing opportunities in all treaty reserved usual and accustomed fishing areas (Framework Concept Paper 3).*

Provide ceremonial, subsistence, and commercial fisheries consistent with court interpretations of Indian treaties (Framework Alternative 1,2,3).

Modify NMFS Evolutionarily Significant Unit (ESU) policy and increase flexibility to use artificial propagation consistent with sound conservation biology (Tribal Vision).

Put fish back in rivers (e.g., hatchery fish supplementation) in order to move toward achievement of full treaty rights (Framework Concept Paper 3).

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).

## 12-2. Tradition, Culture, Spirituality

*Actively restore ecosystem health for currently productive fish and wildlife 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 Actions).*

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 communities' subsistence needs to be 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

## COMMERCE FOCUS POLICY DIRECTION

Emphasizes *human intervention to enhance economic value* of river uses and allocates a portion of the revenues to fund fish and wildlife mitigation.

### FISH & WILDLIFE

#### 1 HABITAT

The Columbia River Basin is managed to provide maximum sustainable economic benefits to the region (Framework Alternative 7). The Columbia River of today is a working river. The economic, social, and political realities...assure that it will remain as such (Dr. Jack Ward Thomas, speaking to the Columbia River Conference IV, March 16 & 17, 2000).

Make salmon programs cost-effective; save BPA Fish and Wildlife monies for programs providing the highest probability of success; avoid big-ticket spending for marginally beneficial projects; and maintain or reduce BPA direct/reimbursable spending over time, as listed stocks recover (Framework Concept Paper 2; Framework Alternative 5). Institute measures to ensure cost-effective salmon recovery, to provide certainty in Fish and Wildlife costs for BPA, and thereby maintain the region's low energy costs (Framework Concept Paper 2). Provide security for BPA, by committing to affordable steps that achieve substantive improvements for fish and wildlife, retaining the region's low cost energy (Framework Concept Paper 2). Seek the maximum use of economic incentives to implement only cost-effective strategies. Put human economic needs above changes designed to enhance the natural environment (Framework Alternative 7).

Implement a least-cost program that ensures the highest level of biological benefit for the public and ratepayer dollars spent (Framework Concept Paper 25). Those actions that have the greatest biological benefit at the lowest cost will be implemented first (Framework Concept Paper 14; Framework Concept Paper 20). 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). Quantify the benefits and costs of existing and proposed measures to protect Columbia Basin salmon and steelhead populations, taking account of adverse impacts and costs to other species of interest, if any (Framework Concept Paper 26).

Sort habitat into "nature preserve" and production categories. Decentralize habitat decisions and focus regional habitat decisions on inter-jurisdictional issues. Leave habitat issues to local decision-makers, eliminate wildlife mitigation, and use the BPA Environmental Foundation to fund habitat improvements (Framework Alternative 7). Provide incentives (start-up grants, tax breaks, etc.) and technical assistance to encourage local landowners, businesses, corporations, and trustee agencies to improve and protect wetland and riparian areas. Include incentives for using best management practices (BMPs) to demonstrate appropriate techniques (LCREP).<sup>1</sup> 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).

Complete all subbasin plans and utilize watershed councils, Conservation Reserve Programs and other financial incentives to encourage land owners and managers to improve riparian and other habitat conditions (Framework Concept Paper 25). Use computer metapopulation models to predict extinction probabilities for listed stocks, and annually reassess extinction probabilities to reconsider listing decisions (Framework Concept Paper 25). Develop partnerships with the timber industry, irrigated agriculture, dry-land farmers, ports, tribes, municipalities and other land owners to improve habitat and water quality (Framework Concept Paper 27). Assess natural mortality levels to gain understanding of when human-induced hydrosystem and other effects are fully mitigated (Framework Concept Paper 26).

Liquidate and cap current habitat mitigation efforts funded by BPA and substitute Bonneville Environmental Foundation or other vehicle for habitat grants. Create one-time endowment of funding vehicle monies saved through mainstem operational changes. Focus habitat improvement funds on "wild reserve" rivers (Framework Concept 26).

A biodiversity trust fund could be set up on a local, state, or national scale, and would have an unlimited variety of

<sup>1</sup> Lower Columbia River Estuary Project: [www.lcrep.org](http://www.lcrep.org)

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).<sup>2</sup>

Establish wild genetic preserve areas to hedge against ecological risks of engineering failures and meet human demands for wilderness and existence value of species of interest. Use wild reserve areas to address "existence values" of wild species (Draft Framework Alternative 7). Fund land acquisitions and conservation easements (BPA) (Final All-H Paper Dec. 2000).

End federal, regional and state regulation of habitat restoration (Framework Alternative 7). Strongly endorse the concept of local planning for recovery of salmonids and other aquatic species. This concept has the advantage of bringing together local and tribal governments with local citizens to develop and implement local recovery plans. A local focus also helps avoid duplication of efforts and "top-down" planning. Recovery plans developed at the local level, whether through state salmon plans, federal agency actions or through the Council's process, must be complementary (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).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (FFCRPS Biological Opinion 2000 Action Table).

*Research, Monitoring, and Evaluation:*

Establish performance goals and end-points to clarify expectations and to clarify what success will look like. Those who...are paying should have a clear idea of how much is enough (Framework Concept Paper 20). Limit the amount of monitoring projects that are funded to [a percentage] of the total budget and no more than [a specified proportion] of an individual project (Framework Concept Paper 22). Ensure that significant costs would be justified by effective fish and wildlife recovery before they are incurred. This justification would be made through research and experimentation (Framework Alternative 4). Limit regional governmental role to clearinghouse for information about successful habitat restoration strategies (Framework Concept 26).

1-1 Anadromous Fish

"The truth is that there is no acceptable way that we can come into compliance with the Endangered Species Act as it relates to salmon in the entire Columbia River System. The truth is that we are simply unwilling to come to grips with the issue that we have, probably irrevocably, decided that the Columbia River is a working river harnessed to provide the cheapest electrical energy in the world—and, simply, we ain't about to give that up. The truth is that playing games with various combinations of attempts to assuage limiting factors for the salmon will not do the job—and we know it. If we frankly admit that we cannot obey the law, we are free to do the best we can to save the remnant populations. That can be done through a combination of directing money and resources to the places they will do the most good, and letting people off the hook who have nothing to do with those efforts" (Dr. Jack Ward Thomas, speaking to the Columbia River Conference IV, March 16 & 17, 2000).

Some watersheds will be designated prime habitat for naturally reproducing salmon and steelhead populations, other watersheds will be designated production streams to support fish harvest objectives, with still other streams designated as not suitable for salmon and steelhead production (Framework Concept Paper 14).

Abandon regional government supervision of habitat restoration. State and local entities will produce more effective efforts, particularly if improved harvest management rewards localities that invest in habitat restoration by allowing salmon and steelhead to return to the improved habitat (Framework Concept Paper 26).

Engineer spawning channels to expand natural spawning areas (Framework Alternative 7). Properly-engineered spawning channels can result in better-than-natural salmonid production through natural spawning at minimal cost

<sup>2</sup>Incentives for Species (by Brett Schaerer); Thoreau Institute:  
<http://www.teleport.com/~rot/schaerer.html#RTFToC2>

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(Draft Framework Alternative 7). [Protect] fish and wildlife habitat to preserve hunting and fishing opportunities (PM).<sup>3</sup>

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). Complete an HCP for Mid-Columbia Dams (Final All-H Paper Dec. 2000). Support BPA offsite mitigation strategy (Final All-H Paper Dec. 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). The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

The Action Agencies, in coordination with NMFS, USFWS, and other federal agencies, NPPC, states, and tribes, shall develop a common data management system for fish populations, water quality, and habitat data (NMFS Biological Opinion Action Table Dec. 2000).

1-2 Resident Fish

Sort habitat into "nature preserve" and production categories. Decentralize habitat decisions and focus regional habitat decisions on inter-jurisdictional issues. Leave habitat issues to local decision-makers, eliminate wildlife mitigation, and use the BPA Environmental Foundation to fund habitat improvements (Framework Alternative 7).

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).

Research, Monitoring, and Evaluation:

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 Action Agencies shall include observations of bull trout captured in field activities under their funding (e.g., research studies and northern pikeminnow reward program fisheries) and report that information annually to the [USFWS] (FWS Biological Opinion Dec. 2000).

1-3 Introduced Species

Introduce mammalian predators to control tern populations on Rice Island and elsewhere (Framework Concept Paper 26; Framework Alternative 7).

1-4 Wildlife

Sort habitat into "nature preserve" and production categories. Decentralize habitat decisions and focus regional habitat decisions on inter-jurisdictional issues. Leave habitat issues to local decision-makers, eliminate wildlife mitigation, and use the BPA Environmental Foundation to fund habitat improvements (Framework Alternative 7).

Fund fish and wildlife out of user fees plus federal grants. Non-game wildlife funding can come from a share of recreation fees and donations (possibly including income tax checkoffs) (Thoreau Institute).<sup>4</sup> Turn over percentage of (hunting) license revenues to habitat restoration projects (Framework Concept Paper 26).

1-5 Predators of Anadromous Fish

Create and maintain sufficient activity on Rice Island to discourage Caspian Terns and Cormorants that prey on smolts, and if necessary make changes to the island that discourage avian predator habitat (Final All-H Paper Dec. 2000; Framework Concept Paper 21; Framework Concept Paper 26; Framework Concept Paper 27). 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 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

<sup>3</sup> Spokane Public Meeting

<sup>4</sup> State Lands and Resources; Thoreau Institute: <http://www.teleport.com/~rot/statelands.html>

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 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 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 Action Table Dec. 2000).

Take direct action to control marine mammals and Northern pikeminnow that prey on salmon [*especially in the mainstem and the estuary*] (Framework Alternative 7; Framework Concept Paper 21; Framework Concept Paper 25). [*Change*] 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 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). Allow limited hunting for marine mammals to control populations; turn over percentage of license revenues to habitat restoration projects. High percentages of returning adults show evidence of marine mammal attacks (Framework Concept 26).

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 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 Action Table Dec. 2000).

Immediately authorize expanded predator controls (MMPA) (Final All-H Paper 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).

1-6 Watersheds

Some watersheds will be designated prime habitat for naturally producing salmon or steelhead populations; other watersheds will be designated fish production streams to support fish harvest objectives, with still other streams designated as not suitable for salmon and steelhead production. Production watersheds will be used to support artificial production through the use of modern hatcheries or other artificial methods (Framework Concept Paper 14). Consider on a prioritized basis capital funding for new river watershed projects that would provide measurable fish benefits by improving in-stream conditions, and be of other economic benefit (Framework Concept Paper 27). Declare some tributaries off-limits to hatchery production and others as production and supplementation watersheds (Framework Alternative 7). Segregate habitat into "nature preserve" tributaries and "production/ supplementation" (hatchery) tributaries (Framework Concept Paper 25). 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; Framework Concept Paper 26).

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).

Decentralize decisionmaking concerning local-specific habitat problems through watershed councils (Framework

Concept Paper 25; Framework Concept Paper 26). There will be a great deal of bottom-up autonomy and local control over implementation plans for specific watersheds by local Watershed Councils. The regional Council will compensate people for economic losses resulting from implementation of the Plan's measures (Framework Concept Paper 14). The philosophical approach will be to create local support and ownership for watershed management through a high degree of local control over how the available funds are spent (Framework Concept Paper 14). [*Encourage*] non-governmental participation in planning and implementation of watershed solutions (Federal Habitat Team, NRCS) (Final All-H Paper Dec. 2000).

Consider on a prioritized basis capital funding for new river watershed projects that would provide measurable fish benefits by improving in stream conditions, and be of other economic benefit (Framework Concept Paper 27).

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

#### 1-7 Tributaries

Seek out opportunities for collaborative partnerships with stakeholders to restore and protect instream flows (Framework Concept Paper 17). Develop an endowed trust fund to financially support improvements by private parties and local governments and tribes on the tributaries and mainstem (Framework Concept Paper 27). Dedicate additional revenues from the sale of electricity to other forms of mitigation in the tributaries (Framework Concept Paper 27). Evaluate comparative cost effectiveness of improved habitat/wild reserve tributary production vs. production/supplementation tributary production (Framework Concept 26).

*Encourage counties to develop habitat to support recreational fishing and other commercial uses (Sample Action).* Segregate habitat into "nature preserve" tributaries and "production/supplementation" (hatchery) tributaries (Framework Concept Paper 25; Framework Concept Paper 26). Link habitat restoration and stock management to provide full seeding for "nature preserve" tributaries, and report the degree to which this is achieved annually (Framework Concept Paper 25). Designate tributaries with extensive hatchery influence as "production/supplementation" tributaries and abandon efforts to protect existing wild stocks in such tributaries (Framework Concept Paper 26).

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).

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. 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).

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).

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).

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).

Because about 15 percent of the Columbia River Basin is in British Columbia, including the headwaters of the Columbia and several of its key tributaries, ecosystem restoration efforts should address transboundary stocks of fish and wildlife and transboundary habitats. Where mitigation measures are designed to benefit both U.S. and Canadian fish and wildlife populations, U.S. ratepayer funding should be in proportion to anticipated benefits to the U.S. populations (Council's 2000 Fish and Wildlife Program).

1-8 Mainstem Columbia

Develop an endowed trust fund to financially support improvements by private parties and local governments and tribes on the...mainstem (Framework Concept Paper 27).

Research, Monitoring, and Evaluation:

The Action Agencies shall investigate and partition the causes of mortality below Bonneville Dam after juvenile salmonid passage through the FCRPS (NMFS Biological Opinion Action Table Dec. 2000). Focus mainstem research efforts on measurement of survival through alternate passage methods at dams to reduce "hot spots" for mortality (Framework Alternative 7).

1-9 Reservoirs

*Manage reservoir habitats to be similar to current regime. Emphasize commercial value of fish and wildlife species using the habitats (Sample Action).* Protect the established ecosystems that the dams have created (Framework Concept Paper 11).

Survey reservoir habitat for extant spawning locations and focus on expanding areas with existing populations (Framework Concept Paper 26).

1-10 Estuary and Ocean

*Allow channel dredging for navigation (Sample Action).*

Increase the use of the estuary to allow transported smolts to mature and acclimate to fresh water conditions. Use mobile pens to hold smolts in the lower Columbia and estuary (Framework Concept Paper 27).

Use tools and incentives in local planning ordinances and state laws to ensure that development is environmentally sensitive (LCREP). Establish an award program to promote successful stewardship and pollution prevention activities (LCREP). Expand knowledge and understanding of the ocean and Columbia River estuary (Framework Concept Paper 27).

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).

Develop conceptual model of estuary conditions and fish population structure and resilience (Final All-H Paper 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. 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 and analyses to evaluate relationships between ocean entry timing and SARs for transported and downstream migrants (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.

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 (NMFS Biological Opinion Action Table Dec. 2000).

Research, Monitoring, and Evaluation:

NMFS should work with the region to conduct an intensive study to address the role of the ocean in fish recovery, including the relative impact on fish mortality due to ocean predation, lack of food sources, temperature problems and harvest regimes. In addition, management of fish in freshwater should reflect new information about the ocean as it is

developed. For example, it may be necessary to adjust hatchery production based on a better understanding of changes in ocean carrying capacity (Governors' Recommendations, July 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 Action Table Dec. 2000).

#### 1-11 Water Quality

*Minimal investment to improve water quality unless there is direct economic return on such investments (Sample Action).*

Recent changes in state water laws that allow instream flows to be recognized and protected provide the basis for providing instream flows in small streams and tributaries. State law changes may involve: 1) providing that instream use is a beneficial use for which a water right can be issued; 2) allowing existing out-of-stream water rights to be transferred to instream water rights; and 3) encouraging efficiency in water use to reallocate saved water to instream use (Framework Concept Paper 17). [Support] voluntary exchanges to obtain needed water for fish and support the development of water markets to effect exchanges among willing buyers and sellers. This strategy has potential to contribute to fish recovery, and we are committed to support changes in state law or policies to facilitate this approach. Recognize *[that there are]* existing efforts to conserve water and support further assistance to promote conservation (Governors' Recommendations, July 2000). Develop partnerships with the timber industry, irrigated agriculture, dry-land farmers, ports, tribes, municipalities and other land owners to improve habitat and water quality (Framework Concept Paper 27).

Identify continuous features (ex. streams) that exhibit linear characteristics and assign a quality rank to stream segments based on a suit of desirable values (ex. ODFW Stream Benchmarks). Several definitions of patch boundaries and edge measures exist at differing spatial scales within a landscape. For water related questions gradients describing physical and temporal properties may be more appropriate. If, for example, a question was related to the late summer flow on a subwatershed. A possible method may analyze datasets including, hydrologic responsiveness, moisture, landform, heat, and vegetation type (Framework Concept Paper 24).

#### 2 HARVEST

*Harvest fish and wildlife to maximize long-term economic value (commercial and sport). Change target species in response to changes in economic value (Sample Action). Increase or decrease harvest in response to cost-effectiveness objectives (Sample Action).*

*[Protect]* fish and wildlife habitat to preserve hunting and fishing opportunities (Public Meeting, Spokane).<sup>5</sup> Financial incentives must be broadened beyond selective fisheries to include economic incentives to reduce impacts to listed stocks, financial assistance for developing "value-added" fishery-related industries and mitigation of economic impacts to fishing-dependent communities (Governors' Recommendations, July 2000).

#### 2-1 Anadromous Fish

Redirect tribal mixed-stock commercial harvest to selective harvest at fish ladders and in tributaries (Framework Alternative 7).

If each country catches "its own" salmon, production and management costs of commercial salmon harvests will decrease, along with political friction (Framework Concept Paper 26).

Develop Youngs Bay and other tributaries as preferred options for commercial and sport fisheries (Framework Concept Paper 27). Shift to terminal fisheries to allow for selective stock harvest (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).

Use supplemented stocks in the mainstem to meet tribal harvest objectives (Framework Alternative 6). Meet non-Indian harvest objectives through artificial production (Framework Alternative 6).

Mark all hatchery fish, so as to facilitate selective harvest. Highest net economic benefits will come from non-tribal recreational harvest, which can select for hatchery stocks (Draft Framework Alternative 7). 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).

Seek opportunities to further reduce fishing impacts on listed fish where necessary and effective by helping the states

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<sup>5</sup> Spokane Public Meeting

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).

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

Research, Monitoring, and Evaluation:

Unify policing functions under *United States v. Oregon* to gain accurate harvest counts, using aerial or satellite-based estimation techniques to corroborate self-reporting by fishermen (Framework Concept 26). The Action Agencies shall work with NMFS, USFWS, the Pacific States Marine Fisheries Commission, 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 Action Table Dec. 2000).

2-2 Resident Fish

*Focus efforts on both commercial (fish farm) and sport fisheries. Maintain or increase populations of economically significant resident fish, including introduced species. Manage harvest to stimulate recreational use and economic values (Sample Actions).*

Mark All-Hatchery fish... to facilitate selective harvest. Highest net economic benefits will come from non-tribal recreational harvest, which can select for hatchery stocks (Draft Framework Alternative 7).

The Action Agencies shall work with NMFS, USFWS, and tribal and state fishery management agencies to develop methods for crediting harvest reforms, and the survival benefits they produce, toward FCRPS offsite mitigation responsibilities. A crediting approach shall be agreed upon by the 3-year check-in (NMFS Biological Opinion Action Table Dec. 2000).

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 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 Action Table Dec. 2000).

2-3 Wildlife

*Allow hunting of economically valuable species. Institute user fees for hunting on public lands, which would be used to improve habitat for target species (Sample Actions).*

3 HATCHERIES

Make extensive use of fish hatcheries to meet fishing needs (Framework Alternative 7) and to make up for lost habitat (Framework Alternative 6). *Produce and release maximum numbers of economically valuable species in harvest areas (Sample Action).* Highest net economic benefits will come from non-tribal recreational harvest, which can select for hatchery stocks (Framework Alternative 7).

Abandon efforts to protect existing wild stocks in tributaries where there is already significant hatchery influence. Declare specific tributaries "off-limits" to hatcheries (e.g., John Day River) to provide buffer zones against genetic problems with wild fish (Framework Alternative 7; Framework Concept Paper 26). Transfer hatcheries to tribal management in settlement of treaty obligations (Framework Alternative 7).

Modify NMFS Evolutionarily Significant Unit (ESU) policy and increase flexibility to use artificial production consistent with sound conservation biology (Tribal Vision).

Restructure hatchery management to improve success in meeting fish and wildlife objectives (Framework Concept

Paper 25). Share fishing tag revenues with hatcheries that return fish to watersheds (Framework Alternative 7).

Use central entity to serve as clearinghouse for successful approaches to artificial production, such as spawning channels and egg boxes (Framework Concept Paper 26).

Close down or convert under-performing production hatcheries (Framework Concept Paper 27).

Implant hatchery releases to reduce mixed-stock fisheries (Framework Concept Paper ).

Use low-cost, low technology hatchery techniques for supplementation actions (Framework Concept Paper 27).

Mark all hatchery releases with an identifiable external mark facilitate selective harvest (Draft Framework Alternative 7; Framework Concept Paper 27).

The fundamental strategy should start with clarification of why we want fish and wildlife populations. The region needs to recognize and respect that there are different and conflicting reasons why we want healthy fish and wildlife populations. There should be distinct and separable goals, objectives, strategies and measures, where necessary, to achieve separate outcomes. As an example, the Columbia Fish and Wildlife Program should consider the similarities and differences between management of anadromous fish and management of animals that produce red meat. This includes beef and other domesticated species as well as "wild" deer, elk, moose, and buffalo. In the case of the four-footed animals, our society has developed very separate institutions. We employ feed lots, open ranges, sport hunting areas, and national parks to achieve different objectives, from high volume production to sport hunting to preserving wild animals in their "natural" environment. There are clear differences between management of anadromous fish and red meat. There are some obvious similarities, however, such as the production of some animals for human consumption and the contrasting desire to protect others so that they can live and die in their natural habitat, We therefore suggest that the overall strategy for managing anadromous and resident fish and wildlife in the Columbia Basin needs to examine whether it has sufficient management systems to achieve disparate goals and objectives (Framework Concept Paper 20).

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 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.

### 3-1 Anadromous Fish

Production watersheds will be used to support artificial production through the use of modern hatcheries or other artificial methods (Framework Concept Paper 14). Make extensive use of fish hatcheries to meet fishing needs (Framework Alternative 7) and make up for lost habitat (Framework Alternative 6).

Transfer hatcheries to tribal management in settlement of treaty obligations (Framework Alternative 7). Implement transfers of facilities or responsibility for operation of certain production programs subject to approved HGMPs for up to four hatcheries (Final All-H Paper Dec. 2000).

Unify and standardize hatchery reporting obligations to single funding entity and require reporting concerning success in generate returning adults to applicable watersheds (Framework Concept Paper 26).

Allow hatchery operators to share revenue from salmon and steelhead tags in hatchery watersheds, to establish feedback loop for hatchery success (Framework Concept Paper 26).

The Corps, in coordination with USFWS, shall design and implement appropriate repairs and modifications to provide water supply temperatures for the Dworshak National Fish Hatchery that are conducive to fish health and growth, while allowing variable discharges of cold water from Dworshak Reservoir to mitigate adverse temperature effects on salmon downstream the lower Snake River (NMFS Biological Opinion Action Table Dec. 2000).

#### Research, Monitoring, and Evaluation:

Fund applied genetics research unit to restore lost size of salmonids, improve disease resistance, and improve tolerance for warmer habitat, as well as other genetic improvements that will increase salmonid abundance (Framework Concept

Paper 26).
3-2 Resident Fish
<p><i>Use hatchery production to provide offsite mitigation or for replacement above blocked areas. Provide maximum production of economically valuable species in harvest areas (Sample Actions).</i></p> <p>For areas above the dams that block salmon migration, allow hatcheries to produce native-type fish that could survive in the changed ecosystem (Framework Alternative 2).</p> <p>The Action Agencies, with assistance from NMFS and USFWS, shall annually develop 1 and 5-year plans for hatchery and harvest measures that provide offsite mitigation (NMFS Biological Opinion Action Table Dec. 2000).</p>
4 HYDRO
<p><i>Maximize power, navigation, and irrigation (Sample Action).</i></p> <p>Maintain the multiple-purpose public benefits of Columbia and Snake River dams and river system. Continue to develop the economic potential of the Columbia River system (Framework Concept Paper 25).</p>
4-1 Dam Modifications and Facilities
<p><i>Dams remain in place. Curtail or abandon fish passage improvements (Sample Action). Hydropower production may be increased at existing facilities, and there is potential for new/improved facilities (Sample Action).</i></p> <p>Millions of dollars and entire economies have been developed based upon the Columbia and Snake Rivers' being multi-use rivers. That should not change (Framework Concept Paper 21). Changes in the system's configuration may occur but only when critical survival bottlenecks are identified that cannot be circumvented through other means and where the costs are justified by the probable biological benefits (Framework Concept Paper 14). Structures <i>[such as dams]</i> in the Snake and Columbia River Basins which have lost their usefulness or may no longer be economically viable to operate and maintain... could also be evaluated for removal and/or modification (Framework Concept Paper 21).</p> <p>Continue to fine tune the fish-friendly turbine prototype on Unit #4, First Powerhouse at Bonneville Dam. When testing is complete, then every Kaplan turbine on the Columbia and Snake River over 40 years old should be replaced by the new high tech turbines (Framework Alternative 7; Framework Concept Paper 11). Ensure that "fish-friendly" turbines are available in time for renovation of mainstem facilities (Framework Concept Paper 26).</p> <p>Install irrigated spawning channels below dam tailraces and elsewhere to increase mainstem spawning habitat (Framework Concept Paper 26).</p> <p>Evaluate structures in the Snake and Columbia River Basins that have lost their usefulness or may no longer be economically viable to operate and maintain. <i>[Those structures could be removed and/or modified]</i> (Framework Concept Paper 21).</p> <p>Impairing the navigability of the river, its hydro-electric capacity, and its flood control capacity are not in the public interest (Framework Concept Paper 21).</p> <p>The Action Agencies, in coordination with the Regional Forum, shall determine the appropriate operating range of turbines equipped with minimum gap runners (MGRs) to increase survival of juvenile migrants passing through these new turbine designs (NMFS Biological Opinion Action Table Dec. 2000). The Corps shall continue the investigation of minimum gap runners at the Bonneville First Powerhouse (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>The Corps shall complete Bonneville Second Powerhouse post-construction evaluation of the new juvenile fish bypass outfall and address design and operational refinements as warranted (NMFS Biological Opinion Action Table Dec. 2000).</p> <p>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 Action Table Dec. 2000).</p> <p>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 Action Table Dec. 2000).</p> <p>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 Action Table Dec. 2000).</p> <p>Establish programs to screen all pumps and restore passage at problematic diversions and obstructions (Final All-H</p>

Paper 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).

#### 4-2 Hydro Operation

*Operate system at pre-listing hydro operations. Maximize power generation in high value months. Maintain storage reservoir elevations for recreation and resident fish (Sample Actions).*

Maximize multiple purpose benefits of federal water projects. Increase hydropower production. Maintain flood control. Maintain navigation. Maintain irrigation (Draft Framework Alternative 7; Framework Concept Paper 26).

Research, Monitoring, and Evaluation:

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).

#### 4-3 Spill

*Spills would be driven by revenue production – PNCA critical water planning. Eliminate voluntary fish spills and minimize forced spills (Sample Actions). Reduce... flow augmentation and... spill at hydroelectric dams (Framework Concept Paper 25).*

Adjust spill on a project-by-project basis to optimize passage survival at non-collector projects (e.g., reduce spill at The Dalles and Ice Harbor), taking care to balance potential positive effects on juveniles against negative effects on adults (Framework Concept Paper 26).

Install fish-friendly turbines in all of the skeletal bays and "spill" excess water through these turbines instead of over the dams (Framework Concept Paper 11).

Assuming increased transportation, moderate spill regimes would be employed at non-collector facilities, working in combination with spill deflectors and improved turbine passage survival. For Snake River projects, a spill passage regime would be established at Ice Harbor, with minimum or non-programmatic spill at other projects. Mid Columbia River system spill passage regime established by Mid Columbia PUD's. All spill regimes would be optimized for fish passage, gas production control, and economic costs (Framework Concept Paper 27).

#### 4-4 Flow

Abandon all spring flow augmentation and real-time management of flow for fish (Framework Alternative 7; Public Meeting<sup>6</sup>). Eliminate existing spring-summer flow targets of National Marine Fisheries Service (Framework Concept Paper 27). Reduce ...flow augmentation and...spill at hydroelectric dams (Framework Concept Paper 25). Change the flow augmentation program to produce additional funds for fish and wildlife measures (Framework Alternative 6). Eliminate Snake River flow augmentation (Framework Concept Paper 5). Allow flow augmentation based on the "willing buyer, willing seller" method only (PM).<sup>8</sup> Undertake efforts to purchase or lease, from willing sellers and lessors, water rights necessary to maintain instream flows in accordance with appropriate state and federal laws (Framework Concept Paper 28).

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).

Research, Monitoring, and Evaluation:

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<sup>6</sup> Twin Falls Public meeting

<sup>7</sup> Twin Falls Public meeting

<sup>8</sup> Twin Falls Public meeting

Experiment with late summer/fall flow augmentation in low water years (Framework Concept Paper 26). 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).

#### 4-5 Reservoir Levels

*Levels would be driven by revenue production – PNCA critical water planning (Sample Action). Maintain stability in levels to protect communities that depend on reservoirs for recreation and tourism income (Sample Action).*

#### 4-6 Water Quality

*Sell “pollution rights” and use proceeds to fund mitigation (Sample Action).*

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).

#### 4-7 Juvenile Fish Passage and Transportation

Improve and maximize fish barging of juvenile smolts (Framework Alternative 6; Framework Concept Paper 25). Maximize smolt transportation by eliminating spill at all collection facilities, and improve transportation by experimenting with release strategies (i.e., further downstream) to avoid substantial estuarine mortality (Draft Framework Alternative 7; Framework Concept Paper 26).

Develop an environmentally friendly passageway for anadromous salmonids (Framework Concept Paper 11). Investigate the use of surface collectors and other devices to enhance guidance at dams (Framework Concept Paper 25). Reactivate sluiceway passage at available projects and expand surface collector efforts (Framework Concept Paper 26).

At the Snake River projects – Lower Granite, Little Goose, and Lower Monument, pursue increased transportation actions during the juvenile migration season; conduct for spring/summer chinook, steelhead, and fall chinook. At McNary modify operations to provide expanded transportation for spring and summer migrants. Secure additional barges to enhance direct loading operations and reduce holding times. Evaluate and monitor program on an annual basis for improvements (Framework Concept Paper 27).

At Lower Granite and Little Goose finish extended length screens and surface collectors. At Lower Monument evaluate the need at for new bypass improvements. At Ice Harbor no extended length screens installed, offer little benefit in increased transportation program. At McNary install extended length screens to increase collection efficiency. At John Day develop surface bypass for existing skeletal bays. At The Dalles rely upon existing sluiceway with a moderate spill regime. At Bonneville, the use of sluiceways and spill should be relied upon for fish passage. Turbine improvements on a predetermined schedule, with priority assigned to Lower Columbia River projects, then moving up river (Framework Concept Paper 27).

*[Operate] the existing facilities to maximize the passage of fish through the existing collectors into trucks or barges for transport downriver. Voluntary spill to bypass fish would be minimized. Fish would be collected in the existing facilities and transported past the dams. Under this alternative, there would be no need to modify spillway flow deflectors, because voluntary spill would be minimized. Some juvenile fish would still pass through the dam turbines (The Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement Executive Summary, US Army Corps of Engineers).*

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 and analyses to evaluate relationships between ocean entry timing and SARs for transported and downstream migrants (NMFS Biological Opinion 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 Action Table Dec. 2000).

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 (NMFS Biological Opinion 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 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 Action Table Dec. 2000).

The Corps shall continue the design development, fabrication/deployment, and testing of a prototype RSW at Lower Granite, in conjunction with the existing prototype powerhouse occlusion devices, including the forebay behavioral guidance structure (BGS) and upper turbine intake occlusion devices. As warranted by prototype test results, the Corps shall install one or more permanent RSWs and occlusion devices at appropriate lower Snake hydro projects, in coordination with the annual planning process (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete design for new juvenile bypass facilities at Lower Granite Dam, including enlarged orifices and bypass gallery, open-channel flow bypass, improved separator for juvenile separation by size, and improved fish distribution flumes and barge-loading facilities and shall proceed to construction, as warranted (NMFS Biological Opinion Action Table Dec. 2000).

The Corps shall complete the extended submerged intake screen systemwide letter report and implement recommended improvements (NMFS Biological Opinion 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 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 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 Action Table Dec. 2000).

*Research, Monitoring, and Evaluation:*

Focus research efforts on identification of survival through alternate passage methods at dams to reduce "hot spots" for mortality (Framework Concept Paper 26). The Corps shall identify and implement improvements to the transportation program (NMFS Biological Opinion 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 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 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. 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

Focus mainstem research efforts on measurement of survival through alternate passage methods at dams to reduce "hot spots" for mortality (Framework Alternative 7; Framework Concept Paper 11). Replace old turbines with fish-friendly turbines (Framework Alternative 7).

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 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 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 it, as warranted (NMFS Biological Opinion 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 Action Table Dec. 2000).

The Corps shall investigate ways to provide egress to adult fish that have fallen back into juvenile collection galleries and primary dewatering facilities at Ice Harbor and McNary dams. The Corps shall either install structural, or implement operational, remedies to minimize delay and injury of fish that fall back, as warranted (NMFS Biological Opinion 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 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 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 Action Table Dec. 2000).

The Corps shall complete adult fishway auxiliary water supply evaluations at each lower Snake River hydro project and implement corrective measures as warranted (NMFS Biological Opinion 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).

#### 4-9 Flood Control

Enhance recreational opportunities and continue to provide regional flood control benefits (Draft Framework Alternative 7; Framework Concept Paper 25). Maintain and enhance the economic benefits of our existing hydropower system: that includes navigation, irrigation, recreation, flood control and power production (Framework Concept Paper 11).

### COMMERCE

#### 5. POWER

##### 5-1. Existing Generation

Maintain or increase hydropower production (i.e., hydroelectric generation) of Columbia River dams (Framework Alternative 7; Framework Concept Paper 11; Framework Concept Paper 25).

Limit electric ratepayer funding of fish and wildlife restoration to offsetting effects of hydropower development and operation, and require other economic sectors to bear recovery costs necessitated by their activities (Framework Concept Paper 26). Increase the output of cheap, clean, renewable hydropower from the existing hydropower system (Framework Concept Paper 11).

##### 5-2. New Generation

*New generation would be dictated by supply and demand (Sample Action).*

Federal, state, and local financial incentives would be available to promote new power generation (e.g., federal solar and wind energy tax credits; Oregon Business Energy Tax Credit).

##### 5-3. Transmission Reliability

*If spill is minimized and generation increases from the Status Quo, the transmission reinforcement actions that have been undertaken (Schultz-Hanford and West of Hatwai projects) would become unnecessary to maintain reliability (Sample Action). Changes in vegetation management maintenance practices to meet habitat requirements would require constant monitoring and reductions in transmission capability in "nature preserve" areas only (Sample Action).*

Enhance service reliability by promoting competition among independent power suppliers. Customers with competitive options will factor reliability into purchasing decisions. Power producers will not get paid unless they provide reliable power (<http://www.newgenutility.com/EnergyInfo1.htm>).

The Northwest Regional Transmission Organization would be assisted by Federal Energy Regulatory Commission to improve system reliability by: (1) improving efficiencies in transmission grid management; (2) improving grid

reliability; (3) removing the remaining opportunities for discriminatory transmission practices; (4) improving market performance; and (5) facilitating lighter handed regulation (<http://www.ferc.fed.us/electric/west.htm>).

## 6. INDUSTRY

### 6-1. Industrial Growth

*Industrial growth would be similar to Status Quo. Some restrictions on industrial development might be lifted, resulting in increased growth (Sample Action).*

### 6-2. Aluminum and Chemical

*De-emphasize government regulation, allow aluminum and chemical industries flexibility in choosing how to meet standards for air pollution, water quality, etc. (Sample Action).*

### 6-3. Mining

*De-emphasize government regulation, allow mining industry flexibility in choosing how to meet standards for air pollution, water quality, etc. (Sample Action).*

### 6-4. Pulp and Paper

*De-emphasize government regulation, allow pulp and paper industry flexibility in choosing how to meet standards for air pollution, water quality, etc. (Sample Action).*

## 7. TRANSPORTATION

### 7-1. Navigation and Barging

Any long-term vision for the Columbia River should include its navigability...The system of inland ports and marine transportation needs to be recognized and maintained as a necessary and integral part of preserving the environment of this region (Draft Framework Alternative 7; Framework Concept Paper 11; Framework Concept Paper 21; Framework Concept Paper 25; Framework Concept Paper 26).

### 7-2. Trucking and Railroads

*Policy would have no effect on roads and highways; expand infrastructure cost-effectively as demand increases (Sample Action).*

## 8. AGRICULTURE

Sort habitat into "nature preserve" and production categories. Leave habitat issues to local decision-makers, eliminate wildlife mitigation, and use the BPA Environmental Foundation to fund habitat improvements (Framework Alternative 7). *Use positive incentives to obtain cost-effective habitat improvements on agricultural lands (Sample Action).*

Given the major responsibilities that will fall upon private landowners, voluntary habitat improvement programs need to be fully encouraged through the use of a federally funded incentive program. Increased riparian fencing is an obvious place to start (Governors' Recommendations, July 2000).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (FFCRPS Biological Opinion 2000 Action Table).

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

Develop partnerships with the...irrigated agriculture, dry-land farmers...to improve habitat and water quality (Framework Concept Paper 27).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (NMFS Biological Opinion Action Table Dec. 2000).

### 8-1. Irrigation

Maintain existing irrigation and allow increased consumptive use of Columbia Basin water (Framework Concept Paper 11; Framework Concept Paper 25; Framework Concept Paper 26).

*Manage irrigation on a cost-effective basis. Use existing local institutions such as ASCS and Resource Conservation Districts and positive incentives (Sample Action).*

Agricultural water conservation. Irrigation waste water treatment. Screen irrigation withdrawals (Human Effects Analysis Appendix D).

Consider water transfers and trades to promote efficient use of water, and to enhance in-stream flows for selected tributary areas (Framework Concept Paper 27). The protection of instream flows is fundamentally a "water quantity" issue. Recent changes in state water laws that allow instream flows to be recognized and protected provide the basis for strategies for providing instream flows in small streams and tributaries. State law changes may involve: 1) providing that instream use is a beneficial use for which a water right can be issued; 2) allowing existing out-of-stream water rights to be transferred to instream water rights; and 3) encouraging efficiency in water use to reallocate saved water to instream use (Framework Concept Paper 17).

Water rights have attributes of private property rights (in the sense that water rights may not be taken for public use without just compensation), and water right holders have the right to decide what to do with their property within limits of applicable state law. A water right market provides one means for water right holders (as willing "sellers") and other parties (as willing "buyers") to transfer water from out-of-stream to in-the-stream use, subject to review and approval by the state (Framework Concept Paper 17).

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 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, 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).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (NMFS Biological Opinion Action Table Dec. 2000).

#### 8-2. Pesticides and Agricultural Practices

*Manage pesticides to the extent it is cost-effective using existing local institutions (Sample Action).*

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).

Other programs include the NRCS's Environmental Quality Incentives Program (EQIP), the Wildlife Habitat Incentives Program (WHIP), the Wetlands Reserve Program (WRP), the Stewardship Incentives Program (SIP), and the Emergency Watershed Protection Program (EWP).

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).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (NMFS Biological Opinion Action Table Dec. 2000).

*Monitor pesticides for impacts on currently productive fish and wildlife populations, use positive incentives where impacts are likely (Sample Action).*

#### 8-3. Grazing

*Manage grazing to the extent it is cost-effective using positive incentives and local institutions (Sample Action).*

*Emphasize private land ownership. Maintain existing grazing permits, or sell land rights to the highest bidder, with land use at owner's discretion (Sample Action).*

*De-emphasize government role in land management; encourage local management of resources. Emphasize financial incentives based on fair market value of resources (Sample Action).*

Create a series of incentives for holders of a new kind of lease to improve and maintain a high quality resource, including:

1. opportunities for investing in, or receiving financial benefits from, conserving land resources through creation of a new market for authorizing uses of our range/grassland resources;
2. long-term tenure on the land; and
3. increased flexibility in how the lands are, or are not, used and managed.

A new kind of lease would be available for the public lands range/grassland resource. This new lease would extend for 30 years and provide for flexibility in management activities. It could be used for a variety of activities, including livestock grazing, wildlife management, and endangered species conservation. There would no longer be a "grazing only" permit. The new lease would grant the holder an exclusive interest in the range/grassland resource subject to the lease, but will not convey a property interest in the public lands, and will not restrict other "multiple uses" on those lands. The lease holder's use of the public resource would be reviewed by the federal land management agency at 5 year intervals to determine if the lands are improving or being maintained in such a manner that meets public lands standards (Thoreau Institute).<sup>9</sup>

Derive social and economic benefits, promote commercial activity, and foster demand for labor and capital formation through producing a variety of goods and services from Forest Service and BLM-administered lands according to land management plan allocations and management direction (ICBSDEIS, B-O55).

#### 8-4. Forestry

*Manage forestry to the extent it is cost-effective using positive incentives and local institutions (Sample Action). Increase logging and use the revenues to mitigate for fish and wildlife impacts through enhancements (Sample Action). Use stewardship contracting on federal lands to compensate for costs of otherwise uneconomical forest improvement practices (Sample Action).*

All federal forest resources can be funded out of user fees...The best incentives are provided by funding management out of net user fees, because such funding gives managers the incentive to engage only in profitable activities—which usually means the activities with the greatest social return. In contrast, an agency funded out of a percentage of gross user fees has an incentive to cross-subsidize unprofitable activities with profitable ones to insure that it keeps its full share of the gross... (F)ocus not on the question of Who owns the forests? But on the question of What are the incentives facing forest managers? To provide the best incentives, (build) federal forest reforms around the trust concept... First, turn the federal forests into a series of forest trusts. The trusts could be individual national forests and BLM districts, or all of the forests in each state, or divided along other lines. The exact size of each trust is not important, although I suggest that a trust larger than a current Forest Service region would be unwieldy and a trust smaller than a current national forest would be susceptible to economic failure (Thoreau Institute).<sup>10</sup>

Increase forest product productivity (Draft Framework Alternative 7). Given the major responsibilities that will fall upon private landowners, voluntary habitat improvement programs need to be fully encouraged through the use of a federally funded incentive program (Governors' Recommendations, July 2000).

Apply voluntary and incentive-based approaches to resolve aquatic resource and water quality problems. Examples include Small landowner assistance programs; Stewardship agreements (ORS ch. 527.662); The Green Permits Act (Oregon Laws 1997, ch. 553); The Forest Stewardship Act (Oregon Laws 1995, ch. 413); Healthy Streams Partnership and the Oregon Plan for Salmon and Watersheds (Oregon Laws 1997, ch. 7); Oregon DEQ's Environmental Management Systems Incentives Project; Habitat Conservation Plans adopted and approved under the federal ESA; Project XL agreements with the EPA; Pollution Prevention Partnership agreements with the EPA.

### 9. COMMERCIAL HARVEST

*Decrease mixed stock commercial harvest. Emphasize fish farming. Manage harvest through financial incentives (Sample Actions).*

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)

Recreational fishing opportunities are maintained and promoted, consistent with escapement goals and the fulfillment of tribal treaty obligations (Draft Framework Alternative 2,3; Framework Concept Paper 27).

Seek opportunities to increase harvest in ways that do not harm listed ESUs (NMFS/USFWS). Discourage non-

<sup>9</sup> Concept paper: Redefining Range/Grassland Management on the Public Lands (Public Lands Council); Thoreau Institute: <http://www.teleport.com/~rot/rangereform.html>

<sup>10</sup> Testimony of Randal O'Toole on Federal Forest Management and Ownership before the Forests and Public Land Management Subcommittee Senate Energy and Natural Resources Committee, November 1995: Thoreau Institute: <http://www.teleport.com/~rot/Testimony.html>

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).

## 10. RESIDENTIAL AND COMMERCIAL DEVELOPMENT

*Decrease regulations on development; allow developers flexibility in protecting natural resources in areas targeted for development (Sample Action).*

Given the major responsibilities that will fall upon private landowners, voluntary habitat improvement programs need to be fully encouraged through the use of a federally funded incentive program. Increased riparian fencing is an obvious place to start. (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).

The Action Agencies shall coordinate their efforts and support offsite habitat enhancement measures undertaken by other federal agencies, states, tribes, and local governments by the following: (See RPA) (NMFS Biological Opinion Action Table Dec. 2000).

## 11. RECREATION

Meet human demands for recreation in natural, undisturbed habitat with adequate supply of wild reserve areas (Draft Framework Alternative 7). Focus efforts on developing economically valuable sport fisheries (Human Effects Analysis Appendix D; Draft Framework Alternative 2,3; Framework Concept Paper 25). Develop Youngs Bay and other tributaries as preferred options for commercial and sport fisheries (Framework Concept Paper 27).

*Emphasize localized decision-making for recreation management, and set fees for various forms of recreation (Sample Action).* User fees for recreation, in the long run, may shift incentives away from selling environmentally and fiscally damaging timber, mineral and grazing leases, and toward recreation. However, this will only happen when managers who oversee both programs within a district are able to make decisions based on fair market valuation of resources and real costs.<sup>11</sup>

Develop industrial recreation: destination recreation facilities featuring mountain biking, kayaking and guided nature walks, off-road vehicle use, heavily developed RV facilities and ski areas with detailed rules spelling out where, when, and how leisure-seekers can participate. And instead of being subsidized and managed by the government, those highly organized forms of recreation -- everything from golf courses and marinas to inline skating parks and water slides -- will increasingly be run by private contractors seeking a profit (e.g., <http://www.wildwilderness.org/docs/news.htm>).

## TRIBES

### 12-1. Tribal Harvest

*Emphasize maximum sustainable harvest (Sample Action).*

Redirect tribal mixed-stock commercial harvest to selective harvest at fish ladders and in tributaries (Framework Alternative 7).

Reduce mixed stock harvest; increase catch value; reduce fishery capitalization (Framework Concept Paper 27).

Accept financial incentives for alternative commercial and economic activity; temporarily suspend or reduce commercial harvest (Framework Concept Paper 27). Decrease commercial harvest; provide economic incentives not to fish during certain migration periods (Framework Concept Paper 27). Support marking All-Hatchery fish to enable selective harvest (Framework Concept Paper 5; Framework Concept Paper 27).

Substitute resident fish and wildlife, plus enhance their habitats in blocked areas (Framework Concept Paper 13; Framework Concept Paper 8).

Recreational fishing opportunities are maintained and promoted, consistent with escapement goals and the fulfillment of tribal treaty obligations (Framework Concept Paper 27).

Shift to terminal [*harvest*] (Framework Concept Paper 27).

<sup>11</sup> "The BLM Recreation Fee Demo Program." Karyn Moskowitz. (posted on Thoreau Institute)  
<http://www.teleport.com/~rot/blm.html>

The Action Agencies shall work with NMFS, USFWS, tribal, and state fishery management agencies to develop methods for crediting harvest reforms, and the survival benefits they produce, toward FCRPS offsite mitigation responsibilities. A crediting approach shall be agreed upon by the 3-year check-in (NMFS Biological Opinion 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 Action Table 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). 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).

#### 12-2. Tradition, Culture, Spirituality

*De-emphasize species diversity and geographic distribution within the basin. Focus on utilizing healthy species in targeted locations. Emphasize economic values of species (Sample Actions).*

Support federally recognized tribes' and tribal communities' subsistence needs to the greatest extent practicable (ICBSDEIS, B-O61).