

Appendix A

RECOMMENDATIONS REGARDING HABITAT OBJECTIVES AND FUNDING SOURCES

The following were recommended by the fishery managers as actions that should be taken to meet the habitat objectives listed in Section 7.6D. The Council lists these recommendations here as potential means of achieving compliance with those objectives.

Sediment

- The Council recommends actions like the following to correct sediment problems: 1) no further ground disturbance or vegetation removal within the watershed until the objective is met, 2) suspend ongoing activities that generate elevated sediment delivery until the objective is met, and 3) initiate active restoration methods such as road obliteration and revegetation.

Bank Stability

- The Council recommends, where the bank stability objective is not being met, that activities that decrease bank stability or forestall bank recovery (i.e. riparian grazing, vegetation removal and road construction) be temporarily eliminated until bank stability is greater than 90 percent.

Water Quality

- Where the water quality objective is not being met, the Council recommends actions such as: 1) restoring the hydrologic regime, 2) not allowing the removal of streamside shading, and 3) restoring streamside shading.

Riparian Vegetation

- The Council recommends active riparian planting in areas with static or declining riparian vegetation trends if natural revegetation is shown to be inadequate for desired improvements. The Council also recommends monitoring trends in riparian vegetation.

Stream Morphology

- The Council recommends actions to improve stream morphology such as: 1) restoring floodplains by removing floodplain impacts (i.e. roads, riprap, and mining operations), 2) prohibiting channalization and channel armoring, and 3) meeting bank stability and sediment objectives. In addition, monitor trends in woody debris, pool frequency and pool volume.

Roads

- The Council recommends actions such as: 1) reducing roads as necessary to meet sediment and other water quality objectives, 2) using watershed-level inventories of terrestrial and aquatic conditions to determine which and how many roads should be obliterated, relocated, or otherwise treated, and 3) road closure, obliteration and revegetation where conditions do not meet the sediment objective.

Grazing

- Where current practices are not compatible with program habitat objectives, reductions or elimination of grazing until these habitat objectives are met or a peer reviewed scientific study describes the level of grazing compatible with such rapid fish habitat recovery.

Timber Harvest

- The Council recommends not harvesting timber in areas prone to landslides or erosion which could degrade the soils or release sediment to streams.

Mining

- The Council recommends that: 1) mining, and associated facilities and roads, not occur in riparian areas, 2) location and design of waste facilities use best available techniques to ensure mass stability and to prevent the release of acid or toxic materials, 3) reclamation bonds be adequate to ensure long-term chemical and physical stability of mine waste facilities, 4) waste facilities be reclaimed immediately after mining operations, 5) transport and holding of toxic materials along spawning and rearing reaches be seasonally restricted, and 6) mining operations be monitored and adjustments be made to operations as needed.

POTENTIAL SOURCES OF RESOURCES FOR HABITAT PROTECTION AND IMPROVEMENT

FEDERAL

Entity	Program	Assistance	Recipients	Purpose	Comments
Farm Home Administration	Watershed & Flood Protection	Loans	Municipalities, local non-profit organizations	Including flood control, recreation and storage	Used in conjunction with Soil Conservation Service's small watershed program
Soil Conservation Service	Small Watershed Program	Technical assistance and grants	State agencies, municipalities, districts	Planning and construction of projects which utilize resources of small watersheds	Covers up to 100% flood control and up to 50% of most other purposes
Soil Conservation Service	Conservation Reserve Program	Direct payment	Private land owners	Soil erosion control	
Soil Conservation Service	Wetlands Reserve Program	Direct payment	Private land owners	Wetlands protection	
Agricultural Stabilization Conservation Service	Rural Clean Water Program	Direct payments	Private landowners	To solve water problems resulting from agricultural nonpoint surface pollution	Cannot be used as local cost share on federal projects
Agricultural Stabilization Conservation Service	Agricultural Conservation Program	Direct payments, technical assistance	Private landowners	Land & water conservation	Up to \$3,500 per year per producer
Agricultural Stabilization Conservation Service	Water Quality Special Projects	Direct payments	Private landowners	Assist large water quality projects involving many participants	Emphasis on hot spots identified by water quality board, national competition

Agricultural Stabilization Conservation Service	Water Quality Incentive Program Wetland Reserve	Direct payments	Private landowners		Direct incentives for improvement measures, no cost share available in Washington
Agricultural Stabilization Conservation Service	Forest Incentive Program	Cost share	Private landowners	Tree planting for woodland improvement	
Agricultural Stabilization Conservation Service		Cost share	Private landowners	Capital improvements to control non-point pollution	
U.S. Bureau of Reclamation	Small Reclamation Projects Act	Loans and grants	Cities, counties, irrigation districts, water districts	Flood control, fish and wildlife, recreation, irrigation & hydropower	Cannot claim other federal funds as local cost share
Bureau of Reclamation	Rehabilitation and Betterment Act Loan Program				
Bureau of Reclamation	Federal Bureau of Reclamation Project Program				
Bureau of Reclamation	Western Watercourse			Facilitate locally sponsored and administered water education programs	
U. S. Fish and Wildlife Service	Partners for Wildlife Prog. Wetlands Restoration	Grants, technical assistance	Private landowners	Restoration and/or enhance wetlands	
US Army Corps of Engineers	Flood Control Studies				

US Army Corps of Engineers	Small Flood Control Prog.				
US Army Corps of Engineers	Beach Protection Studies				
Environmental Protection Agency	205J program	Direct payment	State and local agencies	Water quality demonstration projects	
Environmental Protection Agency	State Revolving Fund Program	Loans	State and local entities	Water quality projects	80 percent federal funds and 20 percent state funds
Environmental Protection Agency	Americorp Program	Grants	Federal, state, and tribal entities	Job training and watershed improvement	
Environmental Protection Agency	106 Grants Program				
Environmental Protection Agency	604B Grants Program				
Environmental Protection Agency	314 Grants Program				
Environmental Protection Agency	National Estuary Program				
Bonneville Power Administration	Fish and Wildlife Program	Direct payment	Various	Fish and wildlife mitigation	Funds model watersheds
U.S. Dept. of Agriculture	Urban Assistance Program	Grants and direct payment	Local and private entities	Urban watershed improvement	
U.S. Fish and Wildlife Service	Washington State Ecosystem Conservation Project	Direct payment		Wetland improvement and protection	Requires cost sharing

STATE

Entity	Program	Assistance	Recipients	Purpose	Comments
Washington of Dept. of Fish and Wildlife	Habitat Enhancement Program				
Washington State Conservation Commission	Water Quality Research Grant Program	Grants to conservation district's, water quality projects			
Washington State Conservation Commission	Nonpoint Water Quality Grants Program	Grants	Conservation districts	Water quality projects	
Washington State Conservation Commission	Dairy Waste Management Program	Loans and grants	Conservation districts and private land owners	Water quality improvement and protection	
Washington Dept. of Ecology	Clean Water Act Section 319	Grants	State or federal government entities	Improvement of natural watershed and quality of surface and ground water	
Washington Dept. of Ecology	Centennial Clean Water Fund	Grants	State or local entities	Water quality projects	
Washington Dept. of Ecology	Lake Restoration				
Washington Department of Ecology	Coastal Zone Management Grants				Environmental Protection Agency funds for coastal waters protection
Washington Department of Ecology	Flood Control Assistance Account Program				

Washington Dept. of Natural Resources	Stewardship Incentive Program	Grants	Woodland owners with 5-1,000 acres of forest land	Improve land management	Cost share is 50-75% & up to \$10,000 per owner per year, program practices include riparian, wetland & fisheries protection
Washington Dept. of Natural Resources & Washington Dept. of Fish and Wildlife	Jobs for the Environment Program	Grants	State, local, and private entities	Employing displaced workers	Works in conjunction with Watershed Restoration Partnership Program
Washington Dept. of Natural Resources & Washington Dept. of Fish and Wildlife	Watershed Restoration Partnership Program	Grants	State, local, and private entities	Watershed projects to enhance fish	Jobs for the Environment Program
Washington Dept of Community Development.	Community Development Block Grant				
Washington State Salmon Enhancement funds					
Oregon Dept. of Water Resources	Oregon Watershed Health Program	Direct payment	Local watershed councils	Watershed improvement	
Oregon Governor's Watershed Enhancement Board	Oregon Watershed Improvement Program	Grants	Various	Watershed improvement and protection	
Oregon Dept. of Agriculture				Watershed improvement	Buck Hollow 2000 Project

PRIVATE

Entity	Program	Assistance	Recipients	Purpose	Comments
Nature Conservancy		Direct payments	State and local entities	Watershed enhancement projects, land & water purchase/lease	
Isaac Walton League		Volunteer assistance		Habitat protection and improvement	
Blue Mt. Natural Resources. Institute	Blue Mountain Elk Initiative	Restoration projects	varies	Restoration of elk habitat	Partnership of 22 tribal, government, and private entities
Trout Unlimited	Embrace-A-Stream Projects	Grants, volunteer assistance		Habitat and fisheries enhancement and protection	
Rocky Mountain Elk Foundation					Potential source of funding for land purch.
Key Bank	Washington Waters Program	Grants	State, local, and private entities	Watershed improvement and protection	
Mid-Columbia Public Utility Districts		Direct payments		Watershed improvement	
Phillips Petroleum Company	Phillips Environmental Partnership Awards	Schools and community organizations		Habitat and wildlife, water, public works, school grounds, recycling, environmental education	\$500-\$5000, Center for Environ. Edu, Oklahoma State U., Gunderson Hall, Stillwater, OK, 74078

Long Live the Kings				Watershed improvement	
Peace Trees				Youth group that does environmental work	
Nordstroms, Inc		Grants		Watershed improvement	
Council of International Education Exchange				Habitat improvement	Volunteers from Europe
Adopt-A-Stream Foundation	Adopt-A-Stream Program	Volunteer		Watershed improvement	
The Land Trust Alliance				Provides specialized services, publications, information, and training on land trusts	
Ducks Unlimited		Grants, volunteer		Wetlands protection and improvement	
Northwest Steelheaders				Watershed improvement	Buck Hollow 2000 Project
Oregon Wildlife Heritage Foundation					Buck Hollow 2000 Project

OTHER

Entity	Program	Assistance	Recipients	Purpose	Comments
Northwest Power Planning Council	Fish & Wildlife Program	Direct payments	State & federal agencies, tribes, and private entities	Program to protect, mitigate and enhance fish and wildlife affected by hydropower system	Can be used as local cost share on federal projects
City and county governments, conservation districts	Stream Walk Program	Volunteer training and funding	Various	Water quality monitoring and stream/riparian enhancement	

Appendix B

SUMMARY OF HYDROPOWER COSTS AND IMPACTS OF THE MAINSTEM PASSAGE ACTIONS

This document summarizes regional hydropower costs and impacts of the mainstem passage actions in the Northwest Power Planning Council's 1994 Columbia River Basin Fish and Wildlife Program. This appendix presents a summary of the staff's hydropower and economic analysis, which provides an indication of the magnitude of the costs and impacts of these actions, as compared to the Council's 1992 Strategy for Salmon measures. In addition, a staff analysis of the biological benefits of these actions is presented in a separate appendix.

Summary

Implementation of a four-pool lower Snake River drawdown to near spillway crest would increase spring flow equivalents in the Snake River by nearly 135 percent in the lowest eight water years and by almost 110 percent in the next lowest 12 years. Summer flow equivalents under a four-pool drawdown operation increase by more than 30 percent. Equivalent spring flows with the four-pool lower Snake River drawdown are above the 140,000 cubic feet per second operational objective about 95 percent of the time. Implementation of only Lower Granite and Little Goose reservoir drawdowns to near spillway crest would increase spring flow equivalents in the Snake River by roughly 50 percent and summer flow equivalents between 10 and 20 percent in the 20 lowest water years. Equivalent spring flows under a two-pool drawdown would exceed the 140,000 objective about two-thirds of the time compared to 14 percent under the Strategy for Salmon operation.

In the lower Columbia River, operation of John Day pool at near spillway crest would increase both spring and summer flow equivalents between 55 and 65 percent in the 20 lowest water years. Equivalent spring flows with John Day drawn down to near spillway crest are above the 300,000 cubic feet per second operational objective about 95 percent of the time. Operation of John Day reservoir at minimum operating pool level would increase spring and summer flow equivalents by 10 to 15 percent in the 20 lowest water years. Equivalent spring flows under this operation would exceed the 300,000 cubic feet per second operational objective about 60 percent of the time, compared to 42 percent under the Strategy for Salmon operation.

Refill probabilities increase at Libby and Hungry Horse dams due to operation of both projects under their respective integrated rule curves. Average end-of-July refill probability at Libby increases from 90 to 92 percent and at Hungry Horse from 86 to 96 percent. At Grand Coulee, the refill probability drops from 100 percent in the Strategy for Salmon to between 40-50 percent in the 1994 measures. This is because in low water years, Grand Coulee is often drafted to an elevation of 1,280 feet in July and August to attempt to achieve the late summer flow objectives. At Dworshak, refill probability depends on whether a drawdown of the four lower Snake River dams is implemented. Without a drawdown operation, Dworshak's refill probability falls from 42 percent under the Strategy for Salmon to 10 percent. With a four-pool Snake River drawdown operation, its refill probability increases to 72 percent. In a two-pool Snake River drawdown operation, Dworshak's refill probability is 34 percent. Brownlee's July elevations are generally higher under

the Council's mainstem actions, but its August refill probability falls from 100 percent in the Strategy for Salmon to about 66 percent.

In general, monthly average nutrient retention times at Grand Coulee Dam remain above or close to the suggested 30-day minimum level except in May. May retention times in the mainstem passage actions are similar to, or improved by about one day from the retention times in the Strategy for Salmon. In the months of April and June, the average retention times hover close to the 30-day value. In July and August, retention times decrease by about 6 to 16 percent, but remain above the 30-day limit. In July, average retention time ranges from about 38 days to 41 days, and in August it is about 44-45 days.

Average annual costs to the Bonneville Power Administration range from about \$90 to \$225 million.¹ The corresponding average rate impacts range from about 4 percent in the near term to 11 percent in the long term. Power system costs, which include the cost of replacement resources, energy purchases and lost revenues, amount to about one-third to one-half of the total cost. Non-power costs include the capital costs of modifying dams for drawdown,² costs of improving bypass or transportation and other related costs. Firm hydropower losses range from 400 to 850 average megawatts, depending on the package of measures implemented.

Background and Study Description

The mainstem passage actions adopted by the Council provide flow and velocity improvements in both the Snake and Columbia rivers to improve salmon survival over the next 20 years.

These actions include an evaluation strategy for smolt transportation, coupled with immediate and long-term flow improvement and/or reservoir drawdown measures. The actions are analyzed in sequence as depicted in Figure 1. They include:

1995 Actions

- A 28-foot drawdown from full pool of Lower Granite reservoir to elevation 710 for two months from mid-April to mid-June. This action will disable the existing juvenile bypass system, but adult passage can still be provided. Since navigation and juvenile fish bypass facilities are not functional during the drawdown period, smolt transportation of spring migrants cannot occur from this project, and spill provides juvenile fish bypass.
- Spill at all mainstem projects for 80 percent fish passage efficiency as constrained by state water quality guidelines, except at Little Goose Dam, which becomes the only smolt collecting and transport project.

¹Costs to Bonneville Power Administration include 71 percent of the regional power system costs, capital costs of modifying dams and other related costs. They reflect the levelized cost of implementing various measures at various future dates. Section 1 of the fish and wildlife program discusses these costs in estimated expenditures for specific years and are, therefore, different from those levelized costs reported here.

²Capital costs of drawdown-related dam modifications are based on Corps of Engineers cost estimates from its System Configuration Study, including contingency costs.

- An additional 100,000 acre-feet of water (over the 427,000 called for in the Strategy for Salmon) from the upper Snake Basin, and up to 1 million acre-feet of water (over the 3 million called for in the Strategy for Salmon) stored operationally in the upper Columbia Basin reservoirs of Grand Coulee, Libby and Arrow.
- Additional drafts from Brownlee reservoir are also provided, with Brownlee passing inflow from the upper Snake Basin and not refilling until the fall.
- Implementation of integrated rule curves to protect resident fish and aquatic life at Libby and Hungry Horse reservoirs in Montana. In addition, the minimum lake elevation at Albeni Falls is raised to 2,056 feet for salmon flows and resident fish.

1999 Actions - Alternative A (same as 1995 plus)

- Maintain John Day Pool near its minimum operating pool level (elevation 257 feet) year-round, which is an 11-foot drawdown from its normal full pool level.
- Provide an additional 1,000,000 acre-feet of water from the upper Snake Basin for flow augmentation and refill of drawn down reservoirs, for a total of 1.427 million acre-feet from the upper Snake.
- Lower Granite and Little Goose reservoirs are lowered for two months to near spillway crest elevations, which are drawdowns of about 45 feet from full pool. Bypass is enhanced at Lower Granite through the addition of a surface juvenile fish bypass system with an effective fish guidance efficiency of 70 percent.
- Due to the drawdown of the two upper Snake River projects, smolt transportation is confined to Lower Monumental Dam.
- Spill at all mainstem projects for 80 percent fish passage efficiency, as constrained by state water quality standards, except at Lower Monumental Dam, which becomes the smolt collecting and transport project.

2002 Actions - Alternative B (same as 1999 plus)

- Lower Monumental and Ice Harbor pools are drawn down to near spillway crest elevations for two months, during the spring, which represent 45 and 40-foot drawdowns from normal full pool levels, respectively.
- John Day pool is drawn down to near spillway crest elevation (elevation 220 feet) year-round, which is a drawdown of about 48 feet from full pool.
- No transportation, spill at all mainstem projects for 80 percent fish passage efficiency as constrained by state water quality standards.

2002 Actions - Alternative C (same as 1999 plus)

- Lower Monumental and Ice Harbor are drawn down to near spillway crest elevations for two months in the spring.
- No transportation, spill at all mainstem projects for 80 percent fish passage efficiency as constrained by state water quality guidelines.

2002 Actions - Alternative D
(same as 1999 plus)

- Lower Monumental and Ice Harbor pools are held at normal minimum operating pool elevations.
- John Day is drawn down to near spillway crest elevation (elevation 220 feet) year-round.
- Spill at all mainstem projects for 80 percent fish passage efficiency as constrained by state water quality standards, except at Lower Monumental Dam, which becomes the smolt collector and transport project.

A decision to implement either Alternative B, C or D, or to continue implementation of Alternative A measures will be made before the year 2002.

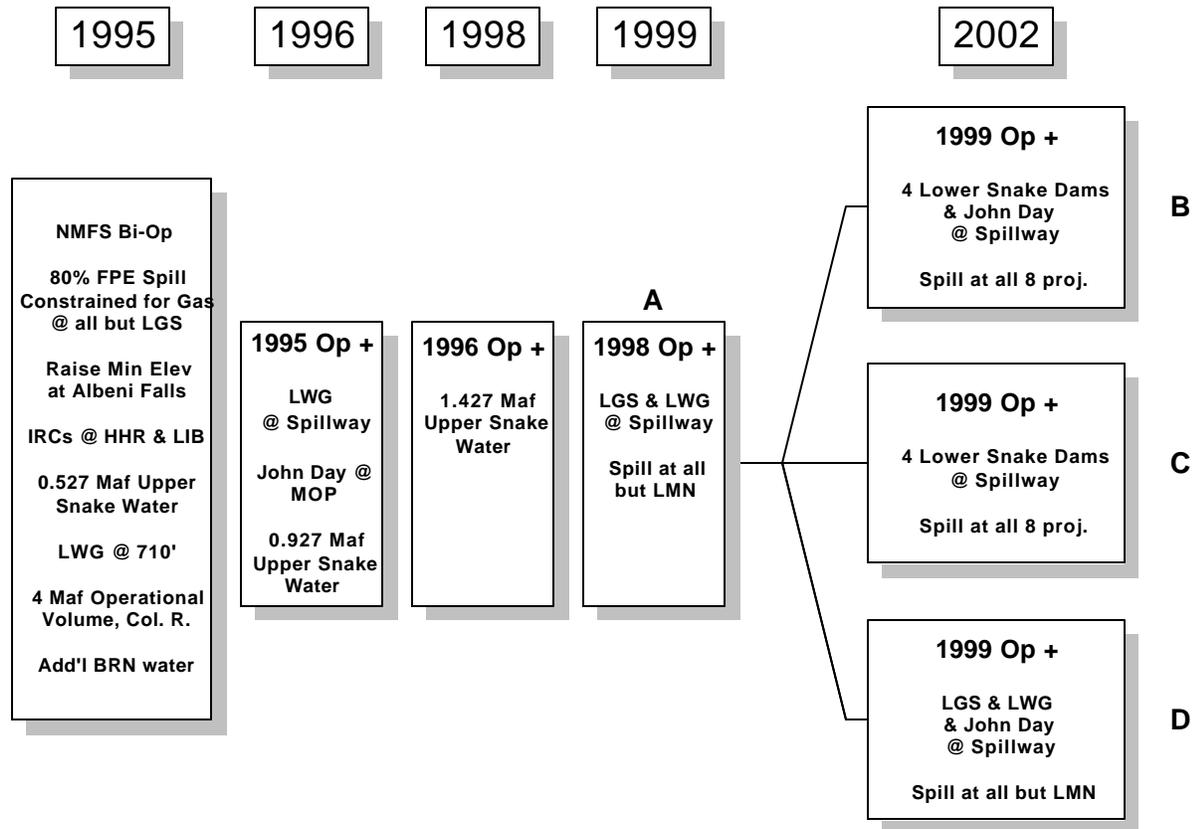


Figure 1

Assumptions

Assumptions for this analysis generally reflect information found in the Northwest Power Planning Council's 1991 Northwest Conservation and Electric Power Plan. Specific hydropower data and project operating rule curves are taken from Bonneville's System Operation Review studies. Gas price information was updated to reflect more current estimates, as were assumptions about combined-cycle combustion turbines. In addition, Southwest market assumptions were also updated based on new information from California and new gas prices.

Water for Flow Augmentation

In the Snake River, water for flow augmentation comes from the Dworshak or Brownlee reservoirs or from the upper Snake River Basin above Brownlee. Upper Snake River water is assumed to be used first, as needed, to meet the flow or water temperature objectives. It is also assumed that this water will be passed, or, in some cases, shaped through the Brownlee reservoir. Because it is presently unclear where and when upper Snake River water would be available within each year, it is assumed that certain volumes would be available for each month, on call as needed to help meet the flow objectives. For the 1995 analysis, 50,000 acre-feet are assumed to be available in the second half of April, 150,000 acre-feet in May and 90,000 acre-feet in June. In August, 137,000 acre-feet could be provided, and in September 100,000 acre-feet for temperature control operations are available. The total amount of upper Snake River water assumed to be available in 1995 is 527,000 acre-feet.

In later years, the Council's Strategy for Salmon calls for an additional 1 million acre-feet from the upper Snake River Basin. For that operation, it is assumed that 250,000 would be available in the second half of April, 550,000 in May, 390,000 in June, 137,000 in August and 100,000 in September. Upper Snake River dams are assumed to refill beginning in October and throughout the winter months, thus reducing the inflows to Brownlee reservoir.

Dworshak will provide up to 1 million acre-feet of water for spring flow augmentation, as needed, to meet the flow objective. In addition, any water stored in shifted flood control space will also be used for flow augmentation. In July, Dworshak is allowed to draft to an elevation no lower than 1,520 feet, if needed to achieve the desired summer flows.

Brownlee reservoir is drafted for flow augmentation only if volumes from the upper Snake and Dworshak are depleted. In spring (second half of April and May) Brownlee would be drafted no lower than elevation 2,069 for flow augmentation. This provides as much as 110,000 acre-feet, if drafted from full. In June, Brownlee would not refill, but simply pass water through from the upper Snake. In July, Brownlee could be drafted up to 137,000 acre-feet if needed to meet the flow objective. It would not be drafted below elevation of 2,067 feet in July. In August, normally the Brownlee reservoir would refill. Under the new measures, in the near term, Brownlee would allow 50,000 acre-feet of upper Snake River water to pass through. In the long term, it would allow a pass-through of all 137,000 acre-feet of upper Snake water.

In the Columbia River, the original 3.45 million acre-feet of water budget volume is assumed to be available for flow augmentation. The additional 3 million acre-feet of operational volume called for in the Strategy for Salmon is increased to 4 million acre-feet. The amount of additional volume to be stored is based on runoff conditions, with the full 4 million acre-feet to be stored in poor water years. It is to be stored above normal power draft elevations subject to: a) space available up to flood control elevations; and b) maintaining Vernita Bar and at-site minimum flow constraints. It is assumed that this water would be stored, as much as possible, in equal volumes beginning in January through the middle of April, and prior to the spring salmon migration season. This 4 million acre-foot operational fish volume is stored first in Grand Coulee, then Libby, and finally in the Arrow project in Canada, if necessary.

Any remaining flow augmentation volume can be held and released in the summer to achieve the summer flow objective. In addition to this water, Grand Coulee can be drafted to an elevation of 1,280 feet in July or August, if necessary to meet summer flow objectives. This represents about 800,000 acre-feet, if drafted from full pool elevation of 1,290 feet.

Flow Objectives for the Snake River

It is understood that in low runoff years there is insufficient water to achieve the mainstem passage flow objectives unless a drawdown of the four lower Snake River dams is implemented (see discussion of flow results below). Thus, for those packages of measures that include a two-pool drawdown or no drawdown operation below minimum operating pool levels, a sliding scale flow target was used in the model to distribute the release of flow augmentation water. In these low years, simply applying a 140,000 cubic feet per second objective would use up all or most of the volume in the first month, leaving little or no water for salmon flows during the latter part of the migration season. By applying a sliding scale target, starting at 85,000 cubic feet per second and ramping up to 140,000 cubic feet per second, a more even distribution of flow augmentation is achieved in these low water years. In the shoulder months, second half of April and June, the sliding scale started at 70,000 cubic feet per second to better simulate a typical spring hydrograph shape. No sliding scale flow targets are used for July, but Dworshak is allowed to draft to an elevation of 1,520 feet, if needed to achieve the summer flow objective.

Flow Objectives for the Columbia River

Various fishery agencies and lower river Indian tribes recommended specific Columbia River flow objectives, ranging from 300,000 cubic feet per second from April 15 to June 15, to 200,000 cubic feet per second in last half of June and all of July, and ramping down to 160,000 cubic feet per second in August. The spring flow objectives are decreased by 40,000 cubic feet per second in each of the second- and third-year critical periods, so that the spring flow objective under third-year critical rule curves is 220,000 cubic feet per second. These flow objectives are treated as operational flow objectives, which the system will try to achieve.

To cover the early migration, a target of 170,000 cubic feet per second is used in the modeling analysis in the second half of April. In May and June, a sliding scale target ranging from 180,000 to 300,000 cubic feet per second is used at The Dalles. As in the Snake, the flow objectives cannot be achieved in low water years without a drawdown of the John Day pool. Again, a sliding scale flow target is used to even out the distribution of flow augmentation for these low runoff conditions and more accurately simulate the natural hydrograph. In summer months, the targets remained fixed for all conditions at 200,000 cubic feet per second in July and 160,000 cubic feet per second in August.

Other Hydro-Related Assumptions

Non-treaty storage water is allowed to be used for power purposes, but is not modeled for flow augmentation. Too many complexities prevented a simulation of the use of non-Treaty water for flow augmentation.

The analysis takes into consideration the existing agreement between the United States and Canada over the lake elevations at Corra Linn Dam. This agreement affects the operation of the Libby project in Montana.

The Vernita Bar minimum flow of 70,000 cubic feet per second, as well as flood control requirements, are maintained from January through April. These requirements can sometimes limit the quantity of operational storage for salmon. This year, for example, the Vernita Bar required minimum flow was 60,000 cubic feet per second.

Estimating Firm Energy Losses

Firm energy losses were estimated using the Council's System Analysis Model. A critical period operation was simulated (operation of the hydro system over the 1929 through 1932 water conditions) in order to calculate the maximum amount of firm hydro energy, given a particular set of constraints. For a normal critical period operation (prior to water budget operations), the hydro system starts full at the beginning of the critical period and is empty by February of the 1932 water year. During the critical period no electricity service is curtailed, except interruptible contracts. All available and declared non-hydro firm resources are in operation and no imports or exports are allowed. This defines the maximum amount of firm hydro energy available in the region.

Because of the water budget and other non-power constraints, this operation must be modified somewhat. Because of efforts to store water in winter for later release for flow augmentation, out-of-region energy purchases are allowed up to 2,000 megawatts per month from January to April. Firm energy loss estimates assume the availability of up to 2,000 megawatts of energy per month from out-of-region utilities.

Southwest Market

A better and more current estimate of the Southwest market was made, taking into account current estimates of Southwest resources and demand. This produces a smaller market in the near term. Also, more current information on interregional contracts was used.

Gas Prices

Current estimates for gas prices, which are lower than those in the 1991 Power Plan, result in lower revenues from Southwest sales, but also result in lower Northwest operating costs.

Replacement Resources

Combined-cycle combustion turbines were used to replace lost firm hydro energy. This choice of replacement resource is not optimal, but it provides a good estimate of what likely costs would be. (See the section on cost uncertainty, below, for more information.) Combustion turbines are a reasonable choice for replacement resource in lieu of performing a full power plan to develop a mix of resources that would minimize the cost. Capital costs for combustion turbines are about one-third lower than the assumptions used in the 1991 Power Plan.

Spill Levels

Spill levels were increased from the Strategy for Salmon to try to achieve 80-percent fish passage efficiency. However, the spill levels at each mainstem federal dam are constrained to limit dissolved gas supersaturation below 120 percent, as determined from the actual 1994 spill levels and 1994 dissolved gas monitoring information.

Integrated Rule Curves at Libby and Hungry Horse Dams

Integrated rule curves obtained from the Montana Department of Fish, Wildlife and Parks in June of 1994 are incorporated in the analysis. These rule curves provide a set of minimum elevations for each of the

50 historic water conditions simulated. It was assumed that the State of Montana fully integrated these curves with flood control protection. Thus, these curves took precedence over the older flood control elevations at these projects.

Albeni Falls Minimum Elevation

By raising the minimum elevation at Albeni Falls to 2,056 feet, some additional water would be available for flow augmentation in the spring. Normally, this project is drafted to an elevation of 2,051 feet during the winter. Keeping the reservoir 5 feet higher in the winter represents about 440,000 acre-feet of spring water that does not have to come from natural streamflows to fill the project. In other words, water that would have filled Lake Pend Oreille from 2,051 to 2,056 feet in early spring can instead be passed through the dam. In order for this "passive" flow augmentation to work most effectively for flow augmentation, however, replacement energy (in November when it otherwise would have been drafted) must come from a non-hydro resource. Thus, this volume should be treated just as the operational volume stored in Grand Coulee, Libby and Arrow. To hold water in Albeni Falls, either: a) nonfirm hydropower sales to out-of-region utilities must be curtailed; b) non-hydropower resources must be used in the region; or c) out-of-region energy can be purchased. In this analysis, however, the minimum elevation is raised, but no active replacement strategy is used. The entire Northwest resource system is used to replace the water held at Albeni Falls. Therefore, since some of the replacement energy may have come from the hydro system, spring outflows from Albeni Falls may not be quite as high as they could be under a more desired replacement energy operation.

Methodology

System simulation models can be used to evaluate the costs and benefits of the actions called for in the Council's program. For this analysis, as noted above, the System Analysis Model (SAM) was used. SAM is a Monte Carlo program that simulates the monthly operation of the region's hydroelectric dams and thermal resources to meet demand (load) for electricity, including regional interruptible loads and extra-regional secondary loads. Short-term demand uncertainty, hydropower uncertainty (in terms of variable runoff conditions) and thermal performance uncertainty are modeled explicitly. Exchanges with B.C. Hydro and the Pacific Southwest are also modeled. SAM will simulate the dispatch of generating resources to achieve the most economical operation for the Pacific Northwest region.

SAM provides detailed information for reservoir elevations and outflows. It can be used to estimate the magnitude of lost firm energy generating capability for a proposed change in system operations. It will also calculate the magnitude of changes in secondary energy production and the corresponding change in revenue. Costs of out-of-region energy purchases are also included.

Since SAM is a monthly model, it cannot analyze capacity losses. Capacity issues, such as the hydrosystem's ability to meet daily peaking requirements, must be analyzed using a smaller time increment. Models exist that can simulate the hydrosystem operation on an hourly basis, but these programs are cumbersome to use and require extensive computer time. Efforts are under way to develop tools to analyze capacity issues in a more timely fashion.

The spring smolt migration period is assumed to be April 16 to June 15 in the Snake and May 1 through June 30 in the lower Columbia. During the migration periods, desired fish flows are modeled as sliding-scale target flows, which are proportional to basin runoff conditions. That is, the higher the runoff, the higher the target flow, and vice versa. Target flows can be set at Lower Granite Dam on the Snake River, Priest

Rapids Dam in the mid-Columbia River and The Dalles Dam in the lower Columbia River. Target flows are set so that all of the water stored for fish flow augmentation is released by the end of the migration period.

The intent of these flow targets is to evenly distribute, as much as possible, discharge throughout the migration period. For example, if in a particular year, natural runoff is early and flows are high in May, then most of the water reserved for flow augmentation would be saved for later release in June. In general, the sliding scale target flows are achieved provided enough water is in storage and no project limitations are violated. In some low runoff conditions, however, the target flows could not be achieved.

Two cases are usually analyzed to identify costs and impacts from a previous operation. For this analysis the base case reflects the operation of the hydrosystem under the Council's Strategy for Salmon measures. Alternate cases reflect changes adopted in the Council's amendments to its fish and wildlife program (see Figure 1).

Impacts to the power system are defined as differences in reservoir elevations, river flows and costs between the two cases. Energy costs are comprised of lost revenue from changes to secondary energy sales, replacement resource capital and operating costs, additional operating costs for existing resources and out-of-region purchase costs.

Results

The following tables summarize the impacts and costs to the hydropower system of the mainstem passage actions called for in the 1994 Fish and Wildlife Program. Tables 1 through 4 show the expected change in river flows at Lower Granite and The Dalles dams for spring and summer periods. Table 5 highlights the change in end-of-July average reservoir elevations and refill probabilities for Libby, Hungry Horse, Grand Coulee and Dworshak dams. Tables 6 and 7 summarize changes to the average nutrient retention times at Grand Coulee Dam. Table 8 identifies the range of lost firm hydro energy, the cost to Bonneville and its estimated rate increases.

River Flows

Implementation of the four-pool lower Snake River drawdown to near spillway crest (Alternatives B and C) would increase spring flow equivalents in the Snake River in the eight lowest water years by nearly 135 percent, and by almost 110 percent in the next 12 lowest water years. Summer flow equivalents would also increase by more than one-third in the 20 lowest water years. In some years, both for the Snake and Columbia rivers, normal flows would generate flow equivalent values over the flow objectives. In some of those years, some of the flow augmentation volume could be held in storage for later release in the summer, or for reservoir refill, or to minimize system cost.

Implementation of only Lower Granite and Little Goose reservoir drawdowns to near spillway crest (Alternatives A and D) would increase spring flow equivalents in the Snake River in the eight lowest water years by 57 percent, and by 50 percent in the next 12 lowest water years. Summer flow equivalents would also increase between 10 and 20 percent in the 20 lowest water years.

Table 1
Average Spring Flow Equivalents³
in the Snake River at Lower Granite Dam
(thousands of cubic feet per second)

	Strategy for Salmon	1995	A	B	C	D
Lowest eight water years	64.1	73.3	100.5	150.3	150.3	100.6
Next lowest 12 water yrs.	88.3	99.8	132.5	184.4	184.7	132.5
Highest 30 water years	126.4	143.4	187.7	239.8	239.8	187.7
50-Year Avg.	107.3	121.8	157.3	212.6	212.6	157.3

Table 2
Average Summer Flow Equivalents
in the Snake River at Lower Granite Dam
(thousands of cubic feet per second)

	Strategy for Salmon	1995	A	B	C	D
Lowest eight water years	24.1	25.9	26.7	32.1	32.1	26.7
Next lowest 12 water yrs.	28.6	31.3	34.4	39.1	39.0	34.0
Highest 30 water years	40.7	40.8	42.1	44.4	44.6	42.1
50-Year Avg.	35.1	36.1	37.9	41.1	41.2	37.8

Under a four-pool drawdown (Alternative C), the spring flow objectives can be achieved with lower absolute flows. For that alternative, flow targets at Lower Granite Dam are reduced to about 64,000 cubic feet per second (which is the 140,000 cubic feet per second equivalent flow with a four-pool drawdown operation) for the April 16 through June 15 period. The equivalent flow, averaged over the eight driest years, is about 150,000 cubic feet per second compared to about 64,000 cubic feet per second for the Strategy for Salmon. Under a two-pool drawdown (Alternative A), absolute spring flows, in the driest years, are higher than they are under a four-pool drawdown, but the equivalent flow is about 100,000 cubic feet per second.

In the lower Columbia River, operation of John Day pool at near spillway crest would increase both spring and summer flow equivalents between 55 and 65 percent in the 20 lowest water years. Operation of

³An equivalent flow produces the same water particle travel time at full pool as the regulated flow under a reservoir drawdown condition.

John Day reservoir at minimum operating pool level would increase spring and summer flow equivalents between 10 and 15 percent in the 20 lowest water years.

Table 3
Average Spring Flow Equivalents
in the Columbia River at The Dalles Dam
(thousands of cubic feet per second)

	Strategy for Salmon	1995	A	B	C	D
Lowest eight water years	191.0	201.4	215.3	302.7	210.7	308.6
Next lowest 12 water yrs.	242.7	250.4	266.7	376.0	262.1	382.7
Highest 30 water years	334.9	345.0	366.3	515.3	360.4	524.9
50-Year Avg.	289.8	299.4	318.2	447.9	312.9	456.0

Table 4
Average Summer Flow Equivalents
in the Columbia River at The Dalles Dam
(thousands of cubic feet per second)

	Strategy for Salmon	1995	A	B	C	D
Lowest eight water years	125.3	130.8	142.9	203.4	141.6	205.5
Next lowest 12 water yrs.	160.7	167.6	185.3	265.4	184.9	264.2
Highest 30 water years	188.7	194.5	214.4	307.1	214.6	307.5
50-Year Avg.	171.8	177.9	196.0	280.6	195.7	280.7

Note that reservoir drawdowns play an important role in meeting the velocity equivalent flow objectives. Without drawdowns, the Strategy for Salmon flow measures fall short of achieving either the National marine Fisheries Service 1994-98 Biological Opinion flow targets or the 140,000 cubic feet per second operational flow objective. For example, in the eight lowest water years in the Snake River, the Strategy's spring flow measures fall 3 million acre-feet short of achieving the 85,000 cubic feet per second National Marine Fisheries Service spring flow target for the Snake, and 10.8 million acre-feet short of providing the 140,000 cubic feet per second operational flow objective. In the next 12 lowest water years, the Strategy is almost 7.4 million acre-feet short of the operational flow objective. Over all 50 water years, the Strategy would need more than 4.6 million acre-feet to fully achieve the 140,000 cubic feet per second operational flow objective.

Similarly, in the eight lowest water years in the Snake River, the Strategy for Salmon's summer flow measures are more than 2.1 million acre-feet short of achieving the 50,000 cubic feet per second National Marine Fisheries Service summer flow target for the Snake. In the next 12 lowest water years, the shortfall to achieve 50,000 cubic feet per second is 1.7 million acre-feet. Over all 50 water years, the summer shortfall is 1.2 million acre-feet.

For the lower Columbia River, in the eight lowest water years in the Snake River, the Strategy for Salmon's spring flow measures fall more than 700,000 acre-feet short of achieving the 200,000 cubic feet per second National Marine Fisheries Service spring flow target for the Columbia, and almost 8.9 million acre-feet short of providing a 300,000 cubic feet per second operational flow objective. In the next 12 lowest water years, the Strategy is almost 4.7 million acre-feet short of the operational flow objective. Over all 50 water years, the Strategy would need more than 800,000 acre-feet to fully achieve a 300,000 cubic feet per second operational flow objective.

In the eight lowest water years in the Columbia River, the Strategy for Salmon's summer flow measures are about 2.1 million acre-feet short of achieving the 160,000 cubic feet per second National Marine Fisheries Service summer flow target for the Columbia, and nearly 4.6 million acre-feet shy of providing a 200,000 cubic feet per second operational flow objective in July. In the next lowest 12 water years, the shortfall to achieve the 200,000 cubic feet per second flow objective is 2.4 million acre-feet. Over all 50 water years, the shortfall is more than 1.7 million acre-feet to fully meet the summer operational flow objective.

The equivalent flow levels in Tables 1-4 indicate that the 1995 salmon flow measures also fall short of providing the operational flow objectives recommended by the fishery agencies and lower river Indian tribes, except in the 30 highest water years. Implementation of a four-pool drawdown in the Snake River, and a drawdown of John Day reservoir to near spillway crest elevations would achieve the operational flow objectives, even in the lowest water years. In addition, implementation of a two-pool drawdown in the Snake River and drawdown of John Day pool to minimum operating pool level come closer to achieving the operational flow objectives than the Strategy for Salmon flow measures.

Figure 2

**Duration Curve for Spring Flows
at Lower Granite Dam - Alternative B**

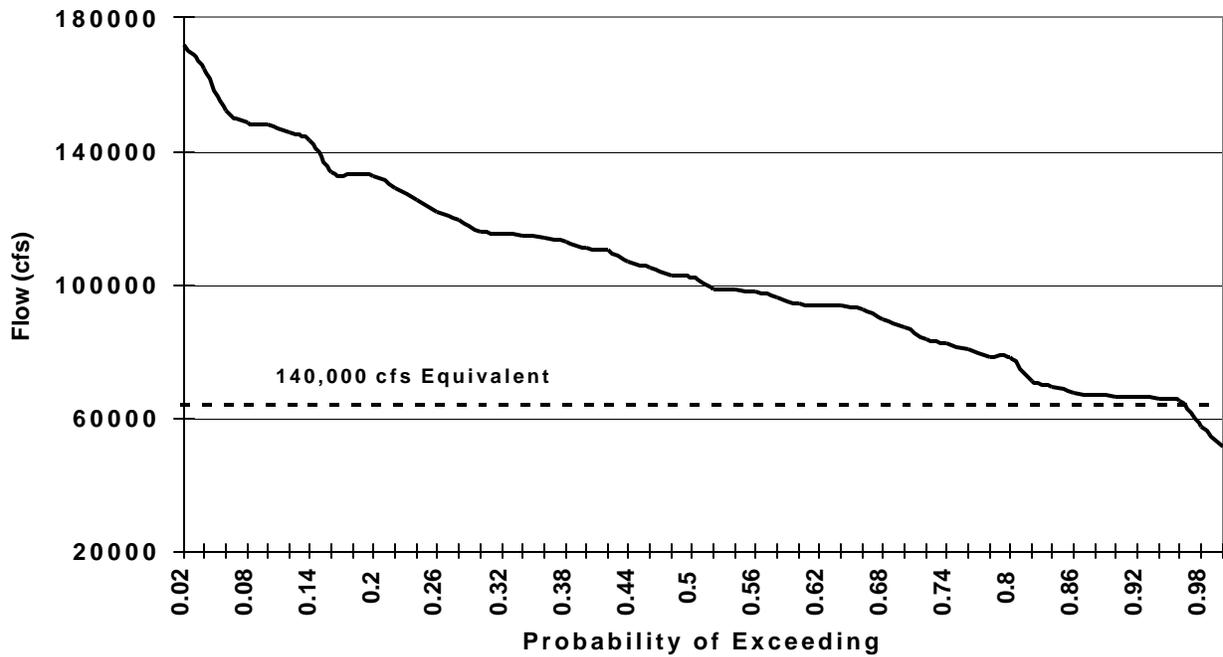


Figure 3

**Duration Curve for Spring Flows
at Lower Granite Dam - Alternative A**

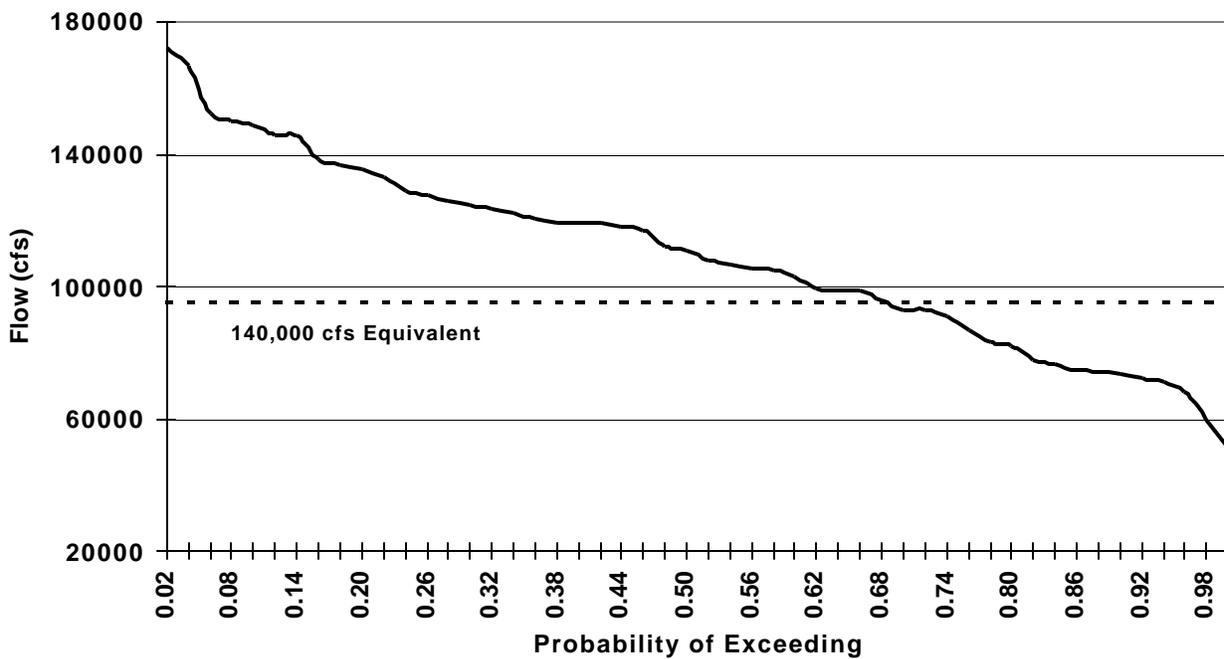


Figure 4

**Duration Curve for Spring Flows
at The Dalles Dam - Alternative B**

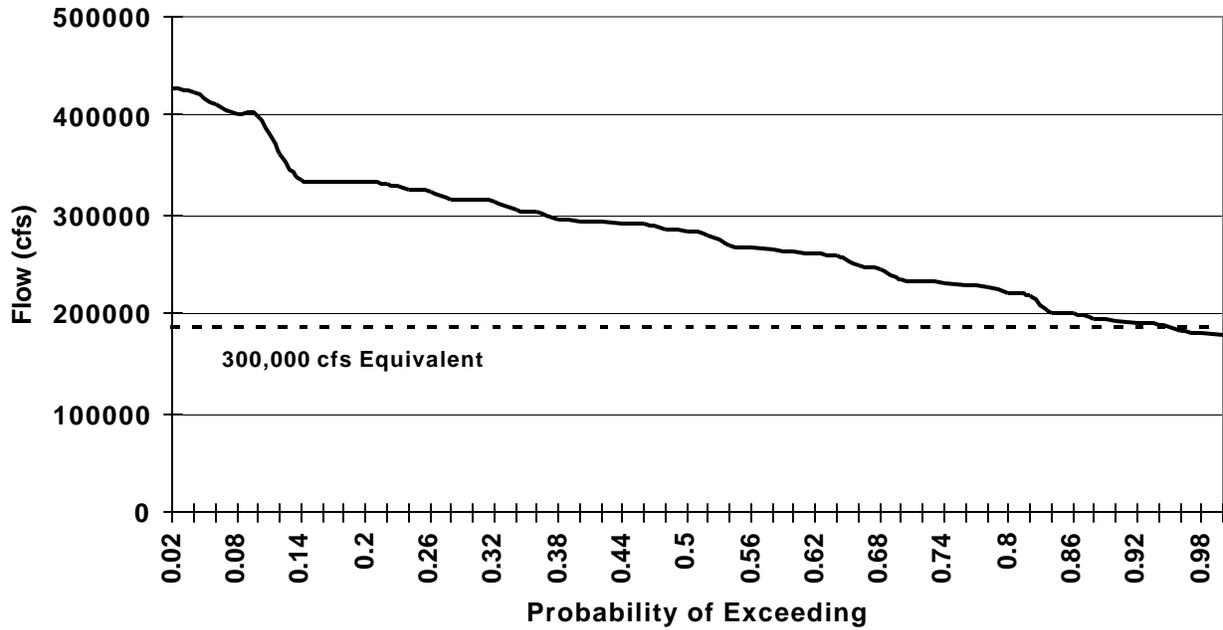
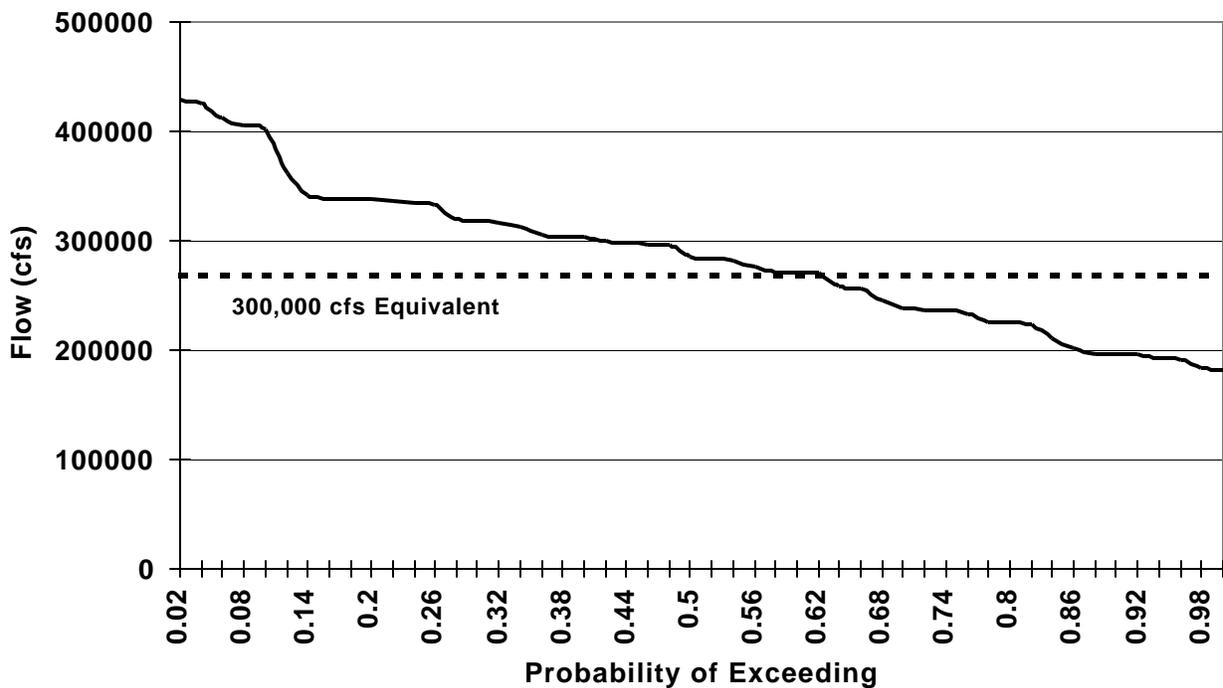


Figure 5

**Duration Curve for Spring Flows
at The Dalles Dam - Alternative A**



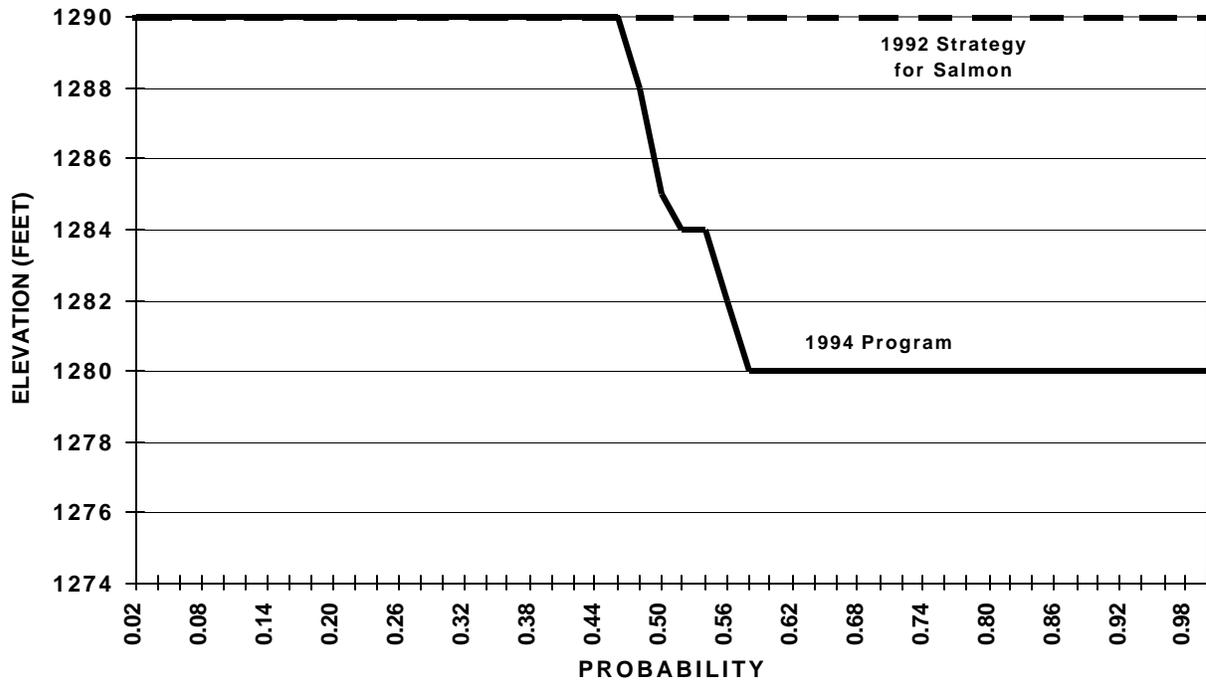
Figures 2 and 3 illustrate how often the 140,000 cubic feet per second flow equivalent is achieved under a two- and four-pool drawdown operation on the Snake River. The curve in Figure 3 (a two-pool drawdown) indicates how often a specific flow level will be achieved or exceeded. The horizontal line, at about 95,000 cubic feet per second, in that figure shows where the 140,000 cubic feet per second flow equivalent is based on a two-pool drawdown. For this operation, the flow objective is achieved about two-thirds of the time. In Figure 2 (a four-pool drawdown), it is achieved about 95 percent of the time. Under the Strategy for Salmon operation, the flow equivalent in the Snake River is achieved about 14 percent of the time.

Figures 4 and 5 illustrate the probabilities of achieving the spring flow objective of 300,000 cubic feet per second in the Columbia River. When John Day is operated at near spillway crest elevation, the flow equivalent objective is achieved about 95 percent of the time (Figure 4). Under a John Day operation to minimum operating pool, the flow equivalent objective is achieved about 60 percent of the time (Figure 5). Under the Strategy for Salmon operation, the flow equivalent in the Columbia River is achieved 42 percent of the time.

Reservoir Elevations and Refill Probabilities

Refill probabilities increase significantly at Libby and Hungry Horse dams due to implementation of the recommended integrated rule curves at both projects. Refill probability at Libby increases from 90 to 92 percent and at Hungry Horse from 86 to 96 percent. At Grand Coulee, the end-of-July refill probability drops from 100 percent in the Strategy for Salmon to under 50 percent. However, when Coulee does not refill it is generally 10 feet down from full, due to the 1,280-foot draft limit. By having August flow objectives at The Dalles, Grand Coulee cannot refill in August in dry years, and the project remains at its lower elevation of 1,280 feet. The refill probability curve for Grand Coulee is shown in Figure 6.

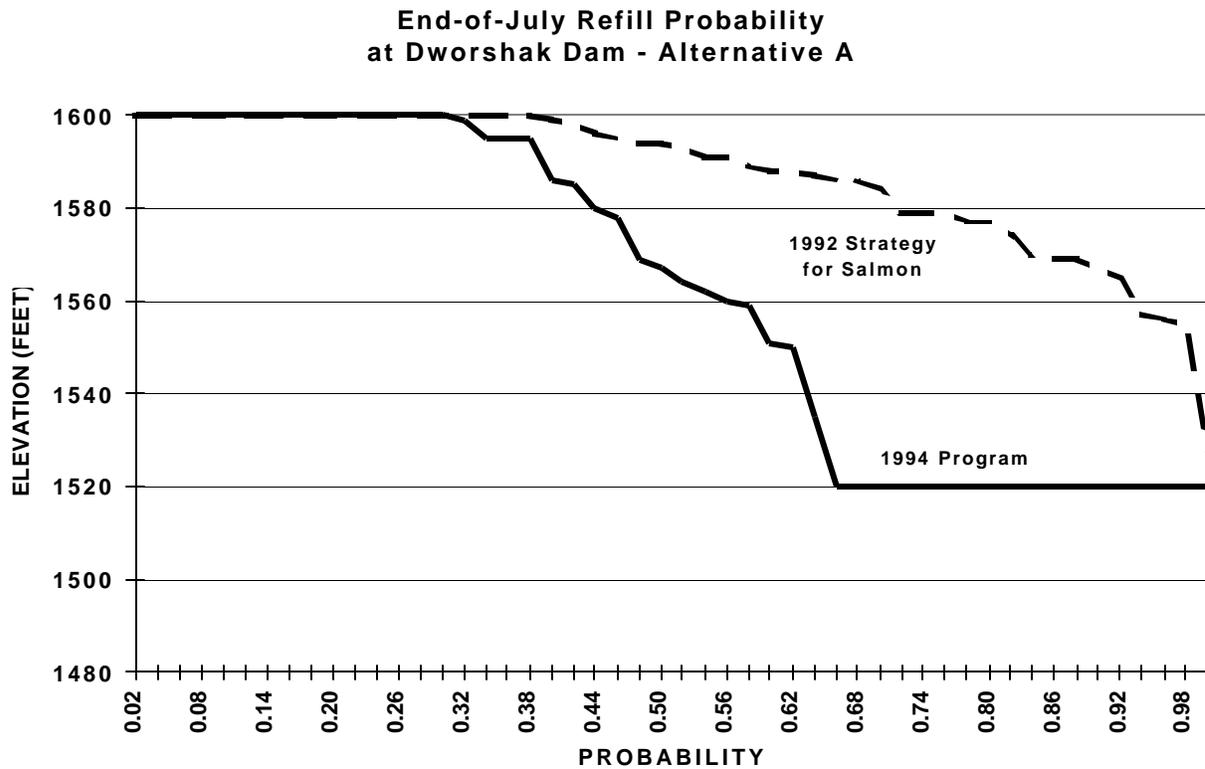
Figure 6
End-of-July Refill Probability
at Grand Coulee Dam - Alternative A



At Dworshak, refill probability depends on whether a drawdown of the four lower Snake River dams is implemented. Without a drawdown, Dworshak's refill probability falls from 42 percent under the Strategy for Salmon to 34 percent. This is due to its draft to elevation 1,520 feet, if necessary, to assist in meeting a summer flow objective of 50,000 cubic feet per second. With a four-pool Snake River drawdown operation, its refill probability increases to more than 70 percent. Figure 7 illustrates Dworshak's refill curve for the end of July. As evident in that figure, Dworshak will be drafted to an elevation of 1,520 feet in July, about one-third of the time, in the lowest water years.

The end-of-July refill probability for Brownlee Dam (Table 5) under the Strategy for Salmon operation is zero. This is because the Strategy measures call for a release of 137,000 acre-feet of water from the Brownlee Reservoir in July of every year, which is to be replaced by upper Snake River water in August. Under that operation, Brownlee refills by the end of August for all water conditions. Under the actions called for in the 1994 program, however, release of the 137,000 acre-feet of water in July is conditioned on the need for that water. Because of that, Brownlee's July elevation is higher, on average, than under the Strategy, and quite often it refills in that month. In August, the 1994 program calls for the upper Snake water, that would have refilled Brownlee, to be passed through instead. Because Brownlee is generally higher by the end of July under the 1994 program, the simulation shows that it is still able to refill by the end of August in every year. During winter months, Brownlee is used both for power and to maintain minimum flow requirements through April for salmon egg incubation.

Figure 7



**Table 5
Average End-of-July Elevations (feet)
and Refill Probabilities for Major
Columbia Basin Storage Projects**

	Strategy for Salmon	1995	A	B	C	D
Libby (full=2459 ft.)	2457.1 90%	2458.3 92%	2458.2 92%	2458.2 92%	2458.2 92%	2458.3 92%
Hungry Horse (full=3560 ft.)	3556.9 86%	3559.1 96%	3559.1 96%	3559.0 96%	3559.0 96%	3559.1 96%
Grand Coulee (full=1280 ft.)	1290.0 100%	1285.2 50%	1285.1 46%	1284.6 40%	1284.7 40%	1285.0 46%
Brownlee (full=2077 ft.)	2067.0 0%	2073.2 62%	2073.6 64%	2075.8 88%	2075.8 88%	2073.6 64%
Dworshak (full=1600 ft.)	1586.9 42%	1548.9 10%	1560.1 34%	1583.4 72%	1583.3 72%	1560.1 34%

Nutrient Retention Time at Grand Coulee Dam

In general, monthly average nutrient retention times at Grand Coulee Dam remain close to or above the suggested 30-day minimum level except during May. In April and June, average retention times are close to the 30-day value. In July and August, retention times decrease by about 6 to 16 percent from current operations, but remain above the 30-day level. In July, average retention time is between 38 and 41 days; in August it ranges from about 43 to 45 days.

Table 6
Average Nutrient Retention Time
at Grand Coulee Dam⁴
(Days)

	Current Oper.	1995	A	B	C	D
April 16-30	30.0	29.0	29.8	28.7	28.6	29.9
May	22.4	23.1	23.5	22.0	22.0	23.5
June	31.2	29.9	29.8	29.0	28.9	29.8
July	43.5	37.7	38.1	41.1	40.7	38.0
Aug 1-15	49.8	43.1	43.7	44.9	45.0	43.7
Aug 16-31	52.6	45.2	44.5	44.4	44.7	44.7

Table 7
Difference in Average Nutrient Retention Time
from Current Operations⁵
(Percent)

	1995	A	B	C	D
April 16-30	- 3	- 1	- 1	- 1	0
May	+ 3	+ 5	- 2	- 2	+ 5
June	- 4	- 5	- 7	- 5	- 5
July	-13	-12	- 6	- 6	-13
Aug 1-15	-14	-12	-10	-10	-12
Aug 16-31	-14	-15	-16	-15	-15

⁴ For nutrient retention times at Grand Coulee Dam, the current river operation was used as the base case.

⁵ For nutrient retention times at Grand Coulee Dam, the current river operation was used as the base case.

Cost and Rate Impact to Bonneville Power

Average annual costs to Bonneville Power⁶ range from about \$90 million to \$225 million. The corresponding average rate impacts range from 4 to 11 percent. The 4 percent increase would be realized if only the 1995 measures were implemented over the next 20 years. In the long-term, depending on which additional measures are implemented, the average rate increase over the next 20-year period ranges from 7 to 11 percent. Energy costs, which include the cost of replacement resources, energy purchases and lost revenues, amount to about one-third to one-half of the total cost. Non-power costs include the capital costs of modifying mainstem dams for drawdown operations,⁷ costs of improving fish bypass or transportation and other related fish and wildlife project costs. Firm hydro energy losses range from 400 to 850 average megawatts, depending on the final package of measures implemented.

Table 8
Cost and Rate Impacts
to Bonneville Power⁸

	Firm Energy Loss (MWA)	Capital Costs (millions)	Other Annual Costs (millions)	Energy Costs (millions)	Annual BPA Costs (millions)	Average Rate Increase (%)
1995	400	\$ 17	\$21	\$53	\$ 89	3.7
A	525	\$ 61	\$21	\$69	\$151	7.2
B	750	\$108	\$21	\$95	\$225	11.1
C	525	\$ 81	\$21	\$67	\$170	8.1
D	850	\$ 89	\$21	\$99	\$209	10.3

Uncertainties in Cost

A number of factors can affect regional cost estimates. Generally, cost estimates are made by comparing net revenue requirements between two different power system operations. The base case defines the operations from which changes are made. For this analysis, the base case represents the hydro operation under the Council's Strategy for Salmon measures.⁹ Even though those measures differ from current river

⁶ Costs to Bonneville Power include 71 percent of the regional power system costs, capital costs of modifying dams and other related costs. They reflect the levelized cost of implementing various measures at various future dates.

⁷ Capital costs of drawdown-related dam modifications are based on Corps of Engineers' cost estimates from its System Configuration Study, including contingency costs. Edward L. McLean, a consultant, estimates the total cost of a four-pool Snake River drawdown to near spillway crest at \$610 million. This estimate is 50-percent lower than the Corps' estimate of \$1.3 billion.

⁸ The costs shown in Table 8 are levelized over the period from 1994 to 2015. In the introduction, some of these costs are discussed for specific years and thus will differ from those in this table.

⁹For nutrient retention times at Grand Coulee Dam (Tables 6 and 7), the current river operation was used as the base case.

operations,¹⁰ the Strategy for Salmon is the correct base case to use because amendments being considered by the Council reflect changes to the Strategy measures.

Cost estimates can also differ depending on the computer programs used to simulate river operations. Some programs provide very detailed simulations, while others use simplifying assumptions that yield more approximate estimates of operations. The System Analysis Model provides a very detailed simulation of river operations. It models the operation of individual dams in the Columbia River Basin and includes specific non-power constraints at those projects.

Besides variations in estimates caused by factors mentioned above, cost can also vary due to fluctuations in other assumptions. For example, the cost of a particular set of measures can vary dramatically based on the amount of precipitation in a given year. The *average* cost of current river operations compared to the Strategy measures, for example, is about \$40 million, yet in dry years the cost could be as high as \$125 million.

What follows is a description of the variance in cost estimates due to uncertainty in four variables: gas price, capital cost of combustion turbines, water conditions and resource replacement type. Figure 8 illustrates the range in energy cost¹¹ (in percent) due to the uncertainty in these four variables.

A swing in gas price of 25-percent changes cost estimates by about 5 percent. A 25-percent reduction in the capital cost of a combustion turbine reduces the energy cost by about 8 percent, and correspondingly, a 50-percent increase in capital cost results in a 16-percent raise in energy cost.

Water conditions swing the cost more dramatically. Cost in years of poor water conditions would be nearly double the average value or more, and cost in good water conditions would be about half the average or less.

Each of the packages of measures being proposed will have some effect on the hydropower system's ability to produce firm energy. Losses to firm energy generation must be replaced if the same level of service is to be provided to Northwest customers. The choice of replacement resource makes the largest difference in the cost. In Figure 8, the change in cost due to resource type ranges almost 90 percent in either direction.

The choice of replacement resource for the average values was a combined-cycle combustion turbine. This resource has low capital costs and reasonable operating costs. When nonfirm hydro energy is available, the combustion turbines can be turned off to save operating costs. In the simulations, the replacement turbines operated about half the time. While this choice is probably not the optimum, it does represent a low cost option that continues to provide a high level of service to Northwest customers. Ideally, an optimal package of replacement resources¹² would be designed that would minimize the costs, while not harming level of service.

¹⁰ Current river operations represent the National Marine Fisheries Service 1994-98 biological opinion measures. Those measures decrease firm hydro energy generation by about 150 average megawatts and cost the region about \$40 million per year, on average, more than the Strategy.

¹¹ These fluctuations in cost reflect only energy costs, which represent about a third to one half of the total cost of the measures being proposed.

¹²This optimal package of resources would be developed through the Council's power planning activities in conjunction with efforts of other Northwest utilities and agencies.

This package would undoubtedly include conservation and renewable resources, as well as additional purchases or energy exchanges with out-of-region utilities.

On the high cost side, a “flat,” non-displaceable and non-dispatchable, 35-mill per kilowatt-hour resource was chosen to replace lost firm hydro energy. This type of resource yields the greatest cost because the region must pay for it every hour of the year. It can not be turned off when surplus nonfirm hydro energy is available.

On the other end of the spectrum, only out-of-region energy purchases were used to replace lost hydro energy. Whenever there was a shortage, energy would be purchased from out-of-region utilities. If the interties (major power transmission lines) were full or if the supply was depleted, the model would simply curtail service to Northwest customers at a lost revenue rate of about 45 mills per kilowatt-hour.

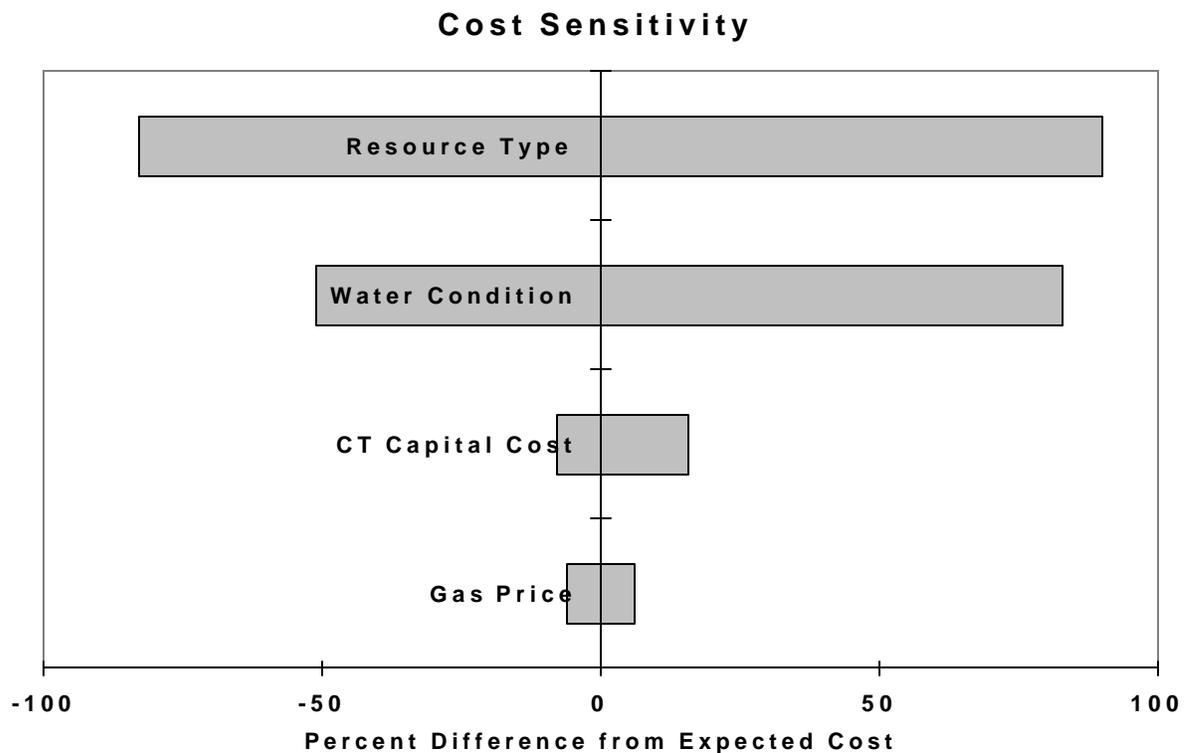


Figure 8

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Appendix C

ASSURING AN ADEQUATE, EFFICIENT, ECONOMICAL AND RELIABLE POWER SUPPLY AND THE ABILITY TO CARRY OUT OTHER PURPOSES OF THE POWER ACT

Introduction

The U.S. Ninth Circuit Court of Appeals' recent decision in *NRIC v. Northwest Power Planning Council* characterizes the fish and wildlife provisions of the Northwest Power Act as “[a]ttempting to balance environmental and energy considerations.”¹ The Northwest Power Planning Council’s Columbia River Basin Fish And Wildlife program must consist of measures to “protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management of [hydropower] facilities while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply.”² “Assuring” the region of such a power supply implies a reasonable degree of certainty that the objectives of adequacy, efficiency, economy and reliability will be achieved.

The Council must also determine whether the fish and wildlife program is consistent with the purposes of the Northwest Power Act.³ These purposes include encouraging conservation of electricity and timely repayment of the Bonneville Power Administration’s debt to the federal treasury.⁴ An adequate, efficient, economical and reliable power supply that includes a healthy and financially viable Bonneville Power Administration is essential to carrying out those purposes.

The Council has examined the effects of fish and wildlife program measures on the ability to assure the region an adequate, efficient, economical and reliable power supply and Bonneville’s ability to carry out the other purposes of the Power Act. The fish and wildlife program includes measures that would alter the operation of the hydroelectric system, affecting the amount and value of power produced. The program also includes measures that have significant capital and/or operating costs that would be borne, at least in part, by the power system.

There is a very wide spectrum of views in the region regarding the meaning of an adequate, efficient, economical and reliable power supply. Some hold that it must be considered entirely in the context of the power system that existed in 1980. In this view, an acceptable power supply is one whose characteristics are different than those of the 1980 system in only minor respects. For others, it may mean doing whatever is necessary to accommodate the needs of fish and wildlife, so long as some kind of power system can be maintained that is roughly as adequate, efficient, economical and reliable as those in other parts of the nation.

¹ *NRIC v. Northwest Power Planning Council* slip opinion at p. 10879 (9th Cir. 1994)/

² 16 U.S.C. § 839b(h)(5).

³ 16 U.S.C. § 839 b(h)(7)

⁴ 16 U.S.C. § 839(1), (4).

In general, it is likely that the adequacy, reliability, efficiency and economy of the region's power supply can only be fully gauged in the context of a full revision of the Council's Power Plan. Congress appears to have had this in mind. Congress anticipated that the Council would develop the fish and wildlife program immediately after passage of the Act.⁵ In contrast, the Council was given up to two years to develop the power plan. Among its several purposes, the power plan is intended to:

reduce or meet the Administrator's [of the Bonneville Power Administration] obligations with due consideration by the Council for (A) environmental quality, (B) compatibility with the existing regional power system, (C) protection, mitigation and enhancement of fish and wildlife and related spawning grounds and habitat, including sufficient quantities and qualities of flows for successful migration, survival, and propagation of anadromous fish, and (D) other criteria which may be set forth in the plan.⁶

Thus, the fish and wildlife program is part of the power plan, and the mutual impacts of fish and power measures are intended to be examined together.⁷ It may be that the potential impacts of a particular fish and wildlife measure look different in the context of a full revision of the power plan than they do during the fish and wildlife amendment process.

This does not mean that, in adopting the fish and wildlife measures, the Council need not make a determination that the fish and wildlife program assures the region an "adequate, efficient, economical and reliable power supply." It must do so. But its determination may recognize that a fuller analysis of the issue will follow in revising the power plan.

This appendix describes the Council's analysis of the balance between fish and wildlife measures and the power system. In summary:

- The Council should adhere to utility industry standards for an adequate and reliable power supply. If fish recovery measures do not allow enough time or flexibility for the power system to adapt, those measures could violate the conditions necessary for an adequate and reliable power supply. The Council's analysis indicates that there are sufficient resources under development, available for purchase in West Coast electricity markets or that could be developed with relatively short lead time to ensure the region an adequate power supply. Although the reliance on purchased power is a departure from traditional regional planning practices, the Council believes it is becoming an increasingly common facet of the emerging competitive power market. The costs of new resources and purchased power have to be considered in the context of the economics of the power system.
- To ensure the reliability of the power supply, system operators need the ability to draft storage projects below elevations required for fish purposes in the event of circumstances that threaten firm loads. Such circumstances include severe weather, loss of major transmission links and loss of major generating units. Furthermore, the operators need some discretion to begin drafting in anticipation of severe weather events, so that the water can reach lower river projects when it is needed. Provided this sort of flexibility is allowed, the reliability of the system can be assured.

⁵ Remarks of Rep. Dingell, Cong. Rec. p. H10683, November 17, 1980.

⁶ 16 U.S.C. § 839b(e)(2).

⁷ 16 U.S.C. § 839b(e)(3)(F).

- Fish recovery measures may require actions that are not as efficient from the standpoint of the single objective of power operations as current operations. However, the Northwest Power Act clearly expected a balancing of fish and power objectives, i.e., operating the system with multiple objectives. The greatest efficiency has been and should continue to be sought in achieving both objectives. The changes in the efficiency of power operations will, however, have impacts that are considered in terms of the economics of the power system.
- From the standpoint of the region's economy and power system as a whole, it is unlikely that fish recovery measures would result in an uneconomical power supply. The total costs are small relative to regional income. Ignoring the sunk costs in the existing power system, even if Bonneville's customers were to turn to other power suppliers, the resulting power supply would still be relatively economical in relation to the rates paid by other parts of the nation. However, the advantage the Northwest currently enjoys relative to the rest of the nation would be expected to diminish dramatically both as a result of increased costs in this region and decreased costs brought on by competition elsewhere.
- The costs associated with fish recovery measures could prove to be burdensome to some individuals and industries. This is particularly true of electricity-intensive industries. However, the fact, that, on average, the costs of fish recovery are relatively modest in relation to the regional economy suggests that it is possible to redistribute costs if necessary to avoid unreasonable burdens on specific customer groups.
- The Bonneville Power Administration is an integral part of the region's power supply. It is possible for fish recovery measures to cause Bonneville's power supply to be perceived as no longer economical in relation to competing supplies. If a number of customers accounting for significant loads decided to seek other supplies of electricity, Bonneville would no longer collect sufficient revenue to fund fish and wildlife and other purposes of the Act, including repayment of its debt to the federal Treasury. The analysis presented suggests that Bonneville could absorb modest additional fish recovery costs and maintain its ability to be economical in comparison with other electricity supplies. This conclusion, however, is subject to significant uncertainty.
- The variability inherent in Bonneville's revenues also suggests that there may be some years when Bonneville's revenues are such that it could contribute "excess" revenues to support fish recovery measures. This would be contingent on Bonneville having financial reserves consistent with prudent utility practice.
- The Council has identified actions that are necessary to protect, mitigate and enhance fish and wildlife affected by the development, operation and management of hydropower facilities. To successfully implement these actions *and* assure an adequate, efficient, economical and reliable power supply and not subvert the other power purposes of the Act, the region will need to work with the federal government on the allocation of costs. There is a need to implement the fish recovery measures and maintain the Bonneville Power Administration as an economical power supply.
- The Council has identified three possible means of mitigating the impact of fish and wildlife costs on Bonneville. One is to seek federal appropriations or other sources of funding for fish recovery measures. A second is to share as much of the cost of fish and wildlife costs as are attributable to the non-power uses of the Columbia River system as allowed under Section 4(h)(10)(c) of the Power Act. The third recognizes the parallel between fish recovery measures and utility investment that is made uneconomic and therefore no longer recoverable as a result of competitive pressures. Much of the policy debate surrounding the ongoing restructuring of the electricity industry nationwide is focused on the question of

unrecoverable or “stranded” investment. A charge for use of transmission and/or distribution systems is the mechanism that is most frequently proposed. The potential for recovering part of the fish recovery costs and/or costs of uneconomic investment in the unfinished Washington Public Power Supply System nuclear projects through a transmission charge should be investigated.

- Finally, while the Council has done considerable analysis in connection with these findings, it is important to recognize that the adequacy, reliability, efficiency and economy of the region’s power supply, and the impact of these measures on Bonneville’s ability to carry out the purposes of the Act, can be more fully gauged in revising the power plan. Some recommendations submitted in the fish and wildlife amendment process, for example, the Columbia River Inter-Tribal Fish Commission’s proposal to establish ramping rates for flow fluctuations at mainstem dams, raise issues of adequacy and reliability that could not be addressed in the fish and wildlife process. The potential impacts of these and other fish and wildlife measures deserve further consideration in the context of a full revision of the power plan.

Adequate Power Supply

The term “adequate” has a generally accepted meaning in power planning. An adequate power supply is one where power resources are either currently available or can be developed in time to meet forecast demands with an adequate reserve margin. “Adequate” is distinguished from “reliable” by the time dimension. “Reliable” relates to the short term, when resources cannot be added (except for spot market or other short-term purchases), while “adequate” relates to the longer term, when resources can be added. Adequacy might also be thought of as forecast reliability.

Fish recovery measures would result in a power supply that was *not* adequate if they reduced the capability of the Northwest power system to such an extent that, on a planning basis:

- existing supplies and/or transmission capability in the West Coast market were insufficient to meet forecast demand; and
- the timing were such that sufficient additional new resources and/or transmission capability could not be developed in time to meet forecast demand.

Given sufficient time, it would be possible to develop sufficient resources to assure an adequate power supply, albeit at some cost. Then the question becomes whether the resulting power system is economical. Nonetheless, the power system cannot be judged to be adequate if existing resources or constraints on the development of new resources were such that it was not possible to acquire sufficient resources to meet forecast firm loads.

Analysis

The analysis of adequacy focuses on the period 1996 through 2000. Fish recovery actions taken during 1995 may be of concern because of their possible effect on system reliability. Beyond 2000, the typical five-year lead time for the development of combustion turbine power plants (Table 1) should allow these plants to be developed “from scratch,” providing that the need for new resources is identified and acted upon during 1995.

Table 1
Representative Combustion Turbine Power Plant Development Schedule

Project and site selection, agreement to proceed	12 months
Permitting, preliminary engineering, contracting	24 months
Final engineering, procurement, construction and testing	24 months

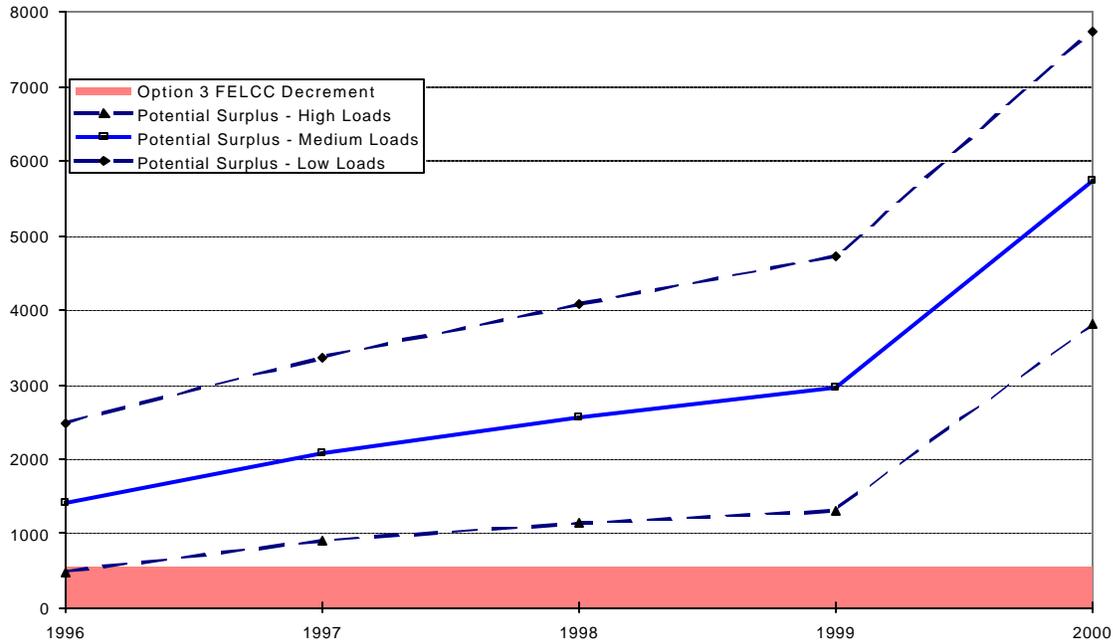
Fish recovery measures could affect both the capacity and energy capabilities of the hydropower system, possibly requiring both replacement capacity and energy resources. However, with the exception of the Detailed Fish Operations Plan, the options considered, while reducing hydropower capacity, are expected to maintain sufficient hydropower system flexibility to preserve current capacity during the regional winter peak period. Adequacy concerns therefore focus on the ability to compensate for the energy impacts of fish recovery programs.

The ability to secure additional resources to meet needs in excess of forecast loads during the period 1996 through 2000 is depicted in Figure 1. Figure 1 shows the firm regional energy load/resource balance. Each line on the figure is the difference between the sum of existing firm resource capability, new resource development potential and additional potential for imports, and the forecast regional loads for low, medium and high growth. The existing capability of the hydropower system is held constant, reflecting hydropower operation under current fish recovery programs. Positive numbers denote a potential supply surplus.

Also plotted in Figure 1 are the estimated decrements to hydropower system firm energy load carrying capability that would result from implementation of Recovery Option 3.⁸ Of the recovery options considered (other than the Detailed Fish Operations Plan), Option 3 would produce the greatest reduction in firm hydropower energy during the period of interest. (The 4,700 megawatt firm energy load carrying capability reduction resulting from the Detailed Fish Operations Plan could likely not be fully replaced under medium, or greater, load growth conditions until 2000.) Option 3 firm energy load carrying capability reductions are estimated to be 525 megawatts beginning in 1995, increasing to 550 megawatts in 1999. Though in year 2002, other recovery options might result in greater firm energy load carrying capability reductions, ample time would be available to secure sufficient replacement resources.

⁸In amending the Columbia River Basin Fish and Wildlife Program, the Council analyzed several alternative packages of mainstem measures. These were called "Options". The Council adopted what was called "Option 7," whose energy impacts would be less than those analyzed.

Figure 1
Availability of New Resources Compared to Option 3*
Firm Energy Load Carrying Capability Decrement



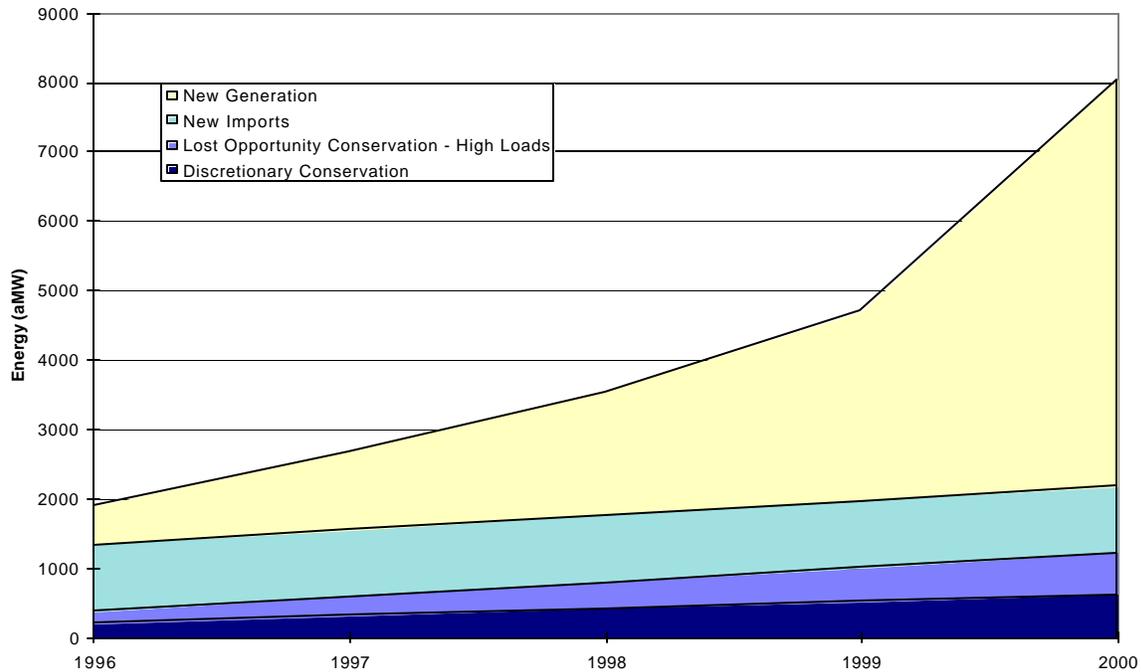
* see footnote

As depicted in Figure 1, it appears to be possible to accommodate the hydropower energy decrements resulting from Option 3 for all load growth cases, In the worst case situation -- high load growth - - sufficient energy could be secured by 1996 to maintain load/resource balance. With continuation of medium load growth, nearly 1,000 megawatts of potential surplus energy could be secured. The potential resource surplus steadily increases through 1999, when it reaches nearly 2,500 average megawatts with medium load growth and 800 megawatts with continued high load growth.

By 2000, sufficient time is available to bring new combustion turbine plants through the full development process, and the amount of potentially available new resources increases rapidly. Beyond 2000, new resource development would be constrained primarily by the availability of suitable sites, resource diversity concerns and environmental constraints. This would probably have the effect of increasing the cost of new resources, as more stringent environmental controls and more extensive site facilities are required. However, it is likely that resources adequate to compensate for the hydropower firm energy load carrying capability reductions of all options save for the Detailed Fish Operations Plan could be secured by 2002.

The new resources that could be secured to offset reductions in hydropower system output include conservation, generating resources developed within the Northwest and increased imports of existing surpluses from British Columbia and the Southwest. Most of the new resources available during the early years of the period are from increased imports from California and British Columbia (Figure 2). Later in the period, an increasing amount of energy could come from steadily increasing new conservation and generating projects (mostly gas combined-cycle plants) under construction, committed for development or in the process of permitting.

Figure 2
Potentially Available New Resources



Conservation resources include all discretionary resources plus lost-opportunity resources corresponding to the respective load growth rates.

Generating resources are based on actual projects under construction or proposed for development, plus a 500 megawatt (capacity) block of new wind resources. The short lead time for wind projects and the competitiveness of wind with combustion turbines under current tax laws suggest that if needed, this amount of new wind resource in excess of currently proposed new projects could be developed by the year 2000.

The potential energy contribution of each new and proposed generating project is estimated as the product of the project capacity, the estimated project availability, the estimated probability of successful project development (permitting, contracting and financing) and the estimated probability of successful project construction. Probabilities are estimated by resource type, based on recent project development experience. For example, the energy contribution of a proposed 240 megawatt gas-fired combined-cycle combustion turbine is estimated to be 164 megawatts, as follows:

Net capacity	240 megawatts
Availability	90 percent
Probability of successful development	80 percent
Probability of successful completion	95 percent
Expected energy contribution	164 average megawatts

The estimated timing of each new generating resource was based on its current stage of development and the expected time to complete project selection, development and construction, as applicable. For example, a combined-cycle project, currently licensed on speculation, but not holding a power purchase agreement, would be estimated to be available for the 1999 operating year, as follows:

Need for power identified	July 1995
Project selection	12 months
Project development	0 months
Project construction	24 months
Initial service date	July 1998
First operating year	1999

Additional imports from California or British Columbia could be limited by the availability of generating resources within these regions to supply power in excess of local needs, by transmission bottlenecks between these regions and the Northwest and by the ability of the Northwest to accept energy during certain periods. The estimates of potential new imports used in this analysis while based on limited information, are thought to be relatively conservative. Both British Columbia and California have resource surpluses available for the period considered, and there is surplus intertie capacity over and above that needed for current long-term contracts. This is true even for the reduced intertie capacity available this winter. The assumptions used in this analysis are shown in Table 2. These figures include the approximately 6,000 megawatt-months needed to store water for fish flows, which are not available to provide firm energy. Those 6,000 megawatt-months have not been included in Figure 2.

Table 2
Estimated Availability of New Energy Imports
(Megawatt-months)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CA	2680	2287	1893	1500	0	0	0	0	1500	1500	1500	1500
BC	0	0	800	800	0	0	0	0	800	800	0	0

Conclusions on Adequacy

The Council finds that the resources either under development or proposed for development in conjunction with reasonable amounts of imported energy are sufficient to assure an adequate power supply under the full range of probable loads and fish recovery measures, with the exception of the Detailed Fish Operations Plan. It would be difficult to accommodate recovery options resulting in very large decrements (thousands of megawatts) of hydropower capability, early within the period examined and maintain power supply adequacy.

The reliance on imports to meet firm power needs is a departure from traditional planning practices in the Northwest. The Council believes, however, that the emerging competitive West Coast power market will encourage a much greater level of sales and exchanges among the regions of the Western system. This will occur regardless of fish and wildlife requirements because it is a more economically efficient use of the power system.

Reliable Power Supply

A non-technical approach to reliability would ask the question: If all the emergency purchases that could have been made have been made, then under all but the most extreme possible circumstances, can all firm loads be met without interruption to the bulk power supply system? In a reliable system the answer is “yes.”

As in the analysis above, for the purposes of this analysis, “reliable” means the short-term ability to meet load. It is distinguished from “adequate” by the time dimension. “Reliable” relates to a condition in the short term when resources cannot be added (except for spot market or other short-term purchases), while “adequate” relates to the long term, when new firm resources can be added. Adequacy might also be thought of as forecast reliability.

This analysis proposes to deal only with reliability at the bulk power supply level, since that is generally the level at which the criterion could be applied to fish issues. It does not deal with questions of unreliability at the distribution system level, for example, outages caused by downed distribution wires.

“Load” refers to all firm load. In the case of the direct service industries (DSIs), restriction rights are specified in the contracts, and firm load is the load that is not restrictable. Load can also be distinguished between energy load, which is the total amount of a resource used over some time period and capacity load, which is the amount of resource required at any one time.

Generally, capacity unreliability is a different and more serious kind of problem than energy unreliability, because it is less easily remedied and the consequences (area blackouts) are more severe. Energy unreliability can usually be solved completely with purchases (thus becoming mostly an economic problem), while capacity reliability often cannot be solved merely with purchases, especially in the shortest term of a few hours to several weeks. However, because the Northwest is a hydro-based system, it is possible under certain circumstances, such as the long-term (multimonth) loss of a large resource, like Washington Nuclear Project Two (WNP2), or of an intertie, on top of poor reservoir conditions due to drought, to have energy shortages that would make the system unreliable.

On a forward looking basis, reliability is usually defined probabilistically. Capacity reliability is defined by a certain level of probability that load can be met after taking into account the distribution of forced outages of generating plants and the simultaneous distribution of possible loads, the latter usually based on random weather variations. Because of the interrelationship of water availability and capability to meet instantaneous loads in the Northwest’s hydropower system, this measure is not as easily defined as in conventional thermal systems. Work is continuing on this problem, though current results typically address specific contingencies rather than defining them probabilistically.

Energy reliability in the Northwest has historically been based on meeting regional loads with regional resources under critical water conditions. The expansion of the Western regional bulk power market in recent years has allowed utilities to relax their reliance on regional resources, but reservoir status and water conditions still dominate the region’s ability to meet its energy loads.

“Reliability” raises the question of voluntary limits on loads. Generally, the definition of “firm load” can be qualified in two different ways, load without curtailments or load after voluntary curtailments. The utilities and the Northwest states have in place a mechanism for calling for voluntary firm load curtailments.

This mechanism will be used before any involuntary curtailments are imposed in a last ditch effort to prevent a widespread blackout of the system. Whatever that level of reliability may be, normal industry usage does not assume the ability to voluntarily curtail load when calculating whether that level can be met. This paper recommends that voluntary curtailments not be part of the definition of a reliable power system.

Increasing reliance on purchased power to meet monthly and annual energy loads has tended to mean that we also increasingly rely on purchased power for energy during periods of peak capacity demand, for instance, during cold snaps. Reliability for this purpose is a much more rigorous test than reliability for annual energy demand. Failure of key intertie transmission lines during a cold snap would have more serious consequences than during other times. For capacity reliability purposes, transmission availability (and the size of the supply market that lies behind it) can be as important as the reliability of a generating plant and needs to be addressed analytically with the same rigor.

The question has been raised whether a system that relies on out-of-region purchases for a significant part of its power supply has the same reliability as one that meets all its needs internally. The implication is that there may be both less reliability from an out-of-region supplier and less reliability as a result of dependence on transmission. This is not necessarily true, though it may be, depending on the facts of the specific situation. In-region plants can go down, as can in-region transmission lines. The Council believes that reliance on a West Coast power market will be a fixture of the emerging competitive market for electricity. The reliability of that market is an issue that can be addressed analytically in the future.

In any case, the Northwest has been relying on out-of-region supplies for some time. Moreover, Bonneville has decided that, over the next few years, it would rely on purchases rather than new resource development because of the economically attractive supply purchase opportunities on the West Coast market and the long-term risk management benefits such purchases can provide.⁹ The Council believes that reliance on out-of-region supplies should not be considered, in and of itself, a reason for finding the power supply to be unreliable.

Bonneville reported that there are significant effects on the reliability of the system if certain restrictions on the operation of reservoirs are maintained. Bonneville provided the results of a set of studies evaluating the ability of the federal system to meet monthly energy loads and to meet hourly loads in the event of a severe cold snap this winter. Different levels of restriction on the storage reservoirs¹⁰ as well as the effects of contingencies in large thermal plant operation and intertie availability were examined. The studies concluded that monthly energy loads could be met this winter even if the three U.S. headwater projects (Libby, Hungry Horse and Dworshak dams) were operated at their flood control levels, as long as there were no major problems with the intertie. If there were extended problems, or if Grand Coulee or Arrow dams were required to operate to flood control levels, the system could be unable to meet its firm energy load and could be unreliable.

In addition, hourly capacity studies showed that, during a cold snap, constraining draft on the three headwater projects, even in the absence of contingencies, could lead to firm load curtailments. Libby and Dworshak were more crucial than Hungry Horse in these cases, because their water passed through all the

⁹ Bonneville Power Administration, "Resource Additions to Optimize the Power System -- Developed for the General System Management and Expansion Component of the Power and Resources Strategic Plan," March 8, 1994.

¹⁰ Libby, Hungry Horse, Dworshak, Albeni Falls, Grand Coulee and Canadian projects to the extent available under the Canadian Treaty and other agreements.

downstream plants during the simulated cold week, while the water from Hungry Horse was trapped in Flathead Lake by other constraints.

Bonneville's comments noted that operation of fish-constrained projects would be a last resort among the tools available to deal with both capacity and energy reliability problems.

Conclusions on Reliability

One way to address reliability concerns in connection with fish recovery measures would be to put conditions on the use of stored fish water for emergency non-fish reasons. The current fish and wildlife program contains similar flexibility for operation of Dworshak.

A situation testing these issues could come up this winter. A cold, dry winter on top of current low reservoir levels could leave the region exposed to the effects of a cold snap like that of February 1989 or December 1990. In such a circumstance, the ability to meet loads on an hour-to-hour basis (capacity reliability) would depend in part on the ability to release enough water over a short period of time (likely one to two weeks) to support the full generating capability of the system.

Another example of the operation of such a criterion could be support for the Corps and Bonneville's desire to maintain two to three weeks of storage in Dworshak for emergency operating reasons, rather than drafting completely to support fish migration.

To ensure the reliability of the power supply, the system operators need the ability to draft storage projects below elevations required for fish reasons in the event of circumstances that threaten firm loads. Furthermore, the operators need some discretion to begin drafting in anticipation of severe weather events, in order that the water can reach the lower river projects at the time it is needed. The travel time can be as long as three days from some projects to the lower river.

In response to the clarification request by the Power Planning Council to address actions the federal system would take to maintain reliability, Bonneville and the Council developed the following paragraphs:

To ensure the reliability of the power supply, power system operators need the ability to draft storage projects notwithstanding fish needs in emergency circumstances that threaten firm loads (e.g., major temperature drops like those experienced in 1989 and 1990; loss of a major resource like WNP 2 or a large Grand Coulee unit; or loss of the Northern or Southern intertie). System operators need some discretion to begin drafting in anticipation of severe weather events, so that the water can reach the lower river projects when it is needed. BPA also has the responsibility under the Pacific Northwest Coordination Agreement, the Northwest Power Pool and the Western Systems Coordinating Council to maintain reliability standards for voltage and transmission stability. Instability could result in local or regional blackouts.

Accordingly, during the time of year that water is being stored for fish at the federal projects (Hungry Horse, Libby, Dworshak, Albeni Falls and Grand Coulee), such storage may be temporarily drafted to avoid: 1) threatened inability to meet firm loads due to emergency circumstances (see above); or 2) voltage and transmission instability. Such drafts should be only temporary and should strike an equitable balance between impacts to resident and anadromous species. System operators are expected to make purchases to minimize

the risk that there will be less water stored for resident and anadromous fish than would otherwise have been stored. The role of financial considerations in Bonneville's purchase decisions is discussed later in this appendix.

Efficient Power Supply

The term "efficient" is more ambiguous than either adequate or reliable. It could have several meanings in the context of "assuring an adequate, efficient, economical and reliable power supply". Because one of the purposes of the Act is to "encourage development of energy conservation and efficiency resources", one view of an efficient power supply might be one in which electricity is used efficiently. There are conceivably two ways in which fish measures might preclude some efficiency measures. One would be if the performance characteristics of some conservation measures conflicted with the requirements of fish measures. For example, the provision of fish flows in the spring and summer reduce the value of conservation measures that reduce summer loads. On the other hand, irrigation conservation measures that reduce water withdrawals and measures that reduce fall and winter loads and peak demands would have greater value. Taken altogether, this does not seem to be a particularly significant line of reasoning. In developing the power plan, the Council should interpret the cost-effectiveness of all resources in light of their value to the power system, taking fish and wildlife and other objectives into account.

Another way in which fish measures might preclude improvements in the efficiency of the use of electricity would be if the cost of fish measures made investment in efficiency resources impossible. The implication of this is that it would no longer be economically feasible to make such investments. This should be considered in the context of raising a conflict with one of the purposes of the Act.

"Efficient" could also be interpreted in an engineering sense. For example, requirements for spill result in "wasting" water that would otherwise be used for power production. From a power production standpoint, that is inefficient operation of the power system. Similarly, not using "efficient" hydroelectric generation because of fish objectives and running less efficient thermal generation instead results in a less efficient power supply from the standpoint of the average amount of energy used to produce a kilowatt-hour of electricity.¹¹ In that sense, however, the power system has already become less efficient as more thermal or other generation has been added to the system merely to meet load growth. This trend can be expected to continue. Loss of hydro energy capability will hasten this decline in efficiency, but it is not clear that in the long run, the overall efficiency would be significantly different.

The inability to run the hydro system as a multiyear system with the flexibility to transfer energy from one time period to another suggests a system that is possibly less efficient than it once was. More likely, it means a system which is less flexible. Because the Power Act expressly contemplates electric power losses associated with fish measures, this view of "efficiency" seems too restrictive. Moreover, from a practical standpoint, the consequences of this operation, apart from biological, are subsumed in the economics of the power system. The real question is whether this operation results in a power system that is no longer economical.

¹¹ From the standpoint of the fuel conversion efficiency of the individual generating units in the system, the system is more efficient than it was in 1980.

It is also worth noting that less efficient power operation will have some associated environmental issues. For example, less reliance on the hydro system will probably result in greater reliance on gas-fired generation that may contribute to global climate change. To the extent those effects are internalized in the future through a carbon tax or some other mechanism, they will show up in the economics of the power system.

Conclusions on Efficiency

The objective of the planners and operators of the power system is a power system that is as efficient as possible given the multiple objectives for the use of system. From the single objective perspective of power operations, the power system is less efficient than it was at the time of the passage of the Act. This is the result of many factors, some of which are just related to characteristics of new resources available to meet growth and some related to the effects of fish recovery measures. It is still, however, a very efficient system relative to systems elsewhere. The Council does not believe that the framers of the Power Act meant the term "efficient" to establish an absolute standard. The Northwest Power Act clearly expected a balancing of fish and power objectives, i.e., operating the system with multiple objectives. The greatest efficiency has been and should continue to be sought in achieving both objectives. Ultimately, the consequences of reductions in the efficiency of the power system are economic -- additional costs to supply a given amount of power. These effects will be evaluated in the context of whether the power system is economical and whether the costs impair Bonneville's ability to fulfill the purposes of the Power Act.

Economical Power Supply and the Ability to Carry Out Other Purposes of the Power Act

As the discussion of adequate, efficient and reliable suggests, except for a few relatively well-defined circumstances, the overriding consideration is whether the power system is economical. The legislative history suggests that the Council must search for ways to accommodate the needs of fish and the needs of the power system, and if there are trade-offs, must strike a balance. Congress did not intend, however, that fish and wildlife needs should be sacrificed just to save money.¹² The legislative history also suggests that in striking the balance, the Council should consider potential power and revenue losses and costs imposed on consumers. Having done so, the Council should judge whether the power and revenue losses are "unreasonable", whether the costs "burden" consumers, and whether these losses and costs "subvert the power objectives" of the Act -- in addition to ensuring a stable and affordable power supply, the Act is intended to encourage energy conservation and efficiency; and ensure that Bonneville customers and consumers pay the full cost of power, including repayment of federal Treasury investments.

Burden on Consumers

At what point would additional fish recovery costs unduly burden consumers of the Northwest? This question suggests two possible frames of reference. Because of the national politics of this issue, it may be necessary to look at it from the standpoint of the costs of electricity in this region in relation to the rest of the country. Another frame of reference is the costs in relation to the size of Northwest economy.

Analysis

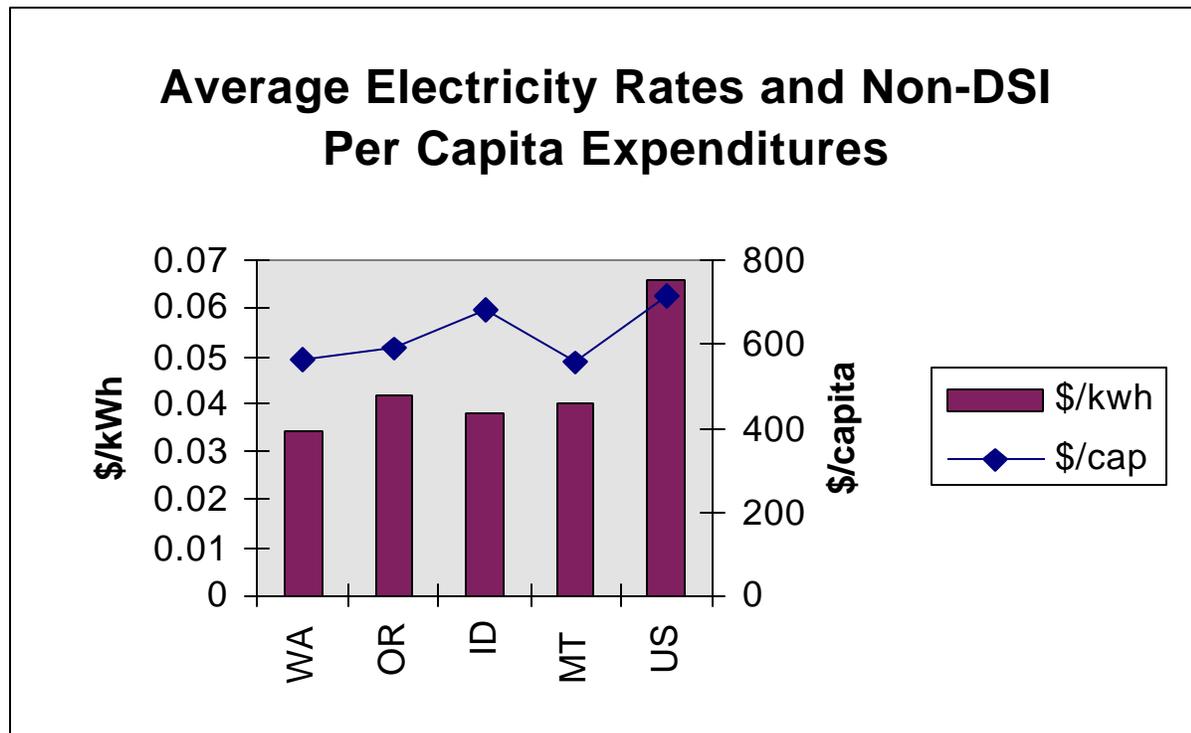
On average, it is unlikely that the magnitudes of the fish recovery costs considered by the Council could be considered a burden for Northwest consumers by others outside the region. Figure 3 shows average

¹² For a more complete discussion of the legislative history, see Volkman, John, "Adequate, economical, etc. power supply," memorandum to Council members, October 6, 1994.

electricity rates and non-direct service industry per capita expenditures for electricity for the Northwest states and the United States as a whole.¹³

The reason Idaho's per capita expenditures are out of line with the rest of the region is unexplained. It may be the consequence of irrigation pumping loads. This figure implies that electricity rates could increase somewhat before average cost for electricity per customer in the Northwest equaled the national average. Increased prices would stimulate conservation and substitution that would moderate the effects of increased rates.

Figure 3



Looking at the issue in relation to the size of the Northwest economy, annual personal income in this region is approximately \$200 billion and is forecast to increase at approximately 2.8 percent for the period 1993 - 2005 in real terms and 2.3 percent per year for the period 1993 to 2015. The maximum average additional annual cost of most of the fish recovery measures considered during the program amendment process amounts to less than 0.2 percent of regional personal income. The most expensive, the Detailed Fish Operations Plan, amounts to about 0.4 percent. That option has not been analyzed further. It seems unlikely that, *on average*, this increase over the long term would amount to an unbearable burden to consumers in the Northwest.

From the standpoint of rates, as will be shown later, the increase in Bonneville wholesale rates associated with the costs of the fish recovery measures considered range from almost 2 percent to almost 25

¹³ *State Energy Price and Expenditure Report -- 1990*, Energy Information Administration, U.S. Department of Energy, Sept. 1992, pp. 11-16, and *Bonneville Power Administration Annual Report -- 1990*, p.38.

percent. By the time this is passed through to retail consumers, the impact would generally be significantly less. Retail rates in the region would still be significantly less than the rest of the country. Utilities other than Bonneville and its customers would also be affected by fish recovery measures, but not to the same extent.

It should be noted, however, that the historical advantage that the Northwest has had in electricity rates is likely to erode. This is the effect of both the upward pressures on power costs in this region and the anticipated reduction in power costs elsewhere in the nation in response to competitive pressures. Whereas average electricity rates here are typically less than the cost of new resources, the average rates elsewhere are typically greater than the cost of new resources. Competition from new resources can be expected to force rates down in the rest of the United States.

The problem with thinking in terms of the average burden from the standpoint of either rates or overall cost to the economy is the problem with averages -- they frequently do not represent the situation of many individuals and industries. In this instance, there are two problems. First, the costs of fish recovery measures are not spread uniformly around the region. The costs which are the result of derating of the hydropower system or capital additions to that system are recovered through the rates of the Bonneville Power Administration and other utilities with hydroelectric facilities on the Columbia and Snake River systems. Other costs of the fish and wildlife program are recovered through Bonneville rates. How closely this distribution of costs corresponds to the historical distribution of benefits from the Columbia and Snake river hydroelectric facilities is unclear. If the costs of fish recovery and the benefits derived from the hydro system do not coincide, the fact that the costs of fish recovery appear bearable on average may suggest that recovering some of the costs of fish recovery efforts other than through Bonneville power rates is appropriate.

Second, not everyone is an average consumer. Consumers in some parts of the region must cope with a more severe climate than others; consumers in some areas historically have been more heavily reliant on electricity than others; some consumers have lower income than others. Each of these groups and others are more likely to find an increase in electricity costs more burdensome than the "average consumer."

One obvious example is the direct service industries, most of which are aluminum smelters. The cost of electricity is about 20 to 30 percent of the cost of a pound of aluminum, depending on the efficiency of individual plants and the world price of aluminum. Several of the plants in the region are relatively old and inefficient. Absent adjustments in their power rates, which are tied to the world price of aluminum (the Variable Industrial Rate), they might not operate when world aluminum prices are low. Increases in their cost of power would increase the amount of time that they would not operate. If their rates go up sufficiently, the owners of these plants might cease operations in the Northwest, shifting production to lower cost plants elsewhere in the world. Over the long run, this would reduce the need for new resources and reduce power system costs as a consequence. In the short term, however, it would raise rates, unless the power could be sold elsewhere at comparable rates. Public and regional preference requirements could hamper the ability of Bonneville to make such sales.

To assess the relative impacts on particular industries, the data in Table 3 were developed. The first column shows electricity costs as a percent of value of shipments. The others were based on Council estimates of electricity use and average industrial retail rates, and value of shipments from the Annual Survey of Manufacturers. The estimates were for 1990.

The second column shows an estimate of electricity-employment elasticities developed by Bonneville. These were used in the System Operation Review (SOR) to analyze the impact of rate increases on regional

industries. For example, a 1 percent increase in retail electricity rates would lead to a -0.1 percent change in employment in the pulp and paper industry, all other things being equal. The assumption used in the System Operation Review was that output changes would be proportional to employment changes, which is reasonable, given the uncertainty of these estimates. There is not a number for the aluminum industry because Bonneville utilizes a detailed aluminum sector model that evaluates impacts on a plant by plant basis. Changes in output are heavily dependent on the forecast price of aluminum. It is important to note that the System Operation Review Draft Environmental Impact Statement concludes that aluminum output would not be affected under any of the rate impacts associated with System Operation Review alternative system operations. The most extreme rate impact was an increase in direct service industry rates of roughly 20 percent over what would have occurred in the no-action alternative. However, this analysis assumes that two plants in the region have already ceased operation.

The last column shows industry percent of total regional employment. These numbers are quite small even for the major manufacturing industries because manufacturing employment is only 15 percent of total employment. The Council used 1993, the most recent historical year.

Table 3

Industry	Electricity Costs as a % of Value of Shipments	Employment-Electricity Elasticity	Percent of Total Regional Employment
Aluminum	20-30	n.a.	0.2
Pulp and Paper	5	-0.100	0.7
Chemicals	6	-0.025	0.3
Lumber and Wood	1	-0.020	2.6
Food Processing	0.5	-0.010	1.9

While the data in the table are of interest, it is important to recognize that each of the industry categories is not entirely homogeneous. For example, within the category of pulp and paper, a plant that uses electro-mechanical pulping technology may have a higher sensitivity to electricity costs than the sector as a whole. Data was also not available for irrigated agriculture. It is clear, however, that for some irrigated agriculture, power costs are a significant factor.

It is impossible to know with any certainty how much of an increase in power rates would result in any of these industries no longer being competitive. There may also be other consumers who could be similarly affected -- low-income consumers, for example. However the fact that, *on average*, the costs of fish recovery would not appear to be an unbearable burden for consumers in the region might argue for exploring other means of recovering the costs of fish recovery efforts or redistributing the costs of recovery to avoid inordinate burdens on particular consumers. Bonneville and retail utilities, for example, have some ability to establish special rates that are designed to mitigate impacts on specific customer classes if there is an overall benefit to doing so. The effect, of course, is to pass the additional costs on to other, less price-sensitive customers. In Bonneville's case, however, that ability is limited by the competitive alternatives available to its customers.

Repayment of the Treasury and Other Purposes of the Act

The Act requires the Council to assure an adequate, efficient, economical and reliable power system. However, as noted in the introduction, the Council must also determine whether the fish and wildlife program is consistent with the purposes of the Northwest Power Act. Those purposes include encouraging conservation and ensuring that Bonneville customers and consumers pay the full cost of power, including repayment of federal Treasury investments. Bonneville can fulfill neither of these purposes if it cannot recover sufficient revenues to cover its costs. It cannot do so if Bonneville is no longer an economical part of the power supply. The cost of power from the region's hydroelectric system is very low indeed. By itself, it could easily compete with any alternative source of electricity available today. However, Bonneville is faced with recovering all of its costs, including fish recovery costs and repaying debt on the Washington Public Power Supply System nuclear plants. The latter accounts for roughly a fifth of Bonneville's revenue requirements on a net exchange cost basis.¹⁴ In a competitive market, the degree to which costs can be covered through power sales depends on the difference between a utility's rates the cost of alternative marginal resources. Much of Bonneville's ability to cover non-power costs has been "used up" by the Supply System debt.

Given the resources available, past investments in both power resources and fish recovery measures, the evolving competitive wholesale power market, and the possibility of additional fish recovery costs, it is conceivable that there could be an adequate, efficient, relatively economical and reliable regional power system in which Bonneville could not charge enough for its power to recover its costs. If that were to occur, Bonneville would be unable to make full repayment of its debt to the federal Treasury or carry out its other purposes under the Act. If so, the Council could judge that the fish and wildlife program was not consistent with the purposes of the Act. At the time the Northwest Power Act was passed, this possibility was probably inconceivable.

To evaluate the question of Bonneville's competitiveness, it is important to understand the rapidly evolving nature of the electricity industry. The industry is approaching the point of being fully competitive at the wholesale level. This is the consequence of a number of developments and trends in technology, fuels and electricity policy. The primary technology facilitating wholesale competition is the natural gas-fired combined-cycle combustion turbine. The relatively low capital cost, small scale, efficiency and low pollution aspects of the modern combined cycle combustion turbine have lowered barriers to entry into the generation business. Second, current low gas prices and the generally accepted expectation of continued low prices for some time to come have combined with the characteristics of the gas turbine to make it possible for power from new generation to be produced at rates that are significantly lower than those of the best generating technologies of ten or even five years ago.

For more than 15 years, national, regional and state policy has been to promote competition in the generation of power. The Public Utility Regulatory Policies Act of 1978 contained provisions expressly designed to encourage the entry of non-utility generators into the power supply business.¹⁵ State regulatory policies and the Council's plan have encouraged the use of competitive bidding.¹⁶ Finally, the National Energy Policy Act of 1992 further encouraged competition in generation. It created a class of "exempt wholesale

¹⁴ Net of the effects of the residential exchange provisions of the Act.

¹⁵ Public Utility Regulatory Policies Act of 1978, Pub. L. 95-617, Nov. 9, 1978, 16 U.S.C. 2601.

¹⁶ See, for example, *1991 Northwest Conservation and Electric Power Plan, Vol. II, Part II*, pp. 893-900.

generators" that are not subject to the requirements of the Public Utility Holding Company Act and it allows the Federal Energy Regulatory Commission (FERC) to require that the owners of transmission provide open access to their transmission to other power suppliers.¹⁷ The transmission provisions of the National Energy Policy Act apply to Bonneville with some special conditions. The effect is to make it easier for non-utility entities to participate in the generation business and to prevent the owners of transmission, like Bonneville, from denying market access to potential wholesale competitors.

Bonneville's customers are, with the exception of the direct service industries, utility wholesale customers. In the new utility environment, those customers now have choices. Utility solicitations for bids for new power supply typically elicit responses that total many times the bid amount.¹⁸ These bids come from independent power producers, brokers, power marketers and other utilities. The resulting competition typically drives the costs of the bids down. Even the direct service industries, although not wholesale customers of Bonneville, have choices. If Bonneville were to deny the direct service industries access to its transmission system, these industries can, if necessary, be served by power from combustion turbines located on the industries' sites.

As a consequence of the choices available to Bonneville's customers, Bonneville is limited in the cost it can recover in its rates. If those costs become too high or if there is the perception that those costs are going to become too high, customers can choose other suppliers. The recent decision of the Clark County Public Utilities to go forward with a large combustion turbine project is evidence of that. Even though Bonneville's current and projected rates are probably less than the cost of power from a combustion turbine, Clark's perception of Bonneville's possible future rates and the risks of total reliance on Bonneville was such that it chose to go ahead with the project.

If customers, like Clark, take load off of Bonneville, Bonneville's costs must either be recovered from a smaller base of customers, causing their rates to rise and encouraging them to seek alternative suppliers, or the costs must be recovered from the sale of the surplus to other customers, either in the Northwest or elsewhere. Bonneville's ability to make such sales on a long term basis is somewhat restricted by the call-back provisions protecting public and regional preference established in federal law. But even without such restrictions, Bonneville would be selling into a competitive market. Just as its ability to sell to its existing customers is limited by the customers' competitive choices, Bonneville's ability to sell to others would be limited by the same choices. Bonneville cannot charge more than market prices for its products. If those prices are not sufficient to recover all its costs, its only recourse is the U.S. Treasury -- in effect, Bonneville's stock holder. Sustained failure to make timely payment of Bonneville's treasury debt would clearly violate one of the purposes of the Act.

Analysis

To assess the likelihood that Bonneville's rates could become uncompetitive, the Council analyzed Bonneville's future revenue requirements with alternative fish recovery actions compared to the cost of alternative power supplies. For this analysis it was assumed that fish recovery costs could be recovered through Bonneville rates. The analysis was done on the basis of Bonneville's current electricity sales. If

¹⁷ National Energy Policy Act of 1992, Pub. L. 102-486, Oct. 24, 1992, 42 U.S.C. 13201.

¹⁸ See, for example, "Snohomish RFP Elicits 47 Proposals Totalling 7943 MW, Mostly CTs," *Clearing Up*, No. 623, May 23, 1994, p. 2; "Regional Utilities Select 1300 aMW through Bidding Solicitation," *Clearing Up*, No. 622, May 16, 1994, p.4; and "Clark Public Utilities Selects Cogentrix to Build 248 MW CT," *Clearing Up*, No. 644, Oct 17, 1994, p.2.

Bonneville successfully implements tiered rates, tier two sales will compete directly in the marginal power markets. Tier one, however, will serve existing demands and will not grow over time. It is these tier one sales that will be expected to recover the costs of Bonneville's current debts and resources, as well as the costs of additional fish and wildlife mitigation for the hydroelectric system. The central question of the analysis is whether Bonneville's tier one costs can be recovered through power sales revenues.

The costs of Bonneville supplied power are estimated in a simple revenue requirements model. Bonneville's current revenue requirements serve as the starting point. Over time the cost of Bonneville's existing revenue requirements are assumed to decline in real terms by 1.5 percent per year. This reflects an assumption that about 50 percent of Bonneville's revenue requirements are fixed debt repayments that are relatively constant in nominal terms and therefore could decline in real terms at the rate of inflation. At 3.5 percent inflation, this would imply a 1.8 percent nominal increase per year in total existing Bonneville revenue requirements. Assuming 1.5 percent allows for some real cost increases in Bonneville's system aside from fish and wildlife costs, which are examined separately in the analysis.

Total revenue requirements are calculated by adding to the base system costs annual fish and wildlife costs in addition to the Council's Strategy for Salmon for each of the various options being considered. In addition, when existing tier one resources need to be replaced, the cost of new generating and conservation resources are added to the revenue requirements. It is assumed that Bonneville would pay half of the conservation costs, the rest being paid by conservation participants. It is assumed that Bonneville will succeed in building up a financial reserve of about \$500 million by the year 2003, with about 60 percent of these reserves rebuilt during 1996 and 1997.

The average rate for Bonneville power sales to both utilities and direct service customers is calculated by first crediting other types of revenues, such as from non-firm sales and transmission charges, and then spreading the remaining revenue requirement over firm power sales. In the base case, with no additional fish and wildlife costs, Bonneville rates are predicted to decrease, in real terms, at about 1.9 percent a year between 1993 and 2015. With 3.5 percent inflation, this would be consistent with a nominal escalation rate of about 1.5 percent a year. This is similar to the average nominal escalation experienced in Bonneville priority firm rates over the last 10 years. Bonneville is in the process of unbundling its products and services. It may be that Bonneville can recover somewhat greater revenues in the sale of unbundled products (e.g., shaping, load following, reserves) than it can from the currently bundled product. This analysis assumes that is not the case. As such, it may somewhat underestimate Bonneville's ability to absorb additional costs.

Additional fish and wildlife costs were estimated based on specific actions included in a selection of the Council's options as presented in Section 5 of the draft fish and wildlife program amendments (Council Document 94-48). The selected scenarios under options 1, 2, and 3 include a variety of actions such as lower Snake reservoir drawdowns to spillway and natural river, and new storage dams on the upper Snake. Costs are estimated separately for capital expenditures, lost hydropower replacement costs and other annual costs. With the exception of the Detailed Fish Operations Plan, these options span the full range of fish and wildlife costs.

Capital costs are generally based on Corps of Engineers' estimates contained in the System Configuration Study. However, the Corps' construction schedules have not been strictly adhered to in the Council's options. Capital costs are allocated to years, and each year's expenditures are assumed to be financed at an interest rate of 7 percent over a 50-year period.

Hydro system firm energy losses and the cost of replacement were estimated using the System Analysis Model (SAM). Critical period analysis is used to estimate loss of firm hydro energy. SAM simulates the operation of the hydro-electric system over the historic critical water conditions between 1929 and 1932. The model attempts to shape water throughout each year to minimize the need for non-hydro generation, while maintaining non-power requirements (such as fish flows, flood control, etc.). The analysis assumed that purchases from the Southwest or Canada could be made in amounts up to 1,500 megawatts for the months of January through April. Estimated losses of annual firm hydro energy are replaced with gas-fired combined-cycle combustion turbines. Under the simulated operation, the replacement combustion turbines operate only about half the time, being displaced by non-firm hydro energy the other half.

Other annual costs for fish and wildlife actions were gathered by Council staff from various sources. These costs include such items as Bonneville fish and wildlife staff and project management, annual operations costs for expanded transportation operations, cost of evaluations, and water leasing and marketing costs.

The initial rate impacts of fish recovery actions are moderated by an assumed demand response to the electricity rate increases. It is assumed that a 10-percent rate increase will decrease electricity demand by 2.8 percent. This demand response is a weighted average of a 5-percent reduction by the direct service industries and a 2-percent reduction by other customers. The demand reductions create a surplus of tier one electricity, which is assumed to be sold for 25 mills per kilowatt-hour. Both of these assumptions are highly uncertain. If the demand response were smaller or the resale rate lower, the rate impacts of fish recovery actions would increase. These demand responses are not intended to predict Bonneville customer decisions to seek alternative sources of power. They are only meant to represent traditional end-user response to price increases.

The rates implied for Bonneville customers as a result of the factors discussed above are compared to the cost of power from a combined-cycle combustion turbine assumed to be built in 1997. The levelized cost of the combustion turbine, in real 1993 dollars, is estimated to be 29 mills per kilowatt-hour under medium gas price escalation assumptions. However, the levelized cost of the combustion turbine is very sensitive to the assumed escalation of gas prices, varying from 21 to 37 mills. Table 4 shows gas price escalation assumptions and the resulting levelized costs for the combustion turbine.

Table 4
Natural Gas and Stand-Alone CCCT Costs

Gas Scenario	Real Wellhead Price Escalation percent/year	Real Variable Fuel Cost Escalation percent/year	Levelized Cost of CCCT (1993 mills/Kwh)	Real Escalation of CCCT Costs percent/year
Low	-.9	-1.1	20.7	-1.3
Medium Low	.7	1.3	25.1	0.0
Medium	1.9	2.7	28.9	1.0
Medium High	2.7	3.7	32.3	1.7
High	3.6	4.7	36.9	2.6

The costs of the power from combustion turbines needs to be adjusted to make it comparable to power purchased from Bonneville. This is because the Bonneville rate estimates include implicitly the cost of integration services such as shaping, load following, reserves and transmission. It is difficult to estimate the value of these additional products, but the Council has assumed in this analysis that such costs may range from 3 to 7 mills per kilowatt-hour. The lower end of this range is based on staff estimates of the cost of a recent utility contract for integration services. The upper end is based on an analysis of Bonneville's system cost adjustments included in its billing credits program.

Table 5 shows the cost of a combustion turbine integrated into the power system at various gas prices and system integration cost assumptions. The cost of power from a combustion turbine in 1998 varies from 27 to 34 mills, but the lower system integration costs may be more realistic in the near term.

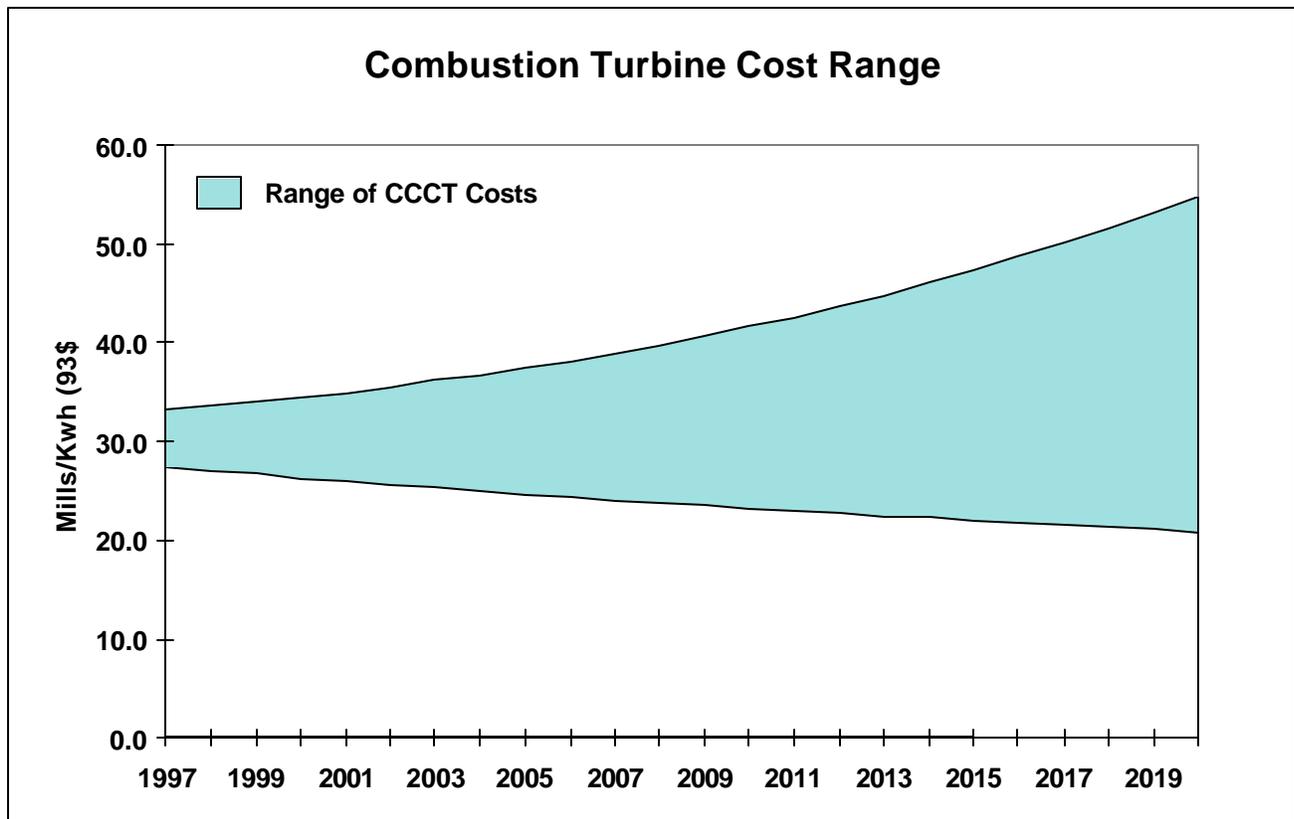
The cost estimates in Table 5 compare well with recent bids received by utilities. Bonneville staff compiled a list of such potential competitors and found average costs in 1998 of 28 mills. The projects costs varied from 22 to 33 mills in 1993 dollars. Bonneville's study also showed that utilities are being offered system sales, which typically include system integration services, at costs averaging 31 mills for 1998 delivery. The system sales and combustion turbine costs are typically either tied to gas prices or escalated in various patterns that average about 4 percent a year in nominal terms, or about 0.5 percent a year in real terms with 3.5 percent general inflation expectations.

Table 5
Integrated CCCT Costs
 (Mills per Kilowatt-Hour in 1993 Dollars)

Gas Scenario	System Integration Cost	1998 CCCT Cost	2015 CCCT Cost	1998-15 Escalation Rate	Levelized Cost of CCCT
Low	3	27	22	-1.2	24
Medium Low	4	29	29	0.0	29
Medium	5	31	35	0.7	33
Medium High	6	33	40	1.1	37
High	7	34	46	1.8	40

The resulting range of costs for power over time from the combustion turbine are shown in Figure 4.

Figure 4



In Figure 5, the price of Bonneville electricity has been overlaid on the range of combustion turbine power costs. Instead of a shaded area, as shown on Figure 4, the combustion turbine costs are shown as solid lines for each of the five gas price assumptions. The price of Bonneville electricity is shown for a Strategy for

Salmon base case and for a range of options. The options include those called Option 1 through 3 in the draft amendments. The reader is referred to the appendix of the draft amendments for a description of the options. However, the cost estimates for the options have been revised in response to public comment and additional information solicited since the draft amendment analysis was done.

The net effect on electricity rates relative to the base case varies from a 2.8 percent increase in *average rates* over the 1994 to 2015 period for option 1b to a 16.7 percent increase for option 2b. The effects on rates in 2015 range from a 3.8 per cent increase over the base case to a 25.3 percent increase. This analysis assumes that Bonneville could successfully recover the fish program cost through rates. As subsequent discussion will illustrate, this may not be the case.

Figure 5

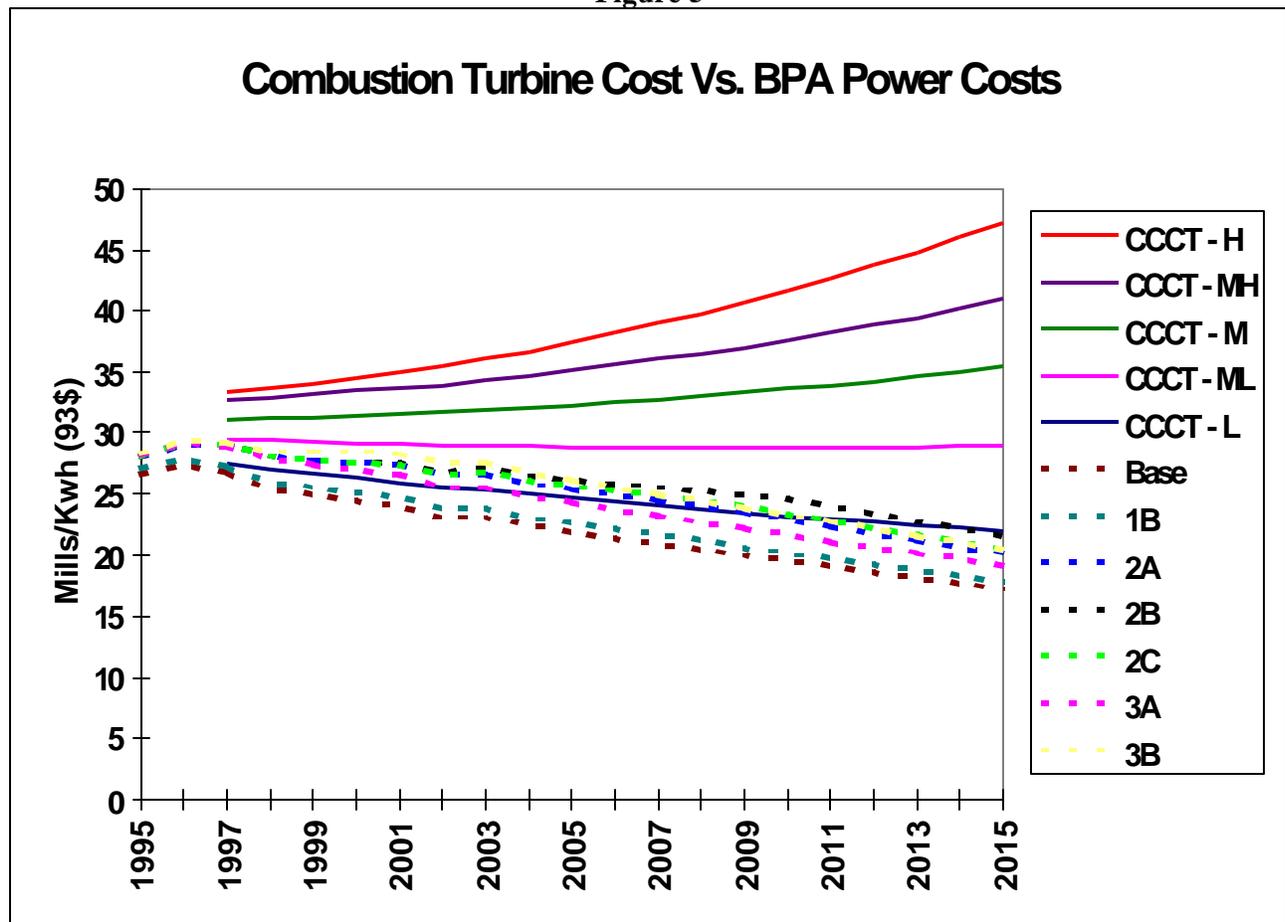


Table 6 shows the levelized costs of the options in three components and in total. Clearly, for all of the scenarios under options 2 and 3, capital costs are the largest component of fish and wildlife costs. The capital costs are dominated by requirements for dam modifications to accomplish drawdowns, or in the case of 3c, to add additional storage reservoirs in the upper Snake. The capital and “other” costs have been allocated to Bonneville. Seventy percent of the energy replacement costs have been allocated to Bonneville. The remaining 30 percent of the energy replacement costs would be incurred by the owners of non-federal

projects, primarily those on the mid-Columbia. Most of the cost variation among the scenarios is due to variations in the capital costs.

Table 6
Levelized Cost of Fish and Wildlife Options
(Millions of 1993 Dollars)

Option	Capital Costs	Energy Replacement Costs	Other Annual Costs	Total Costs
1b	5	18	36	58
2a	148	67	52	266
2b	197	73	52	322
2c	168	68	49	285
3a	80	69	50	199
3b	178	87	50	315

Based on analysis and consultation on several alternative options, including those in Figure 5 and Table 6, the Council has focused on a modified set of mainstem actions. These actions are named Alternative A through D. Which of the alternatives are ultimately pursued depends on decisions made in the future after evaluating additional research and testing. The costs and rate effects of Alternatives A through D are presented below. In addition, the costs of only those actions pursued immediately in 1995 are evaluated over time. This case is referred to as 1995.

Table 7 shows the levelized cost components in millions of 1993 dollars. The increased annual revenue requirements would range from \$89 million in the 1995-actions-only case to \$225 million for Alternative B. Table 7 also shows various wholesale and retail rate impacts and effects on public utility residential customer bills.

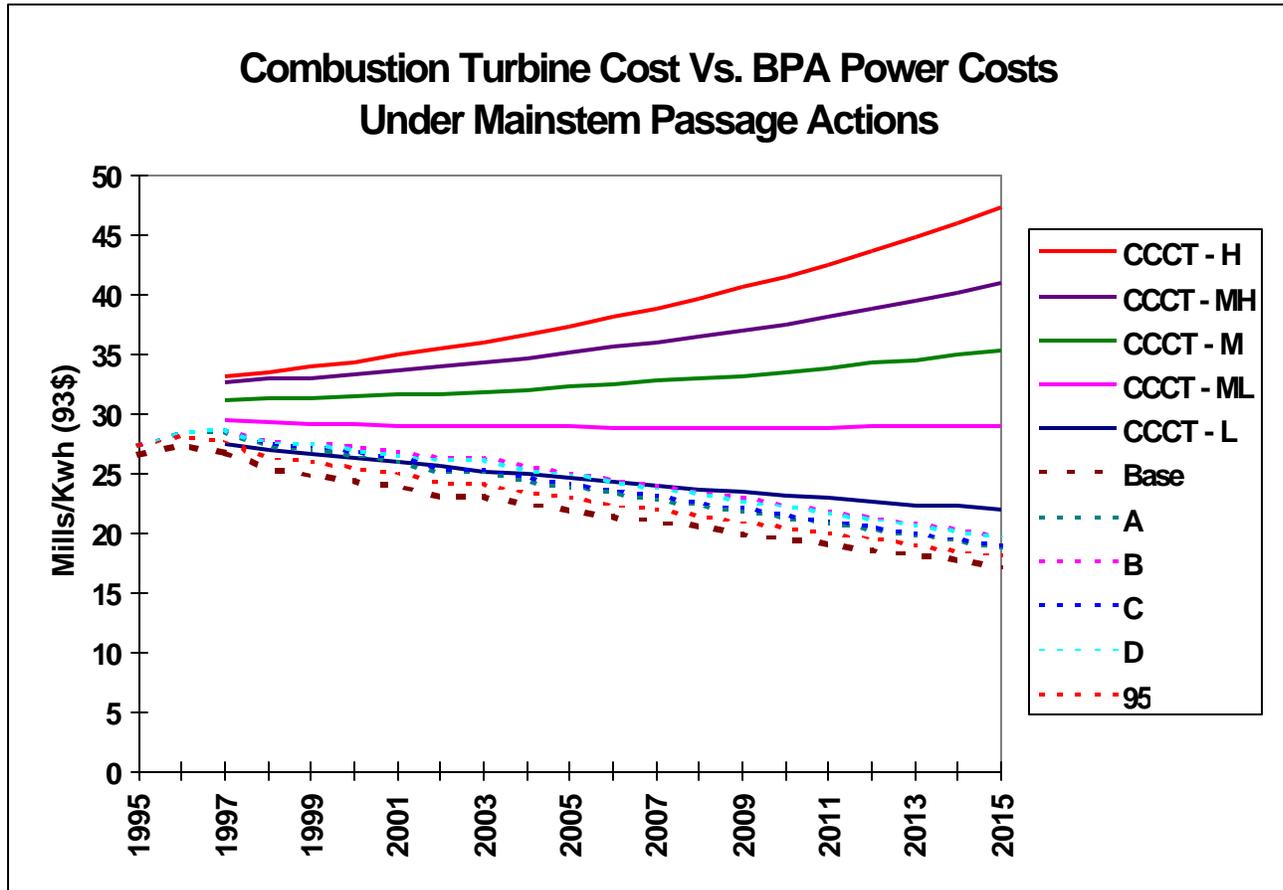
**Table 7
Cost and Rate Impact Summary For Mainstem Passage Actions**

	1995	A	<u>Alternative</u> B	C	D
Levelized Costs (Million 93\$)					
Total	89	151	225	170	209
Capital	17	61	108	81	89
Energy	53	69	95	67	99
Other	21	21	21	21	21
Wholesale BPA Rate Impacts					
Average % Impact	3.7	7.2	11.1	8.1	10.3
1997 % Impact	3.3	5.9	6.6	6.2	6.3
2015 % Impact	4.7	9.0	14.6	10.0	13.8
Retail Public Utility Rate Impacts					
Average % Impact	2.5	4.8	7.4	5.4	6.9
Increase in Typical Annual Bill	\$15	\$29	\$45	\$33	\$41
1997 % Impact	2.2	4.0	4.4	4.2	4.2
Increase in Typical 1997 Bill	\$13	\$24	\$27	\$25	\$25
2015 % Impact	3.1	6.0	9.8	6.7	9.2
Increase in Typical 2015 Bill	\$19	\$36	\$59	\$40	\$55

The average increase in rates for the mainstem passage alternatives compared to the Strategy for Salmon base case vary from 3.7 percent in 1995 to 11.1 percent in Alternative B. These percent increases over the base case should not be confused with average annual growth rates. Their meaning is that in a typical future year, Bonneville tier one costs would be, in the case of B for example, 11.1 percent higher than they would have been under the Strategy for Salmon. The near-term rate impacts for 1997 are about 6 to 7 percent in Alternatives A through D. By 2015, these impacts vary from 9 to 15 percent. Retail rate impacts for residential customers of public utilities that rely on Bonneville power would be about two-thirds of the wholesale rate impacts. The increases would imply annual electric bills that are between \$30 and \$45 higher than those expected under the Strategy for Salmon.

Figure 6 illustrates Bonneville tier one costs under the mainstem passage alternatives compared to combined-cycle combustion turbine costs under different gas price escalation assumptions.

Figure 6



Figures 5 and 6, on the surface, indicate that there is a good chance that Bonneville could cover the expected range of possible fish recovery costs and still compete well with alternative sources of electricity supply. However, such an interpretation may be too complacent. There is uncertainty in the Council’s analysis. For example, the rate model used here is relatively simple and may not fully capture all the factors affecting Bonneville’s costs and rates.

In addition, there is a great deal of uncertainty surrounding gas prices. Over the past several months, Council staff have repeatedly reduced their gas price forecast in the face of evidence and opinion that gas prices were low and were likely to stay low. If natural gas prices escalate at a rate near the low end of the forecast range, Bonneville tier one power will not be a clear winner. Not included in the above analysis, is the fact that Bonneville power costs will also be increased by low gas prices due to reduced secondary power sales revenues.

Most significantly, the change to competitive power markets needs to be the frame of reference for decisions about the ability of Bonneville to recover costs and support fish recovery measures. Because of the nature of customer’s expectations, the flexibility of competitors’ actions, and the unknown future cost of competing supplies, Bonneville, more than ever, will need to develop the flexibility to compete in a market.

Currently, Bonneville's customers perceive that there are alternative supplies available at competitive prices. Their expectations are, as evidenced in the offers they are receiving, that natural gas prices can be maintained at low levels. For many, the expectations for Bonneville costs are for ever-increasing and uncontrollable fish recovery costs as well as other risks -- repayment "reform" that could alter the terms of Bonneville's treasury repayments and risks associated with the operation of the Washington Public Power Supply System nuclear plant. In the face of these expectations, some of Bonneville's customers are already seeking to diversify their sources of power. At least one, Clark County Public Utilities, has acted to significantly reduce its dependency on Bonneville. In a world where uncertainty is large, some diversification may make sense even when simple calculations seem reassuring.

Bonneville has approached the question of how much additional cost it could take on and remain competitive from a slightly different direction.¹⁹ Bonneville gathered the available information (quantity, cost, characteristics) about specific competitive offers to their customers and others. This information was gleaned from contacts with the customers, public information on responses to solicitations, suppliers and others. Based on this information and their knowledge of their customers, Bonneville estimated the customer response to increases in their rates. These estimates were not based on any explicit analytical model, but on the collective judgments of their account executives, segment managers, marketing staff and others. The results suggest that for a rate increase of 10 percent now, they would realize significantly less than a 10-percent increase in revenues as a few customers chose to put some of their loads on competitors. An additional 10-percent increase in rates (20 percent total) resulted in no increase in revenues, as more customers chose alternative supplies. Any further increase in rates resulted in loss of revenue. As with Council staff's analysis, there was a wide band of uncertainty.

Some might argue that Bonneville's perspective on this question is biased toward a limited capability to absorb additional fish and wildlife costs. Council staff's analysis indicates that in the early years, an immediate 10-percent increase in Bonneville's rates would put it in competition with combined-cycle combustion turbines with gas prices at the medium-low forecast. An immediate 20-percent increase would correspond to the medium gas price forecast. On a long-term basis, Bonneville's rates would look much better. Still, the Council believes it is reasonable to expect some of Bonneville's customers to diversify their power supply away from Bonneville if confronted with those kinds of competitive choices.

Bonneville's ability to recover the costs of fish recovery is almost certain to vary depending on the uncertainties discussed above. In addition, it is likely to vary with seasons of the year and time of day, as the value of electricity changes. The addition of more fixed cost on Bonneville's system will seriously reduce its ability to compete flexibly in the electricity market.

There are likely to be conditions under which Bonneville can generate significant revenues to contribute toward non-power costs, e.g., years with good water conditions and high export demands or perhaps years in which higher than anticipated gas prices allow Bonneville to capture a higher margin on its sales. There may also be conditions in which, if burdened by large fixed costs, Bonneville cannot compete successfully enough to even cover its current fixed costs. The new electricity market calls for new approaches to recovering costs of non-power objectives such as the fish recovery efforts.

Conclusion on Economical Power Supply and Other Purposes of the Act

¹⁹ *Competition and BPA's Sustainable Revenues*, Bonneville Power Administration, Market Research, Nov.21, 1994.

It is unlikely that additional fish recovery costs in the range being considered would result in a Northwest power system that is un-economical in relation to the power systems in other parts of the country. It is, however, entirely possible that the kinds of cost increases involved could constitute a burden for specific consumers and relatively electricity-intensive industries. It is not possible for the Council to identify a particular level at which the burden becomes too great. A likely response to increased power costs for at least some major industrial consumers would be to turn to alternative sources of supply not subject to fish recovery costs.

The more immediate concern is that fish recovery costs might seriously reduce Bonneville's ability to compete in the increasingly competitive wholesale power market. Because Bonneville's customers now have competitive choices, they can abandon Bonneville if Bonneville's costs become too high. The effect would be to preclude Bonneville from making timely payment of its debt to the federal treasury -- one of the purposes of the Power Act. The Council's analysis indicates some limited ability to absorb additional fish recovery costs. That ability probably improves with time as Bonneville's existing fixed costs decline in real dollar terms. How great that ability is, however, is subject to considerable uncertainty. To ensure Bonneville's ability to carry out the purposes of the Power Act, the Council should encourage cost-sharing to minimize the additional fish recovery costs that are placed on Bonneville, particularly in the near term. The variability inherent in Bonneville's revenues also suggests that there may be some years when Bonneville's revenues are such that it could contribute "excess" revenues to support fish recovery measures. This would be contingent on Bonneville having reserves sufficient for prudent utility operations.

Although the analysis in this section has focused on long-term costs, Bonneville's ability to repay the federal Treasury can be threatened by short-term and long-term decisions. If Bonneville encountered a reliability problem due to emergency circumstances described earlier in this paper, it might have to make additional short-term purchases to maintain service to firm loads. Prices in such a market would be expected to rise above normal levels, and purchases could strain Bonneville's financial reserves. The Council understands that in making such purchase decisions, Bonneville will consider its financial situation (e.g., financial reserves and its ability to make Treasury repayments), and its obligations under the Endangered Species Act, the Northwest Power Act and other laws.

Mitigating the Impact on the Economics of Bonneville's Power Supply

If the Bonneville Power Administration were a private utility facing the degree of competition Bonneville now faces, it would take several steps to improve its competitive position. One of the more important of these is that it would write down its investment in uneconomic resources. This would cause significant short-term problems for the utility's shareholders, but would ensure the competitiveness of the utility in the long run. Much of Bonneville's investments in the Washington Public Power Supply System are such investments. Supply System debt constitutes about 45 percent of Bonneville's debt and interest costs and roughly a fifth of its net revenue requirement. If part of these costs could be written down, the cost of the fish recovery measures would still be a significant issue, but there would be no question whether those costs could be accommodated while maintaining an economical power supply. However, because Bonneville has no stockholders other than the federal taxpayer, writing down this investment does not appear to be an option.

Although writing down existing uneconomic debt does not seem an option, the fact that the projects that make up the federal Columbia River Power System are multiple purpose projects suggests other means of recovering some of the costs of fish recovery measures. One is to seek federal appropriations or other sources of funding for fish recovery measures. A second is to share as much of the cost of fish and wildlife

costs as are attributable to the non-power uses of the Columbia River system as allowed under Section 4(h)(10)(c) of the Act.

A third approach would recognize the parallel between Bonneville's situation with fish recovery costs and uneconomic investment in generation and so-called "stranded investment" and consider the recovery of fish recovery costs through a charge for the use of Bonneville's transmission system.²⁰

Federal Appropriations

The recovery of salmon in the Columbia River System is an effort at environmental restoration of unprecedented proportions. The Council should explore with Congress the possibility of federal appropriations or other funding mechanisms for part of the costs.

Section 4(h)(10)(C)

Section 4(h)(10)(C) of the Act provides:

The amounts expended by the Administrator for each activity pursuant to this subsection shall be allocated as appropriate by the Administrator, in consultation with the Corps of Engineers and the Water and Power Resources Service, among the various hydroelectric projects of the Federal Columbia River Power System. Amounts so allocated shall be allocated to the various project purposes in accordance with existing accounting procedures of the Federal Columbia River Power System.

Earlier this year, on a one-time basis, the federal government concluded that Bonneville could recoup replacement power costs and other costs of carrying out the Council's fish and wildlife program, but could not recoup the value of lost power revenues. The method of recoupment was to reduce Bonneville's repayment to the U. S. Treasury. Under this approach, Bonneville's ability to repay the Treasury would be determined after the Treasury repayment obligation is reduced to account for a portion of fish and wildlife program implementation costs.

Recovering Costs through a Transmission Charge

In jurisdictions where retail competition is being considered, a transmission or "wires charge" is being considered to allow utilities to recover at least part of the costs of otherwise stranded investments through a charge for the use of the utilities' transmission and distribution systems.²¹ Much of the policy discussion surrounding electric utility deregulation has to do with stranded investment.²² The Federal Energy Regulatory Commission recently issued a notice of proposed rulemaking on stranded investment involving wholesale as

²⁰ "Stranded investment" refers to past utility investment that can not be recovered in power rates because of competitive pressures.

²¹ California Public Utilities Commission Order Instituting Rulemaking and Order Instituting Investigation: On the Commission's Proposed Policies Governing Restructuring California's Electric Services Industry, Docket No. R.94-04-031, April 20, 1994.

²² For example, see Pierce, Richard, "The Advantages of De-Integrating the Electricity Industry," *The Electricity Journal*, November, 1994, p. 20; and *Public Utilities Fortnightly*, Nov 15, 1994, pp. 6 - 7 and pp. 16 - 18; for just a few recent examples of the debate on stranded investment.

well as retail transactions.²³ A recent decision by the Circuit Court for the District of Columbia appears to restrict the treatment of stranded investment.²⁴ The issue, however, is far from resolved.

Fish recovery costs and/or supply system debt can be thought of as analogous to stranded investment. Fish recovery costs, in effect, represent the internalization of environmental damages caused by the past investment in the hydroelectric system. As a result of the competitive environment that exists today, the beneficiaries of those past investments, Bonneville's customers, may be able to strand the fish recovery costs by leaving the system. Similarly, the Supply System costs were incurred by Bonneville for the benefit of a large number of utilities. Today's competitive market may enable these utilities to strand this investment.

Bonneville controls about 80 percent of the transmission in the region as well as large parts of the intertie. If fish recovery and/or Supply System costs were allocated to transmission, it would lessen, but not eliminate, the ability of customers to avoid fish recovery costs by turning to alternative suppliers.

This would be a very difficult and contentious issue. It could result in costs falling heavily on particular utilities that currently participate in the transmission market. It would also not preclude avoidance of fish recovery or Supply System costs by using other transmission providers and by siting alternative supplies to avoid use of Bonneville's transmission system. The extent to which this kind of cost allocation to transmission would be consistent with Federal Energy Regulatory Commission regulation is unclear.

Conclusion

The Council should actively pursue all means for paying for fish recovery measures in addition to using Bonneville power rates.

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²³ Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, 59 Fed. Reg. 35274, July 11, 1994.

²⁴ Cajun Electric Power Coop. v. FERC, 28 F. 3d 173, D.C. Cir. 1994

Appendix D

STAFF ANALYSIS OF BIOLOGICAL BENEFITS OF MAINSTEM PASSAGE ACTIONS

During the course of this amendment proceeding, the Northwest Power Planning Council has examined the biological, economic and hydroelectric impacts of a wide range of options to enhance the biological status of Snake River salmon populations specifically and all Columbia Basin salmonid populations in general. Each of the options was analyzed extensively by Council staff. These deliberations culminated with the Council adopting a set of amendments to its Fish and Wildlife Program at its meeting in Portland, Oregon on December 13-15, 1994.

This report provides the results of the biological analysis of the adopted actions. The package was termed Option 7 during the amendment process. Option 7 is very similar to the Council's previous Alternative 6. The Council received the results of the analysis of Alternative 6 prior to its December 6, 1994 meeting and the analysis of Option 7 was provided prior to the Council's meeting on December 13, 1994.

The analysis has been confined to the biological impacts of the actions on Snake River spring chinook. Because of their close biological similarities, the results would also be applicable to Snake River summer chinook as well. For this analysis, Snake River spring chinook were treated as a single population above Lower Granite Dam

Description of the action

The Council's adopted rule calls for shorter and longer-term flow, velocity and bypass measures coupled with an evaluation comparing transportation and in-river passage. The evaluation is intended to guide future decisions by the Council regarding the different alternatives. The sequence of actions analyzed is shown in Figure 1. Briefly, however, the analysis consists of the following actions:

1. 1995 Actions

- a. Lower Granite drawdown to elevation 710. This action will disable the existing juvenile bypass, but adult passage can be provided with minor modifications. Transportation is eliminated from this project and spill is provided as bypass.
- b. Transportation is reduced to a single project, in this case, Little Goose. Collection from Lower Monumental and McNary is eliminated. Transportation is assumed to be in an evaluation mode and would only operate from a single collector project.
- c. Spill except at the collector project for up to 80-percent fish passage efficiency constrained by state water quality guidelines.
- d. Additional flow as described in Figure 1.

2. 1996 and 1997 Actions

- a. John Day Pool at minimum operating level.
- b. Lower Granite to near spillway (1996)
- c. Additional flow as in Figure 1.

3. 1999 (Alternative A) Actions

- a. Little Goose lowered to near spillway. Bypass is enhanced at Lower Granite through the addition of a surface bypass system with an effective fish guidance efficiency of 70 percent.
- b. Transportation is confined to Lower Monumental Dam.

4. 2002 Actions

a. Alternative B

- i. Lower Monumental and Ice Harbor drawn down to spillway.
- ii. John Day drawn down to spillway. Surface bypass system installed with effective fish guidance efficiency of 70 percent.
- iii. No transportation; spill at all projects.

b. Alternative C

- i. Lower Monumental and Ice Harbor drawn down to spillway.
- ii. No transportation; spill at all projects.

c. Alternative D

- i. Lower Monumental and Ice Harbor at minimum operating pool.
- ii. John Day drawn down to spillway. Surface bypass system installed with effective fish guidance efficiency of 70 percent.
- iii. Transportation from Lower Monumental.
- iv. Spill at all projects except Lower Monumental.

Management for the evaluation of transportation benefits is to be determined by the National Marine Fisheries Service, with management of additional transportation in any year to be determined by the fishery management agencies. The above specifications assume a certain configuration of transportation for the purposes of the analysis, but should not be regarded as necessarily reflecting how the management agencies might elect to manage transportation.

Alternatives A through D are the end points that depend on Council decisions to be made in 2002 (Figure 1). These decisions should benefit from additional evaluations called for by the Council, especially an evaluation of the relative benefits of transportation and inriver passage. The Council's action included all four alternatives with the final path to be determined in the future.

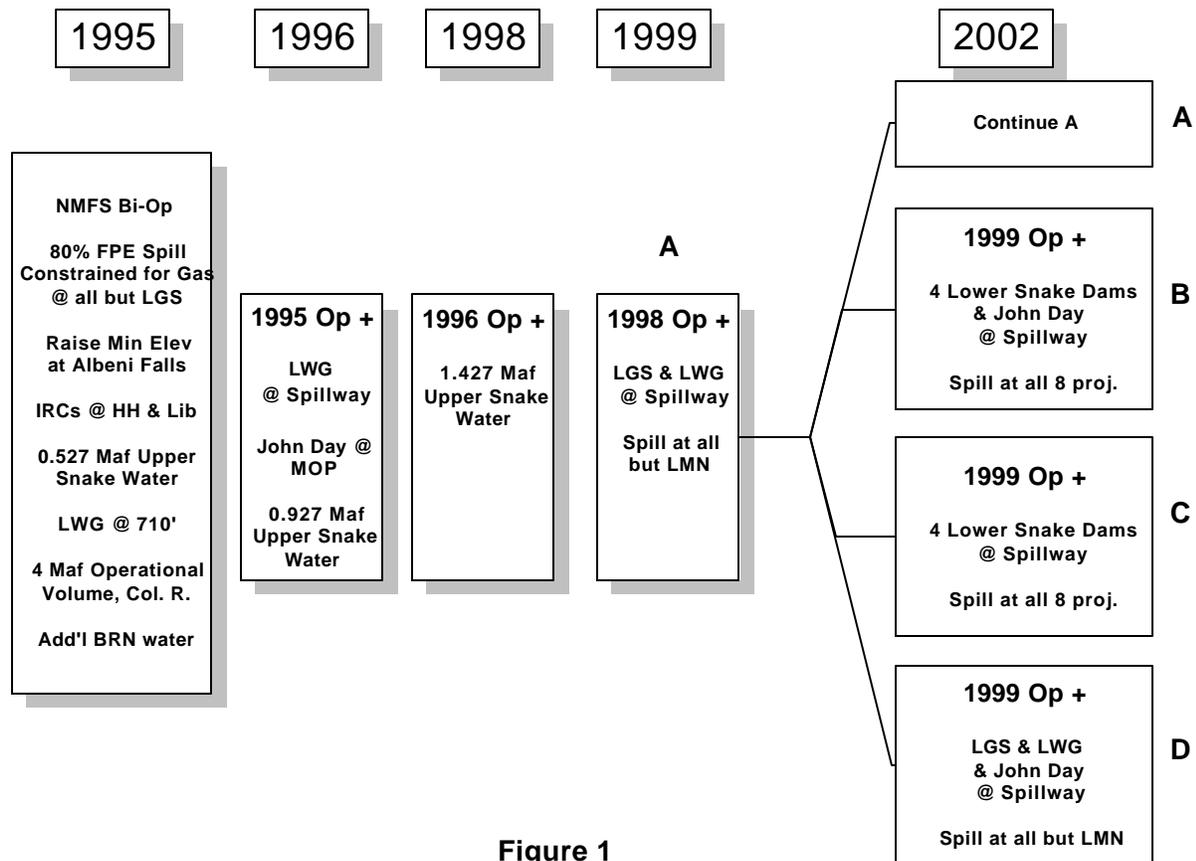


Figure 1

Description of the analysis

Three different analytical tools were used for this analysis. The System Analysis Model was used to examine the hydrological impacts of the option.. This analysis was based on the historical runoff in the Columbia River basin for the years 1929-1978. The result was an array of 50 flows in the Snake and Columbia that reflect the different boxes in Figure 1. These were analyzed using the Passage Analysis Model to estimate the resulting downstream passage survival for each box in Figure 1. The System Planning Model was then used to combine these passage survival rates with other assumptions concerning the salmonid life cycle to produce a simulation of the run into the future reflecting the different paths in Figure 1.

The four possible alternatives, A, B, C, or D, were examined using three different sets of assumptions related to juvenile mainstem passage. These are:

- a. A Sims/Ossiander-based model assuming a moderate level of transportation benefits. The transportation benefits are based on the point estimates of benefits from the National Marine Fisheries Service transportation evaluation studies in 1986 and 1989 (Transportation Benefit Ration equals 1.6:1 and 2.4:1 respectively).

- b. A similar Sims/Ossiander model using the lower end of the confidence limits for transportation in 1986 of 1.01:1.

These two passage options are similar to those used by the Council staff in the past and are consistent with the analytical work being done by the fishery managers. The result of these assumptions is that juvenile mainstem passage survival rate is a major factor limiting upriver spring chinook populations.

- c. A model that assumes that mortality caused by the hydroelectric system is relatively low (HiSurv). This model is similar to that advocated by the Columbia River Alliance and some utility groups. Survival in Lower Granite and Little Goose pools reflects preliminary estimates of survival in Lower Granite and Little Goose reservoirs made by the National Marine Fisheries Service (Skalski and Iwamoto) in 1993 and 1994. Survival in the other pools is derived from the assumption of an 80-percent transportation survival rate (Darryll Olsen, Columbia River Alliance, personal communication) and the transport benefit ratios observed by the National Marine Fisheries Service in 1986 and 1989. The result of this assumption is that juvenile mainstem passage survival rate is not a major factor limiting upriver spring chinook populations. This assumption set is termed HiSurv in the charts.

These options have been used by the Council staff in recent analyses and are documented in the attachment. The intent is to bracket the range of uncertainty in key passage assumptions and to illustrate the implications of different assumptions.

To properly interpret the results of this analysis, it is important to understand that these different passage assumption sets were assumed in the base period and in the simulations of future conditions. For example, if the HiSurv assumption was used, it was assumed to be operating during the base period as well as into the future. Thus, these assumption sets are not different alternatives but are different underlying models of how the system works. The different alternatives to modify the system in the future are overlain on these assumptions.

This analysis did not explicitly treat any potential negative impacts of spill in the sense that there is no explicit mechanism in the analysis linking a level of spill to a level of survival. However, this is not to say that negative spill impacts were not considered. The spill levels used were termed “constrained spill” and are based on empirical observation of dissolved gas levels that occurred in the Columbia and Snake rivers in 1994 during periods of high spill. These observations were used to arrive at an approximation of spill conditions that maintained dissolved gas below a threshold of 120-percent gas saturation level. This provided a relatively high level of fish passage effectiveness, but usually less than the 80-percent level advocated by some fishery management agencies.

In addition to the juvenile passage alternatives, we have included potential impacts of other actions in the program. These include changes in adult passage, pre-spawning survival and tributary survival (egg-smolt stage). Unfortunately, it is not possible to quantitatively link actions to survival in these areas as we do for juvenile passage. In addition, many of these actions affect particular subbasins and populations and not necessarily the population above Lower Granite as a whole. As a result, plausible estimates were used to illustrate the impacts of changes in these survival areas, but they do not represent quantitative estimates of the impacts of specific measures.

The assumption about adult passage is based on observed change in between-dam survival rates that have occurred over the last several years. Relative to the 1975 - 1993 time period, the average adult survival

rates provided by the fishery managers for the last ten years (84-93) have shown appreciable improvement (see table below). Without speculating as to the cause of these improvements, we chose adult survival rates into the future from this array of recent passage rates rather than from the 20-year record. This represents an average increase in adult passage survival for survival from below Bonneville to above Lower Granite of 13.6 percent relative to the entire period (1975-1993).

Adult Passage Survival Rates

Period	BON-MCN	IHR-LRG	Total
1975-1993 Average	0.693	0.826	0.572
1984-1993 Average	0.772	0.842	0.650
Percentage improvement	11.5 percent	1.9 percent	13.6 percent

Pre-spawning survival (survival of adults from Lower Granite to the spawning grounds) and tributary (egg-smolt) survival improvements were based on changes suggested by the National Marine Fisheries Service as part of the 1994 biological opinion analysis. Changes in pre-spawning survival were made relative to the estimated adult survival of radio-tagged fish from Lower Granite Dam to spawning areas in 1992 of 69 percent.¹ The medium level changes suggested by the National Marine Fisheries Service increased pre-spawning survival by 13 percent and egg-smolt survival by 8 percent. These changes are intended to reflect improvements in hatchery practices (reduction in the take of wild fish into hatcheries) and improvement to habitat. Because these changes are presumed to result from future actions, they were not fully realized in the analysis until 2002.

Presentation of Results

Two different ways of comparing the biological impacts of the alternatives are provided. The first is the long-term trend in fish returns as a result of the strategy. These charts present the median value of 500 runs of the System Planning Model. While these graphs are visually appealing, they exclude some of the information from the analysis. For example, it must be kept in mind that half the time, the System Planning Model results were below the median line and half the time they were above the line. If a significant number of times the results showed a decline in the run, this might not be evident from looking only at the median.

Because of this, we also are providing probability charts. These show the probability of the System Planning Model result relative to certain run sizes. For example, the charts show the proportion of the 500 System Planning Model simulations that were fewer than 1,000 fish at Lower Granite after 24 years. Because the recent spring chinook returns are on the order of 1,000 fish, this is the probability that the System Planning Model results show a continued decline in the run after 24 years as a result of the alternative. We analyzed the probability that the System Planning Model results at Lower Granite Dam after 24 years would be:

- a. Fewer than 1,000 fish;
- b. Greater than 1,000 fish;
- c. Greater than 5,000 fish;
- d. Greater than 10,000 fish.

Because the run size varies from year to year, it is necessary to average the results when calculating the probabilities. For this, we used the eight-year geometric mean. This is similar to using the eight-year

¹Bjornn, T.C. et al. 1994. Migration of adult chinook salmon and steelhead past dams and through reservoirs in the lower Snake River and into tributaries-1992. Technical report 94-1 to U.S. Army Corps of Engineers and Bonneville Power Administration.

running average. The eight-year period was chosen to encompass two salmon generations and is similar to the statistic used by the fishery managers in the federal court settlement negotiations currently underway.

The first numeric category is based on the level of recent returns of about 1,000 wild spring chinook at Lower Granite Dam. One way to look at these results is that the probability of an average System Planning Model result for a scenario being fewer than 1,000 fish after 24 years provides an indication of how likely it is that the run would continue to decline as a result of the alternative and under the particular assumption set. The second category speaks to the likelihood that the alternative would provide rebuilding above the existing population size. Finally, the other two categories provide an indication of the probability of rebuilding to higher levels. The use of the word *indication* is important. There are a number of unknowns that will affect the future and many scientific uncertainties. This is highlighted by the use of three alternative passage assumption sets in the analysis. Hence, these are not *predictions* of results so much as indicators of the relative effectiveness of the alternatives under different sets of underlying assumptions.

Results

Prior to discussing the results, one important caveat is in order. This analysis treated all Snake River spring chinook above Lower Granite Dam as a single population. However, the Council has acknowledged that there could be a number of important individual populations that are included in this larger designation. The number of spring chinook counted at Lower Granite Dam must be distributed to all of these populations. There is every reason to suspect that when populations are as low as they have been recently (around 1,000 fish) that some of these populations will be composed of very few spawning fish. This could result in genetic drift or other problems that affect survival and reproductive success. These factors are not built into this analysis. In this respect, the results should be considered optimistic.

Baseline

The System Planning Model median baseline for Snake River spring chinook (i.e. no actions beyond the *Strategy for Salmon*) shows the population leveling off at around 1,500 fish (Figure 2a, NoActionBase). The other three lines in Figure 2a suggest that, without improvement in juvenile passage survival, but with improvements in tributary survival, pre-spawning survival and adult passage, the runs would show a slight rebuilding. Over 90 percent of the System Planning Model simulations showed average runs in excess of 1,000 fish after 24 years; 20-40 percent of the time, the results were greater than 5,000 fish at the end of 24 years (Figure 2b). However, none of the baseline situations indicated a reasonable likelihood of rebuilding even to levels that prevailed during the 1980s, and certainly not to levels that would achieve the Council's goals for Snake River spring chinook.

The results of the alternatives will be discussed in the order that reflects the addition of actions. Alternative A and D for example, differ only in regard to John Day pool drawdown to spillway. Similarly, B and C differ in this regard and add the drawdown of all four Snake River projects. The nomenclature of the alternatives reflects previous discussions and is continued to avoid confusion.

Alternative A

Much of the discussion in this section applies generally to all of the alternatives. The impact of the differing underlying assumptions regarding transportation and flow are evident in the results from Alternative A. If transportation is assumed to have a low level of effectiveness, then drawdown of Lower Granite and Little Goose pools could be expected to have a positive impact on rebuilding (Figure 3a). Similarly, if transportation currently has a moderate level of effectiveness (consistent with the point estimates of benefits

by the National Marine Fisheries Service), then the results point to a positive, but more modest, level of rebuilding. Under both transportation assumptions, there was a 50-percent or greater expectation of a System Planning Model result in excess of 5,000 fish after 24 years with this scenario (Figure 3b).

In the case of the first model (low transportation effectiveness) it is necessary to assume that transportation has a negative impact on survival relative to inriver passage under most conditions (see documentation appendix). In this case, ceasing transportation itself has a positive impact and accounts for some of the rebuilding for A_Low in Figure 3a and for other alternatives as well. It should be stressed, however, that the low transportation effectiveness assumption is based on the lower confidence limit of a point estimate from a single year (1986). Statistically there is reason to place greater confidence in the point estimates from both 1986 and 1989, which are the basis for the mid-transportation effectiveness assumption; there is less evidence to indicate that transportation is as negative as indicated by the low transportation effectiveness assumption. For this reason, the results using the low transportation assumption are likely to be optimistic regarding rebuilding potential and the moderate effectiveness assumption may be the most realistic.

However, if transportation is assumed to have a high level of effectiveness and overall juvenile passage survival is generally high (A_HiSurv), then the drawdown actions in Alternative A have a slightly negative impact on rebuilding relative to the baseline (3a). With this assumption, Alternative A had a 20-percent chance of a result fewer than 1,000 fish after 24 years (Figure 3b) compared to a less than 10-percent chance in the baseline (Figure 2b). In other words, if juvenile inriver passage survival currently is relatively high, and much higher than assumed in the other two models, then actions aimed at improving conditions in the river will have little impact on rebuilding. Further, because with these assumptions transportation survival is very high (80 percent), then actions that decrease transportation, such as drawdown, will have a negative impact on survival.

If transportation were as effective as the HiSurv assumption supposes, then one would have to come to the unlikely conclusion that the development and operation of the hydroelectric system and the resulting modification of the ecosystem have had little effect on downstream migrant survival and are not an important factor limiting spring chinook abundance in the Snake River. In this case, it would be necessary to attribute the present decline in production to some as yet unidentified factor that affects Snake River spring chinook in particular.²

Alternative D

This alternative adds the drawdown of John Day to spillway to the drawdown of the upper two Snake River pools in Alternative A. Under the assumptions of moderate and low transportation effectiveness, this action added about 3,000 fish to the results of Alternative A (Figure 4a). A similar change was seen in the System Planning Model probabilities with an increase in the probability of results greater than 5,000 and 10,000 fish (Figure 4b). These increases result from the assumption of a relatively high benefit from changes in water velocity and a relatively low benefit from transport, as discussed above.

This alternative did not result in rebuilding under the HiSurv assumptions because it reduced, but did not eliminate, transportation relative to the base period (transportation continued at Lower Monumental Dam).

² This does not ignore the profound impact of natural environmental conditions on fish survival and production. Ocean conditions in particular have been poor for several years and have affected populations throughout the Northwest. However, Snake River spring chinook have been particularly hard hit and are now at a level of abundance that threaten the continuation of some populations. Thus there is reason to believe that Snake River spring chinook are limited by some additional factor unique to these populations. Development and operation of the Columbia and Snake river hydroelectric systems must stand out as a likely candidate.

However, there was a small improvement over Alternative A because of the drawdown of John Day pool. The probability of a declining run (fewer than 1,000 fish) for Alternative D was about 17 percent for the HiSurv assumption, compared to about 20 percent for Alternative A. This is because under these assumptions, velocity augmentation still had a beneficial effect, and augmentation of water velocity in John Day pool had an overall positive, albeit small, impact.

Alternative C

Under Alternative C, the four Snake River projects were drawn down to spillway in 2002, but John Day pool was maintained at its minimum operating level. Reflecting the previous reasoning, this action had a dramatic positive benefit if it was assumed that transportation currently has a low level of effectiveness (Figure 5a). Rebuilding, in fact, approached levels that occurred in the early 1970s. Positive, although more moderate, rebuilding was seen under the assumption of medium transport effectiveness as well. With this alternative, there were almost no System Planning Model runs that were fewer than 1,000 fish using the low and medium levels of transport effectiveness, and high probabilities of average runs in excess of 5,000 fish for both assumptions (Figure 5b). Even assuming low effectiveness for transportation, there was a probability of almost 70 percent of a result greater than 10,000 fish after 24 years.

Because this alternative eliminated transportation, it increased the negative impacts of the alternative if the HiSurv assumptions were used (again, under this assumption, transported fish had a survival of 80 percent. Eliminating it, therefore, had a negative effect). For example, the proportion of System Planning Model runs after 24 years that were fewer than 1,000 fish was about 27 percent for Alternative C (Figure 5b), compared to about 10 percent in the baseline (Figure 2b).

Alternative B

Adding the further action of drawing down John Day pool to spillway contributed several thousand fish to the median run sizes of Alternative C under the low and moderate levels of transport effectiveness (Figure 6A). For low transportation effectiveness, this alternative produced median run sizes in excess of 25,000 spring chinook at Lower Granite (still substantially below the Council's goal of 50,000 wild spring chinook at Lower Granite Dam). The probability of a System Planning Model result greater than 10,000 fish after 24 years was almost 90 percent for this assumption (Figure 6b). Using the medium level of transport effectiveness, the median return approached 10,000 fish. Overall, the probability of a System Planning Model run greater than 5,000 fish after 24 years was over 60 percent, but the probability of a result greater than 10,000 was only about 25 percent (Figure 6b).

The results under the assumption of high transport and juvenile passage survival (HiSurv) were similar to those seen in the other alternatives. The drawdown of John Day pool had a positive impact compared to the action without John Day drawdown (Alternative C). The probability of a System Planning Model result after 24 years of fewer than 1,000 fish was about 18 percent for Alternative B compared to about 27 percent for Alternative C, this difference being the effect of the John Day drawdown to spillway.

Conclusions

The Council's adopted actions offer the possibility of substantial increases in Snake River spring chinook. However, like all options for salmon recovery in the Columbia River, the outcome is very dependent on a few key assumptions. In particular, these include the relationship between water velocity and in-river survival and the benefits associated with fish transportation. Under some assumptions, the adopted actions could result in either little change or even a decrease in survival. This sensitivity of any recovery action to these assumptions highlights the need for the evaluation features that are central to the Council's approach.

The result assumes continuation of existing environmental conditions. Improvement in ocean survival conditions or the current drought in Idaho could add to the results reported here. However, because of the depleted state of many upriver chinook populations, of greater concern is that further degradation of environmental or habitat conditions would worsen the situation and delay benefits of any rebuilding actions.

Figure 2a.

Snake River Spring Chinook Baseline Simulations

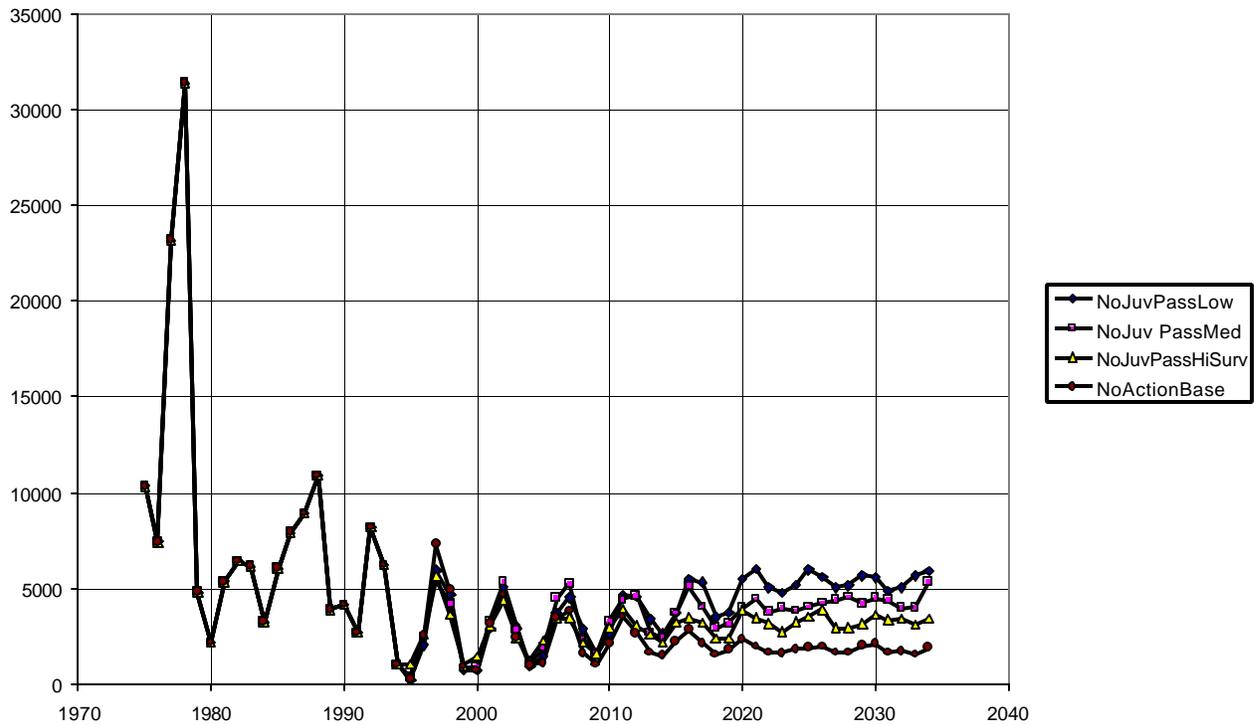


Figure 2b.

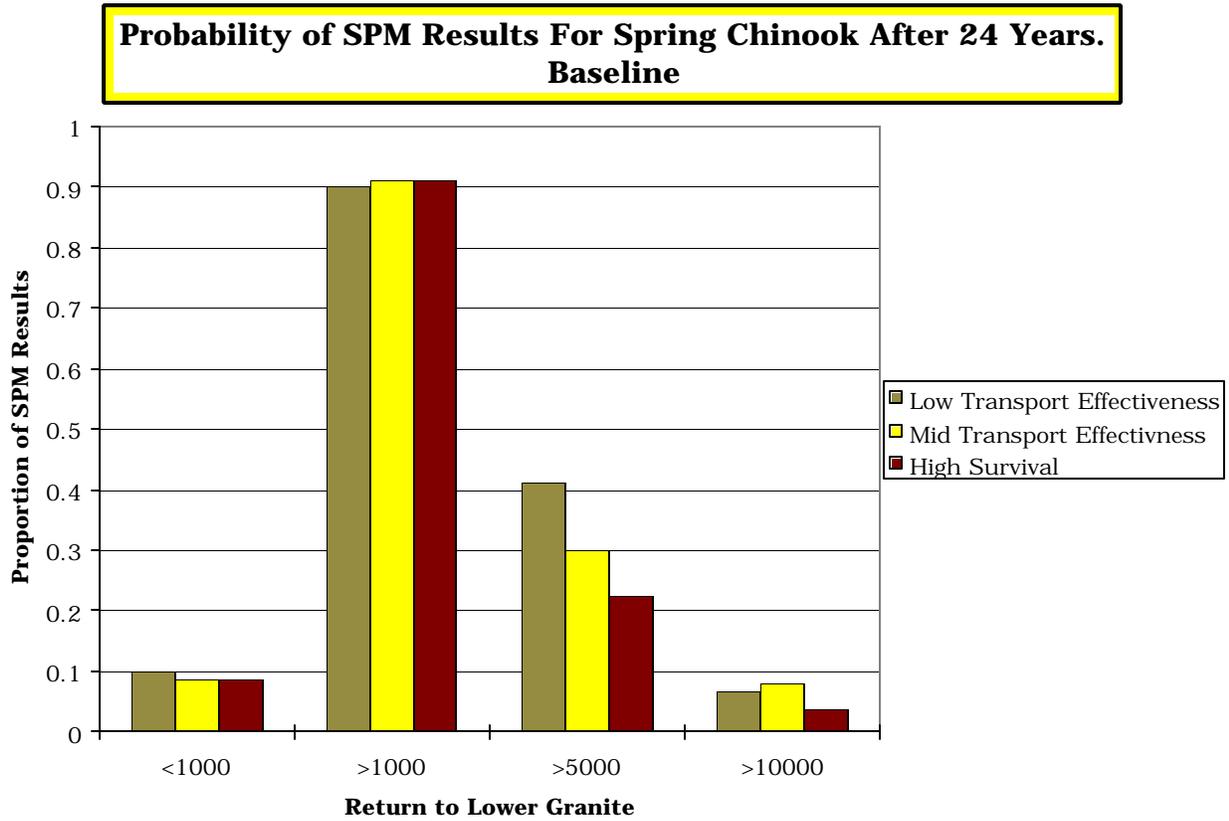


Figure 3a.

Snake River Spring Chinook Alternative A

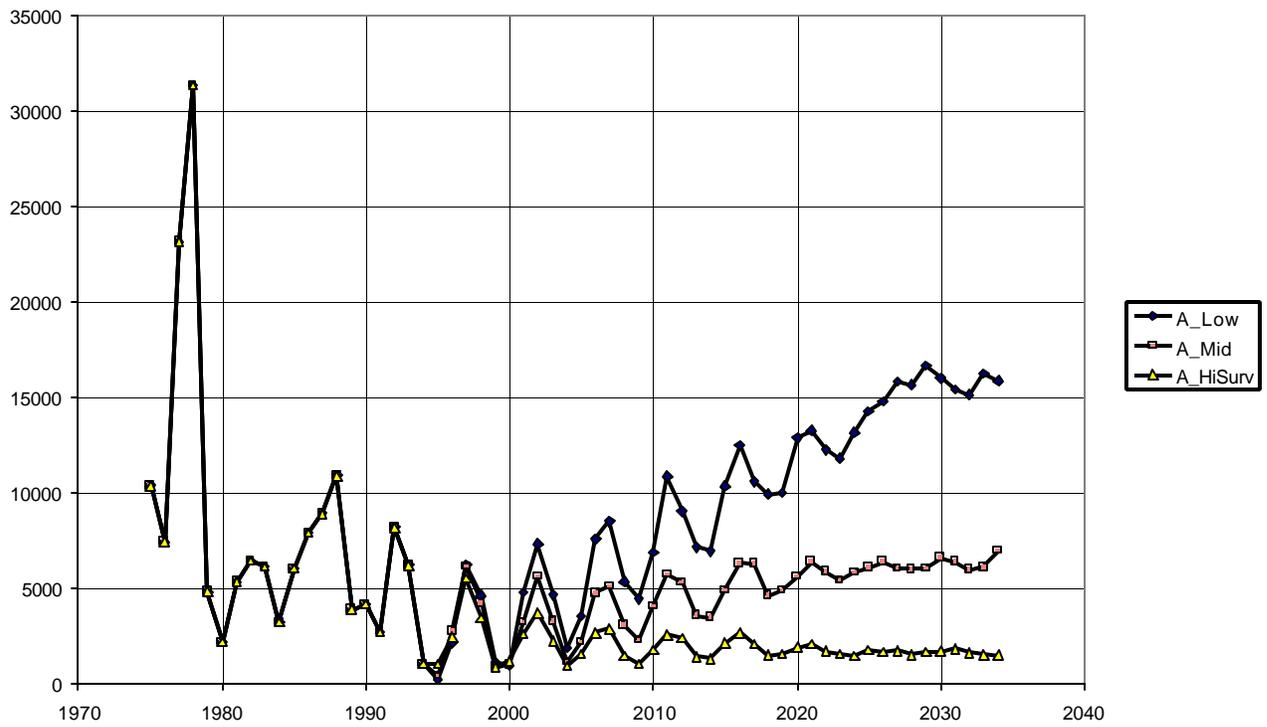


Figure 3b.

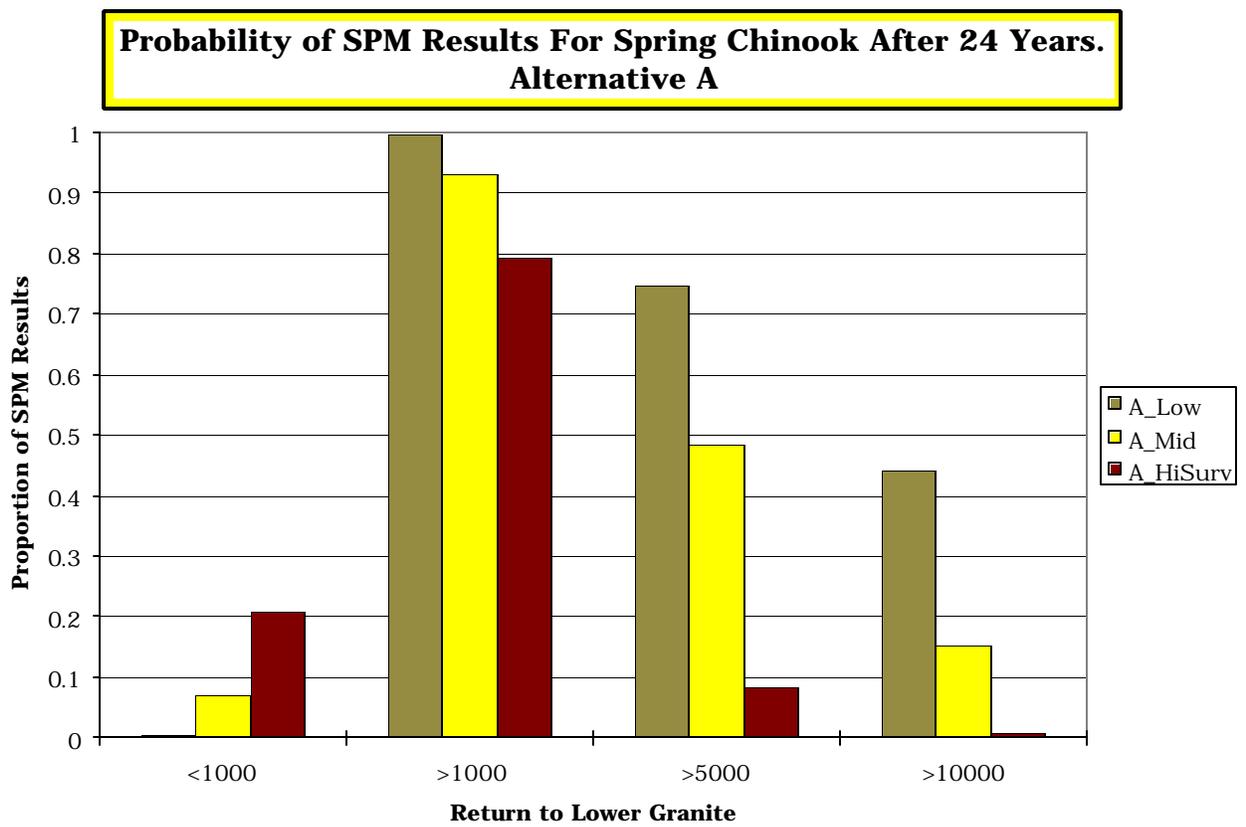


Figure 4a

Snake River Spring Chinook Alternative D

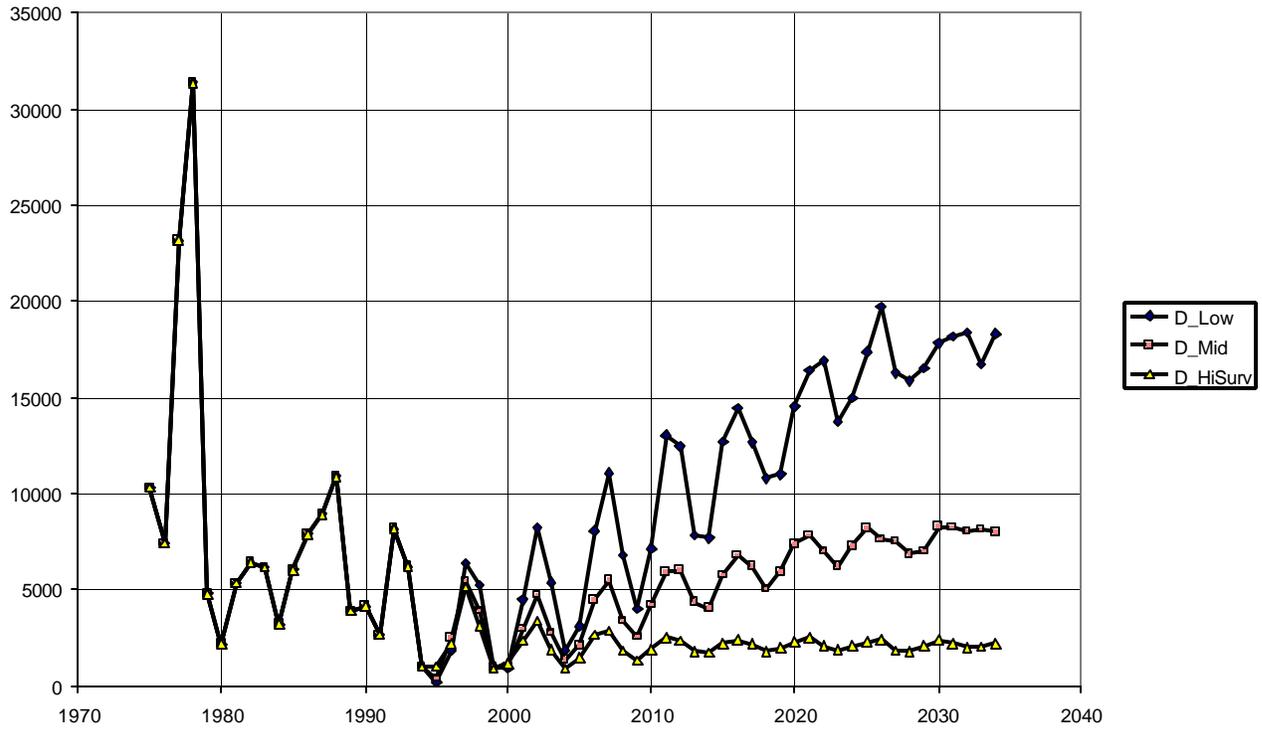


Figure 4b.

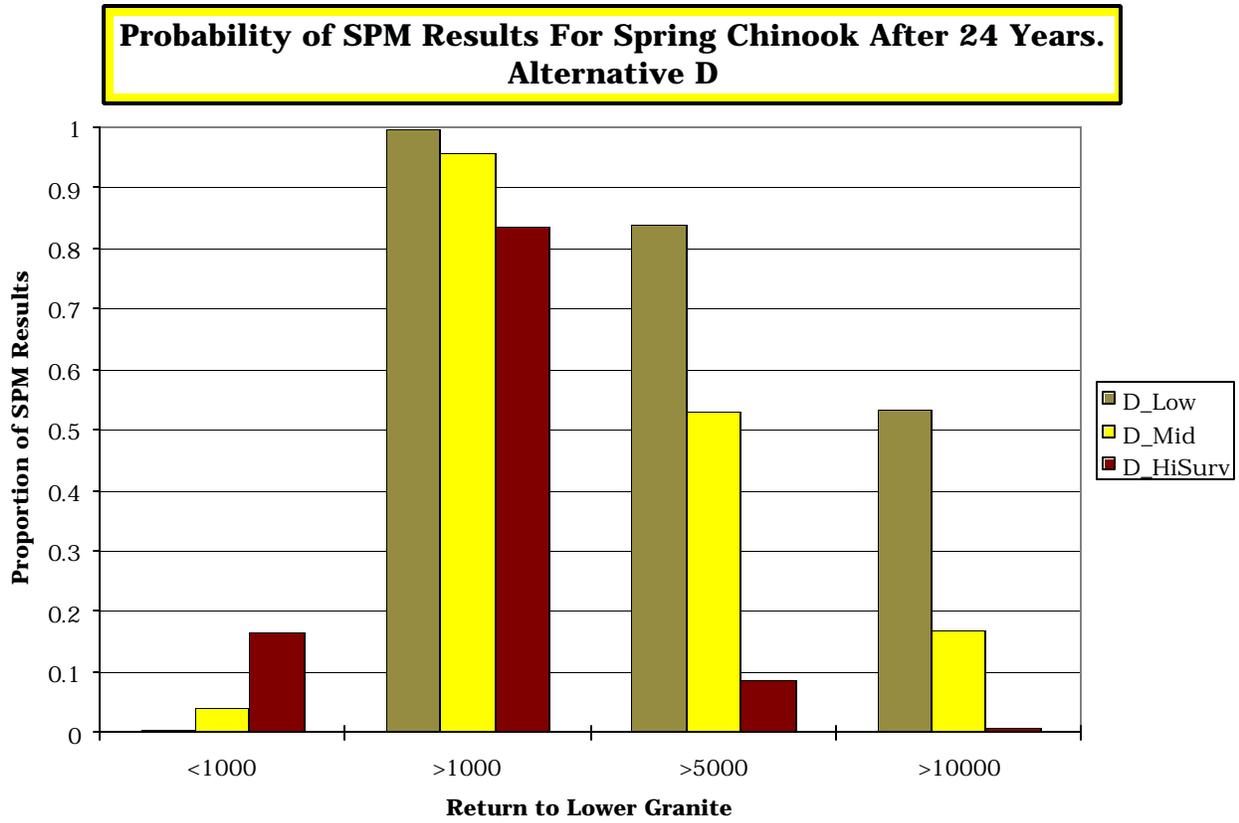


Figure 5a.

Snake River Spring Chinook Alternative C

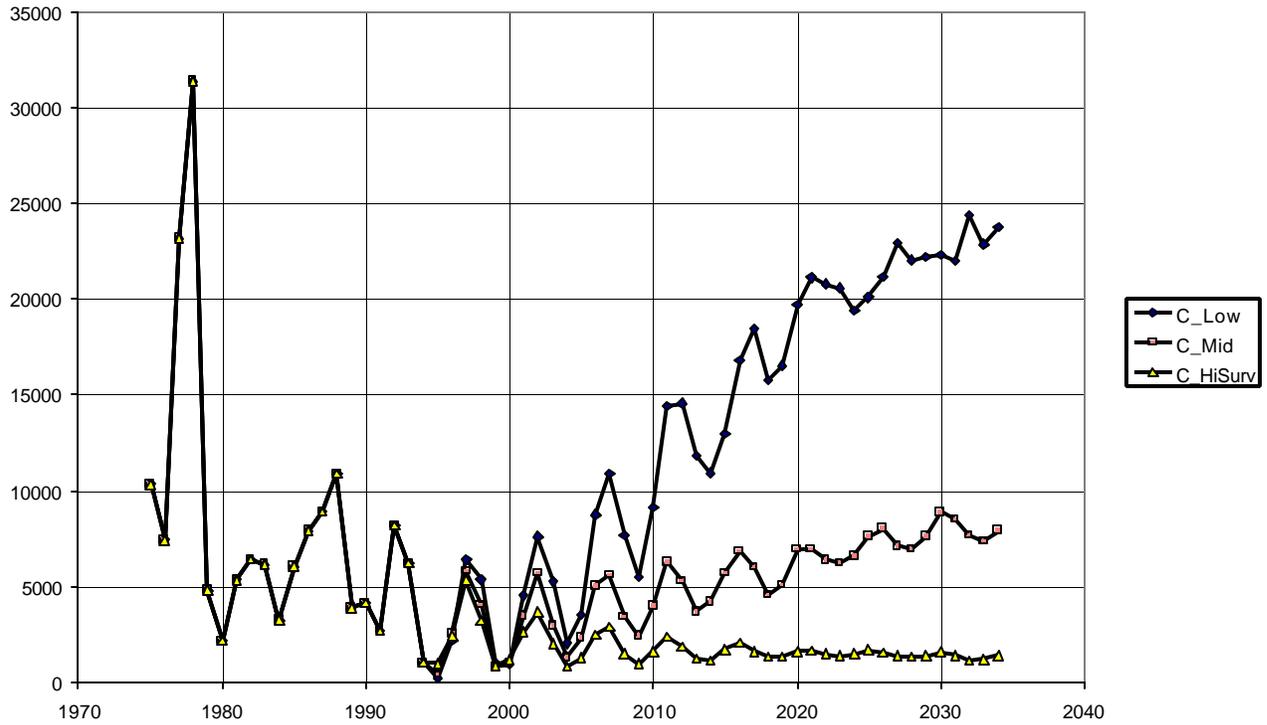


Figure 5b.

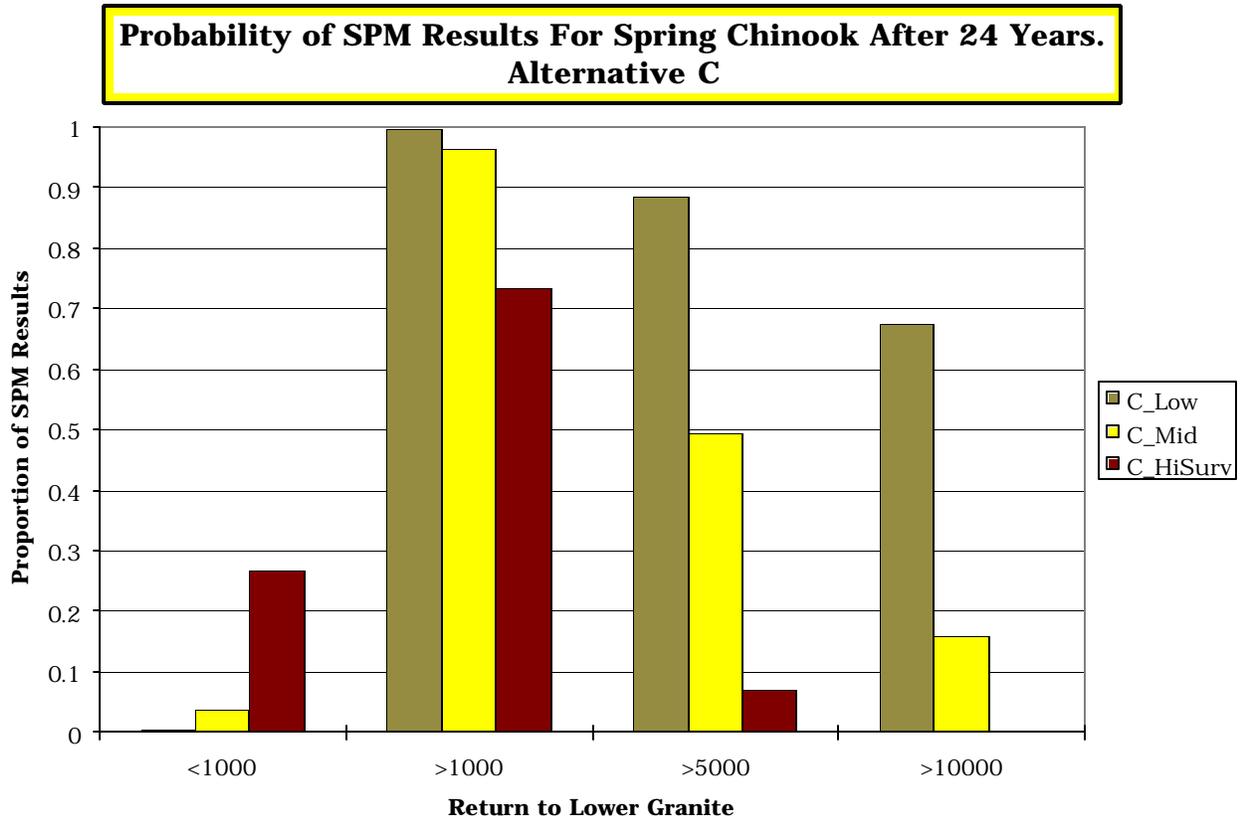


Figure 6a.

Snake River Spring Chinook Alternative B

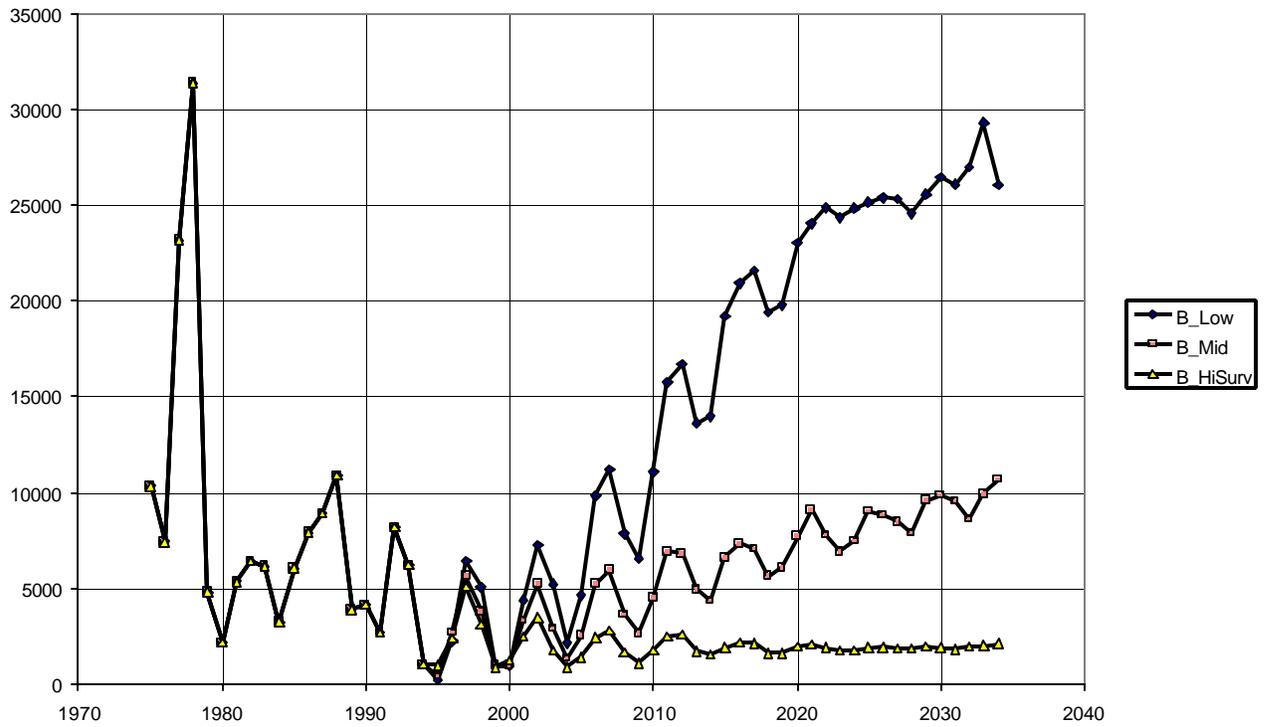
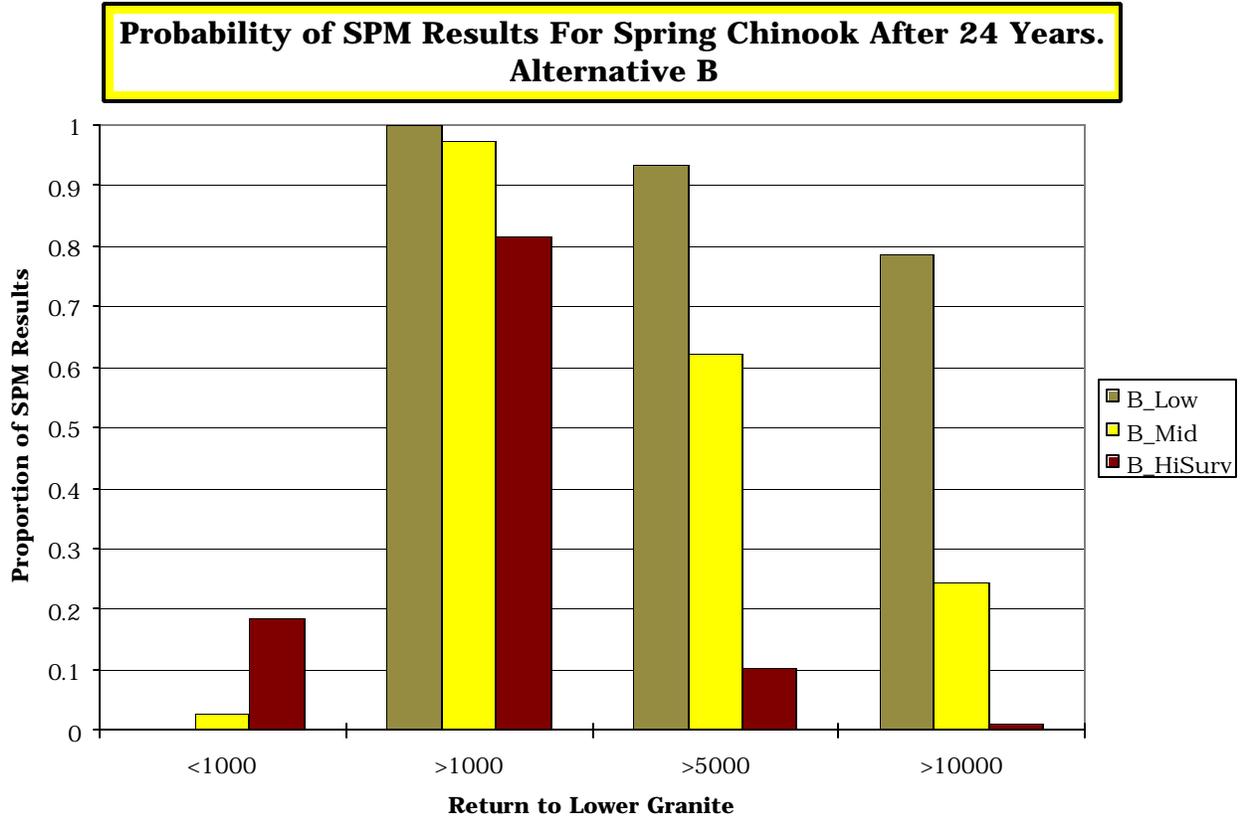


Figure 6b.



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Appendix E

MINORITY OPINION

**By John Etchart and Stan Grace
Montana Members, Northwest Power Planning Council**

On December 14, 1994, the Northwest Power Planning Council amended its Columbia River Basin Fish and Wildlife Program to improve salmon and steelhead survival. While we support the fish and wildlife restoration goals of the Northwest Power Act, the law that created the Power Planning Council, we voted against the recent fish and wildlife program amendments for several reasons.

First, we voted against the amendments because some of the major actions -- such as the river velocity measures in Section 5 -- rely on a scientific foundation that we find unconvincing. These amendments are unlikely, in our opinion, to help fish.

Second, we believe the amendments, as a whole, will impose huge costs on the region's ratepayers. These ratepayers finance most of the salmon recovery work. The amendments also will be costly for others who use the Snake and Columbia rivers.

Third, we voted against the amendments because they were rushed to adoption in a process motivated more by politics than by biology.

This is not to say we opposed all of the amendments. We supported many. For example, we supported the amendments establishing new operating rules for Hungry Horse and Libby dams that will protect reservoir biology from deep drawdowns in all but the most extraordinary conditions. Other features such as accelerated diversion screening, hatchery reforms, harvest restrictions and surface collectors are entirely appropriate.

Our concern with the amendments as a whole, however, has to do with the underlying assumption that salmon and steelhead survival can be increased by further manipulations of the Snake and Columbia rivers. The theory is that higher river velocities during the spring and early summer, when juvenile fish are migrating to the Pacific Ocean, will increase their chances of survival to adulthood by moving them more quickly to the ocean. This increased velocity will result from higher flows or the "drawdown" of reservoirs.

There have been two recent major analyses of drawdown: one done by the U. S. Army Corps of Engineers and the other by a highly reputable engineering firm hired by the Council. Neither found any significant benefit to drawdown except under the most extreme conditions -- that is, all the way to natural river configuration. The drawdowns called for in the Council's recent amendments are less extreme. We couldn't support those drawdowns because they provide such minimal and speculative gain, and without knowing a lot more, we certainly would not support drawdowns to natural river conditions -- tantamount to removing the dams.

Central to this skepticism about the merits of drawdown is the following:

Last year the Scientific Review Group, independent scientists impaneled by the Bonneville Power Administration and the Columbia Basin Fish and Wildlife Authority, told us they question whether salmon survival would necessarily be increased by further focusing of recovery actions on management of the river system. These scientists concluded that while it is important to improve river conditions, further improvements may make very little difference until conditions improve in the ocean. That contention is reinforced by the work of other scientists, who also believe poor ocean conditions may override any mitigative work undertaken in the river environment.

This doesn't mean we believe the hydropower system hasn't damaged salmon runs. Certainly, dams have hurt the Columbia Basin's salmon. But the ongoing debate over river flows, velocity and salmon survival is just that -- a debate, and it hasn't been resolved. It must be kept in mind that the region has been experimenting with "increasing velocity" since the early 1980s, to the extent that we now dedicate 70 percent of our reservoir capacity to fish flows. By our conservative estimate, the region has spent in excess of \$2 billion in the last 14 years on a fish and wildlife program whose centerpiece is the higher-velocity hypothesis. Even with all this money spent, our fish runs are poor and we really are no closer to resolving the flow/survival debate. Just last May, the Council amended the fish and wildlife program with language that calls for concentrated scientific research to investigate this puzzle. That was six months ago. We don't know anything today that we didn't know then, but the Council has now ordered up more of the same in a plan that could cost the ratepayers of this region in excess of \$2 billion more over 20 years. So, in our view, too much of the very expensive new plan is based on the same old uncertainty.

Now, about cost. With the recent amendments, the Council program is going to cost nearly half a billion dollars a year -- \$177 million in addition to the \$250 million our program already costs. Incidentally, these costs are underestimated because they refer only to Bonneville Power Administration costs, ignore utilities' costs and all indirect impacts and are premised on water conditions much better than we have had in recent years.

Even if we could be sure of benefits, the Council must be very careful with measures that affect the region's power system, and we simply aren't comfortable committing to another huge sum of money based on the available flow/survival evidence. About two-thirds of the electricity we use in the Northwest comes from the Columbia Basin's dams, and this system is already pushed to the ragged edge. This plan imposes more costs, further reduces the system's capacity and throws system reliability into question -- all of this without a good understanding of the consequences.

Additionally, the Council rushed its deliberations and its decision. As a result, it did not do the best job of engaging the public, of evaluating the science, of studying the costs, of debating the choices, of considering the alternatives, and so on. But for our headlong rush, the Council could have heard information which could have been useful in our deliberations. For example, the National Marine Fisheries Service plans to release its draft recovery plan for Snake River salmon in January 1995, and it would have been useful to review that plan before finalizing the amendments. In addition, the Columbia Basin Fish and Wildlife Authority, which represents Indian tribes and state fish and wildlife agencies in the Northwest, plans to offer the Council its recommendations on river flows in March.

In the Council's deliberations in this rulemaking, a number of arguments were advanced in support of going ahead with a decision in December 1994. None was persuasive, in our opinion. For example:

- Some thought the Council needed to vote in December because the salmon -- particularly the endangered species in the Snake River -- couldn't wait for us to impose additional protections. We believe those salmon will be protected by the National Marine Fisheries Service, and, in any event, most elements in our plan offer little for Snake River salmon in the near term.
- Some believe that the Council had to amend its program before the Fisheries Service releases its recovery plan. Unless we were trying to set the stage for the Fisheries Service by including measures such as drawdowns, we were rushing for the sake of rushing. This is not a competition. The issues are too critical -- to the fish, to the region's economy and to the power system. We believe that if the Council and the Fisheries Service both use the best science to fulfill their legal mandates -- ours under the Northwest Power Act, theirs under the Endangered Species Act -- our separate paths ultimately will reach the same conclusion.
- We were told that our amendments must be finalized before new Council members are appointed in January because collectively the learning curve of new members would hinder our progress. That is a convenient assertion. In truth, the new Council members will be every bit as likely to accomplish things for fish as the old Council, and this action was taken in the face of two Governors and seven of eight U.S.

Senators asking for a more deliberate pace. For any plan to be successful, it must be embraced more widely than this one will be.

We sought to persuade the rest of the Council that the amendments needed more scrutiny and additional public comment. In particular, we believe there should be a better analysis of the potential costs, impacts and implications for system reliability. But the majority chose to go ahead, and while we respected their right to make that decision, we disagreed with their conclusions. It is our belief that these particular fish and wildlife program amendments were developed too quickly. They will cause the region to spend money it doesn't have and use water that isn't available. They ignore such science as there is, and they are unlikely to be implemented. Even if they are implemented, we are not sure many of them would help fish -- or that we ever would know if they did.

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Appendix F

RESPONSE TO COMMENTS

In addition to receiving recommendations, for which the Council has made findings, the Council received many comments in the fish and wildlife program amendment process. In instances where the comments related to recommendations, the Council has summarized and responded to them in the findings. There were a number of comments that did not specifically address findings, however, and the Council responds to them here. These responses to comments together with the findings, satisfy the federal Administrative Procedure Act's requirement of a statement of "basis and purpose" of the amendments.

The Council wishes to take this opportunity to thank all commentors. The comments were most useful in helping to assure that the Council's fish and wildlife program is responsive to the needs and interests of the region, as well as to the requirements of the Northwest Power Act.

I. AMENDMENT PROCESS

A. Adequacy of the amendment process

Comments: Several commentors said the Council's rulemaking had procedural flaws. The Pacific Northwest Utilities Conference Committee (Pacific Northwest Utilities Conference Committee, 732, 733, 734), the Direct Service Industries (Direct Service Industries, 749) and Idaho Power (724) objected that the Council failed to inform the public of the action it proposed to take because it did not propose a single set of specific amendments. The range of options, in Pacific Northwest Utilities Conference Committee's view, is "so immense as to make meaningful comment impossible." It also said that making a finding on the adequacy, efficiency, economy and reliability of the power supply "in this rulemaking, without sufficient time and the full participation of the region's utilities, is unacceptable." Idaho Power objected that the draft rule contains alternatives that are inconsistent with one another and in some instances, mutually exclusive. The Council has further frustrated meaningful comment by announcing it will consider all the recommendations it received on August 15, 1994 and in the Strategy for Salmon process along with the proposed amendments, Idaho Power said. In short, the Council's notice suffers from over-breadth: the Council has only begun to describe the vast universe of possible actions it might take to address concerns about salmon, in Idaho Power's view. Given the breath and complexity of the rule, Pacific Northwest Utilities Conference Committee and Idaho Power said, the Council did not allowed sufficient time for comment.

Idaho Power also objected to the Council's notice on the ground that it fails to give the Council's reasons for its proposal. The notice has no legal, factual or scientific explanation of why any of the options or recommendations under consideration would be authorized, appropriate or desirable. None of the proposed actions, in Idaho Power's view, would comply with the standard set out in the Act that requires the Council to adopt measures to "protect, mitigate and enhance fish and wildlife affected by the development, operation and management of (hydroelectric) facilities while assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply." Trying to define an adequate, efficient, economical and reliable power supply in the course of this rulemaking is an insurmountable task, Pacific Northwest Utilities Conference Committee said. Idaho Power objected that the notice fails to show how any of the proposed amendments meet the criteria of Section 4(h)(6), which require the program, among other things, to complement the existing and future activities of the federal and the region's state fish and wildlife agencies and appropriate Indian tribes.

Idaho Senator Larry Craig (716) said he would like a second review of a Council preferred option, especially so the new Idaho governor can review it. Western Montana Electric Generating and Transmission Cooperative, Inc. (700) asked the Council to slow down; wait for new governors and new Council members, and not to push toward an "artificial time limit." Columbia River Alliance (587) said that the Council's rulemaking process appears too open-ended, lacking direction based on technical merit. The five mainstem options are simply too broad, encompassing alternatives that are not practical, economically realistic, feasible or even structurally sound. The Council should have stated a preferred option to present to the region for further review and consideration, based on Recovery Team report and the Harza drawdown report. Boise Cascade (594) requested an extension in the public comment period, so there could be more time for review and regional debate over what Boise Cascade saw as proposed habitat policies and standards that raise legal and scientific concerns. Public Utility District No. 1 of Douglas County (600) said it was overwhelmed by volume of material, lack of time and lack of supporting information. The Council should put out for public review a preferred option; Act requires the Council to reject recommendations without supporting information on biological basis. Industrial Customers of Northwest Utilities (698) said that the Council should develop its biological objectives, work with Bonneville Power Administration and the utilities and industry on potential

power system implications, and settle on one proposed salmon plan and put them out for public comment, with an eye on a February 15 decision. Lincoln County (Montana) Economic Development Council (0710) said it would prefer one alternative to comment on, not many. Others also urged delay: Regional Services, Inc. (726); Grand Ronde Model Watershed Program (907); Union Soil and Water Conservation District (0832); Mark Reller (787).

The U.S. Army Corps of Engineers (728) said that the amendment document was confusing, contained numerous unnumbered pages and was disorganized. The use of multiple options was confusing and did not reflect a prudent, reasonable and scientifically based decision-making scenario for salmon recovery. The Council should reformulate the proposed amendments, based on the public comment, into a single, comprehensive proposed alternative.

Bonneville Power Administration (750) said that the Council seeks comments on alternatives, not a draft program. Alternatives should not be the basis for decision; the Council should choose a preferred alternative, including clear proposals on specific objectives, and submit it to the region for comment.

Other commentators urged the Council to make a prompt decision, before the end of 1994. Shortly after receiving the court's opinion in *Northwest Resource Information Center v. Northwest Power Planning Council*, 35 F.3d 1371 (U.S. Ninth Circuit Court of Appeals 1994), the Council consulted with the Columbia Basin Fish and Wildlife Authority, which strongly urged the Council not to delay. A joint comment from American Rivers, the Natural Resources Defense Council, and Trout Unlimited made the same point: "Further delay in selecting a long term alternative for mainstem passage is not legally or biologically acceptable." Michael Blumm (707) urged the Council to conclude the rulemaking before the end of the calendar year, as did others (Sierra Club (0735)).

The Idaho Department of Fish and Game and the Idaho Department of Water Resources said that delay would jeopardize the very subject of the rulemaking, survival of the salmon: "Not only is there no more time to study the reasons for salmon declines, salmon survival is currently so precarious that there are literally not enough fish left to study." The National Marine Fisheries Service (National Marine Fisheries Service) spoke on behalf of the Administration and strongly urged that the Council "proceed without additional postponements." National Marine Fisheries Service urged prompt action for several reasons, including: postponement would not change the basic biological facts nor produce new solutions; and delay would make it harder for the federal effort to mesh its plans with those of the Council and thereby defeat the goal of a "single, unified blueprint for salmon recovery developed by and for the Region."

Response: In developing the fish and wildlife program, the Council is governed by two statutes, the Northwest Power Act and the federal Administrative Procedure Act. The Northwest Power Act requirements become operative before the requirements of the Administrative Procedure Act. That is, there are steps the Council must take pursuant to the Northwest Power Act before it can develop a proposed rule of which it is to give notice under the Administrative Procedure Act. First, the Council is required to solicit recommendations. 16 U.S.C. § 839(h)(2). This requirement is mandatory. Even the parties from whom the Council is to seek recommendations are identified. *Id.* Sometimes this solicitation requirement is triggered by events beyond the scope of the fish and wildlife program itself. That is, the Northwest Power Act requires the Council to solicit recommendations before a major revision of the power plan, which was one motivating factor here. In anticipation of the 1995 Power Plan, the Council solicited recommendations related to the anadromous fish chapters of the fish and wildlife program on May 11, 1994. By the August 15 deadline, some 192 recommendations were received from federal and state fish and wildlife agencies, from the region's Indian tribes, the utilities, and members of the public.

The Northwest Power Act then requires the Council to give notice of the recommendations it has received to Bonneville, to the federal and state fish and wildlife agencies, to the Indian tribes, to the federal agencies responsible for operating the hydroelectric facilities on the Columbia River and its tributaries, to any customer or other electric utility that owns or operates any such facility, and to the public. 16 U.S.C. § 839(h)(4)(A). Shortly after the August 15 deadline, the Council mailed three volumes of recommendations to more than 250 interested parties across the region, and gave notice of the availability of the recommendations for public review.

These activities satisfied the Northwest Power Act's initial procedural steps. In so doing, the Council has also satisfied the legislative intent Congress expressed in setting out these requirements for the fish and wildlife program. "Section 4(h)(1)(C)(ii) provides procedures for making the received recommendations and comments available to all relevant parties and the public, and for conducting hearings and otherwise ensuring public participation and comment on the recommendations." House Rep. 96-976, Pt. II, Interior Committee, p. 44. Giving notice of the recommendations let those with interests in the region's fish and wildlife resources, including the public, know what was at issue in the rulemaking and invited public reaction to the issues raised by the recommendations.

On the basis of these recommendations, the Council drafted proposed amendments to the 1994 Columbia River Basin Fish and Wildlife Program. In accord with the informal rulemaking provisions of the Administrative Procedure Act, the Council gave notice of the proposed amendments on September 30, 1994.

This notice, while reflecting the complexity of the subject matter, fully satisfies the requirements of the Administrative Procedures Act. The relevant Administrative Procedure Act provision says that an agency's notice shall include: "either the terms or substance of the proposed rule or a description of the subjects and issues involved." 5 U.S.C. § 553(b)(3). The Council's notice provides the exact terms of the proposed amendments in most instances, and in some instances, sets out alternatives. Both make clear the subjects and issues involved in the rulemaking, and supply proposed amendatory language. The notice, in short, made clear to the public the nature of the issues the Council is dealing with, and how the Council proposed to approach them.

Again, the Council has satisfied the Congressional intent in requiring such notice. The legislative history of the Administrative Procedure Act says that notice "must be sufficient to fairly apprise interested parties of the issues involved, so that they may present responsive data or argument." Legislative History of the Administrative Procedure Act, S.Doc.No. 248, 79th Cong., 2d Sess. 200 (1945).

First and foremost, the Council's notice contained the proposed amendments themselves. Council Document 94-48, *Draft Anadromous Fish Amendments to the 1994 Columbia River Basin Fish and Wildlife Program*, Northwest Power Planning Council, September 1994, sets out in legislative style mark-up exactly those changes the Council was proposing to make in the anadromous fish portions of the fish and wildlife program. In the area of mainstem survival, the Council set out five alternatives, with an individual description of each option, followed by draft amendment language for the relevant sections of the fish and wildlife program, again in legislative style mark-up for all but one option.

The Council agrees with the commentator who observed that rulemaking notice under the Administrative Procedure Act must make known the agency's views in a sufficiently concrete form that interested parties can critique the proposal or formulate alternatives. The public comment in this rulemaking demonstrates amply that the notice has fulfilled these aims. The Council has received more than 1,000 comments, many of which are detailed and incisive. There have been numerous well-thought out criticisms

and a number of alternative proposals. One of the aims of the notice in informal rulemaking is dialogue, an exchange of views. In that regard, this notice has certainly succeeded.

The Council does not agree that the requirement of a clearly focused statement of proposed action precludes setting out alternatives in the draft amendments. The Administrative Procedure Act certainly does not require an agency to set forth every proposal it ultimately adopts, nor does an agency have to publish the very language in draft that it adopts in the final rule. Neither does the Administrative Procedure Act preclude the use of alternatives. Indeed, alternatives have been encouraged, to make clear to the public just what range of actions an agency is considering. So in the current notice, the Council laid out five alternatives for mainstem survival, and alternatives for other parts of the program, ensuring that all relevant recommendations were given consideration.

The Council agrees with the comment that in informal rulemaking, an agency must also inform the public of the reason for its proposal. Under the Northwest Power Act, recommendations must be supported with “detailed information and data.” 16 USC § 839b(h)(3). The Council distributed this information when it distributed the recommendations for public review. This information, in turn, forms part of the basis for the Council’s draft amendments that were drawn from the recommendations. Moreover, in support of the Council’s draft amendments, and by way of setting out the Council’s thinking underlying the amendments, the Council published with the draft amendments, a volume of appendices. Council Document 94-47, *Appendices to the Draft Anadromous Fish Amendments to the 1994 Columbia River Basin Fish and Wildlife Program*, Northwest Power Planning Council, September 1994. The appendices contained a Council Discussion Paper with background information and brief synopses of the recommendations received. The paper also highlighted key issues on which the Council sought public input, and asked questions to help focus comment. In addition to the Discussion Paper, the appendices included, among other materials, an analysis of potential impacts on River Operations, Rates and Biological Analysis; a Cost Table; and a relevant selection from the Columbia River Inter-Tribal Fish Commission Rebuilding Plan and Integrated System Plan. Again, the Council laid out this background information for the draft amendments to encourage informed public comment.

It has been objected that inclusion of this material made the rulemaking impossibly vast and at the same time made it impossible to know just what the Council was proposing. However, to the extent the notice was broad, this reflects the salmon’s life cycle, its vast migratory range, and its complex interactions with human activities. Indeed, given the breadth and complexity of the subject matter, the notice is relatively specific about the changes the Council was considering. As noted above, the draft rule proposed detailed amendments to the program and, as in the area of mainstem survival, specific options drawn from the recommendations the Council received. In all cases, the notice set out proposed changes, almost always in a legislative-style markup of the program. On an issue of such biological and economic significance, presenting the public with the range of options was a useful way to elicit thoughtful comment, presenting commentators with choices and tradeoffs. The high quality of the comments received in this process is the best evidence that commentators understood the notice.

As to the vastness of the subject matter under consideration, it is important to understand that the current amendment process is only the most recent public debate of these issues. The Council has addressed the subject of salmon restoration at countless regularly scheduled public meetings over the past thirteen years. In the last four years alone, the Council has helped organize a “Salmon Summit” that involved virtually every major party interested in salmon and river operations in a six-month long examination of these complex issues. After the salmon summit, the Council took over two years to involve the public in the process that led to the *Strategy for Salmon*. The *Strategy* identified a number of important mainstem initiatives -- reservoir drawdowns, additional flow augmentation from the Snake Basin through nonstructural and structural measures,

and other initiatives. These initiatives were examined at length by broadly representative advisory committees, working with the assistance of agency analysts and outside contractors. In 1994, the Council conducted a major amendment process regarding the scientific basis for flow, velocity and transportation programs for salmon. Over the summer of 1994, the Council issued a series of briefing papers regarding the issues the Council expected to explore in the current amendment process, and these were made available to the public. The Council has been repeatedly briefed both by interested parties and by its own staff in public meetings.

The rulemaking materials in this process raise many of the issues that have been before the Council and the region for the last several years. These issues have been thoroughly debated, both in earlier phases of the Council's rulemaking process as well as in other forums. The positions of these commentors, as well as the opinions of parties with widely divergent points of view, have been vigorously explored.

Pacific Northwest Utilities Conference Committee, the Direct Service Industries, Idaho Power and other parties who criticize about the lack of notice in this process commented extensively in all the phases of the *Strategy for Salmon* rulemaking. As noted, the issues raised by those recommendations are largely the same as the issues raised by the recommendations that underlie the current rulemaking. The comments these parties have submitted over the last two years, both in writing and in oral testimony, as well as their extensive participation in the current rulemaking, establish beyond any doubt that they are intimately familiar with the issues at hand and with how the Council proposes to address those issues.

Moreover, the Council responded in writing to all the recommendations received in the earlier phases of the Strategy for Salmon. While the Ninth Circuit, in *Northwest Resource Information Center v. Northwest Power Planning Council*, called for incorporation of written findings on the recommendations into the final amendments, the earlier Response to Comments certainly gave interested parties a clear picture of the Council's thinking on the central issues, common to this rulemaking.

Given the posture of the current rulemaking, the Council does not believe that the 40-day period allotted for written public comment (with an extra four weeks for further consulting) is too short. The Council concurs with those commentors who argued against delay. The region is faced with a salmon emergency of sobering proportions. Whether or not the region can act quickly and effectively enough to forestall further extinctions, the Council believes that every effort must be made to act promptly. The Council believes this is fully consonant with the Northwest Power Act. As the court in *Northwest Resource Information Center v. Northwest Power Planning Council* said, the Act "acknowledged fish and wildlife as an irreplaceable finite resource" and so "placed a premium on prompt action." *Id.* at 1395.

B. Deference To Fish And Wildlife Agencies And Indian Tribes

Comments: Several commentors said that the Council must accord "a high degree of deference" to the fish and wildlife agencies' and tribes' judgments in developing the fish and wildlife program, drawing from dicta in *Northwest Resource Information Center v. Northwest Power Planning Council*. The Yakama Indian Nation (730) said that the Council should incorporate various elements of the Ninth Circuit Court's ruling into Section 1 of the program, particularly a clear statement that the recommendations and proposals by the fishery managers should be given "high deference" by the Council. Agencies and tribes' recommendations must be viewed as being based on the best available scientific information on the region's fish resources. American Rivers/Natural Resources Defense Council/Trout Unlimited (715) said that the Ninth Circuit direction to the Council to give greater deference to agencies and tribes is the key to this program amendment process. They are in general agreement on core provisions of a mainstem passage program and the Council should rely on those provisions for the basis of its program.

The Corps of Engineers (728) said that while the court may have found that the Council should rely more heavily on the expertise of the agencies and tribes, that does not absolve the Federal action agencies from Northwest Power Act and Endangered Species Act requirements to base their decisions on the best available scientific information. The agencies and tribes must supply the scientific information to support their recommendations. If such information is not available, the Council should develop or call for research to gain this information before calling for controversial measures without a clear scientific basis. No measure should be adopted unless it is supported by the best available scientific information. The Council should complement the existing activities of the agencies and tribes only when those activities are supported by scientific evidence.

The Direct Service Industries (749) said that the report of the Recovery Team should be given the “due weight” with other agency and tribal recommendations, and the Council “should explain any departures” from the report.

Response: The fish and wildlife agencies and tribes play a special role in the Council’s development of the fish and wildlife program. The Northwest Power Act addresses the fish and wildlife agencies’ and Indian tribes’ role in this process in several respects. The Council must invite recommendations from the agencies and tribes (16 U.S.C. § 839b(h)(2)), whereas other parties need not be invited. The Council’s program must “complement” the agencies’ and tribes’ activities (16 U.S.C. § 839b(h)(6)(A)) and be “consistent with” Indian legal rights (16 U.S.C. § 839b(h)(6)(D)). When recommendations conflict, the Council must resolve inconsistencies “giving due weight to the recommendations, expertise, and legal rights and responsibilities” of the agencies and tribes (16 U.S.C. § 839b(h)(7)).

The fish and wildlife managers’ roles derive from these statutory provisions. The agencies and tribes manage fish and wildlife, as no other party does. Their responsibilities, expertise and experience are obviously important in determining whether particular measures would “protect, mitigate and enhance” fish and wildlife. Their involvement in developing the Council’s program, and in evaluating whether there is an appropriate “fit” between the program and agency and tribal activities, is essential if the program is to work properly. The tribes’ interest in fish and wildlife is based in part on legal principles for which the courts are the ultimate interpreters. These factors explain why the Council must invite the fish and wildlife agencies’ and tribes’ recommendations for the fish and wildlife program, why the program must complement their activities and be consistent with the tribes’ legal rights, and why, when the recommendations conflict, the Council must give their authorities, expertise and rights due weight. This much is the common sense implication of these provisions of the Act, and it points to an important agency and tribal voice in the development of the fish and wildlife program.

The Council does not interpret the *Northwest Resource Information Center v. Northwest Power Planning Council* opinion as saying that agency and tribal recommendations are entitled to conclusive weight in the Council’s process. The Council’s determinations are governed by the Act, which has particular procedures and standards. In some respects, the fish and wildlife agencies and tribes are held to the same standards as other parties. The Northwest Power Act requires the Council to develop a fish and wildlife program on the basis of recommendations, which may be submitted by any party (16 U.S.C. § 839b(h)(3)). All parties must accompany their recommendations with “detailed information and data” (16 U.S.C. § 839b(h)(3)). In deciding which measures to adopt in the program the Council must judge all recommendations by the same criteria (16 U.S.C. § 839b(h)(5) & (6)). The Council must explain its rejection of any recommendation submitted by any party (16 U.S.C. § 839b(h)(7)).

The agencies’ and tribes’ special roles in this process do not change the fundamental distinction between the fish and wildlife managers and the Council under the Northwest Power Act. The fish and

wildlife managers make *recommendations* to the Council. The Council *determines* whether to adopt these recommendations, under special procedures and standards. The question is not whether the Council has a general obligation to defer to the agencies and tribes, but whether each recommendation complies with these procedures and standards. The special roles played by the agencies and tribes are implicit or explicit in the questions posed by the Act: Would a recommended measure protect, mitigate and enhance fish and wildlife? Would it complement agency and tribal activities? Is it based on the best available scientific knowledge? Is there a less costly way to protect fish and wildlife? The agencies and tribes play an important role in helping the Council to answer these questions. But in each case, the Council must apply the specific provisions of the Act and make a judgment.

The recommendations of the National Marine Fisheries Service Recovery Team are advice to National Marine Fisheries Service, not to the Council. The Team is not itself a fish and wildlife agency or Indian tribe. If National Marine Fisheries Service adopts the Team's recommendations and submits them to the Council as recommended program amendments, then the Team's work would comprise a recommendation of a fish and wildlife agency. Any other party also may submit the Team's work as a recommendation in the Council's process, of course. The Team's views are important, and the Council has taken them very seriously in this process.

C. Equitable Treatment and Related Issues

Comments: Public Power Council (731) said that the Council's definition of "equitable treatment" in Section 1.2A is mistaken: "Equitable treatment requires balancing the needs of the fish and wildlife with those of the power system;" Bonneville Power Administration and other federal agencies will make this balancing determination at the appropriate times; "[e]quitable treatment means simply that fish and wildlife interests have been taken into account and weighed into the decisions being made by the responsible federal agencies." Direct Service Industries (749) said that equitable treatment of fish and power is a responsibility of the federal agencies, not the Council. Yet some of the Council's flow options are inequitable. Option 4, for example, calls for moving the river hydrograph back toward historical timing and duration; this would dismantle the power system for measures whose benefits are speculative. Bonneville Power Administration (750) urged the Council to delete its definition of "equitable treatment" in Section 1.2A; the federal agencies who bear this responsibility should define the term, which is also the subject of litigation and pending in the Ninth Circuit. The Council's definition is flawed in logic and characterization, as it assumes a comparable level of certainty can be achieved between a mostly engineered system and a biological one.

Response: The Council agrees that the equitable treatment obligation applies to the federal implementing agencies, not to the Council, and the Council does not intend its interpretation to bind other agencies. The commentors are correct that these issues are in the courts, and that is where the obligation's meaning will be discerned. While the Council does not agree with the Public Power Council's interpretation, Bonneville makes an interesting point. However, the Council's interpretation expresses an equitable principle, rather than a precise formula.

Comment: The Public Power Council said that the fish and wildlife provisions of the Act did not create any new substantive mitigation obligations, "only a new process to fulfill existing mitigation obligations."

Response: The Ninth Circuit has more than once observed that the Northwest Power Act imposes substantive as well as procedural obligations on the federal implementing agencies.

Comment: The Public Power Council warned that multipurpose federal projects have specific statutory purposes; the Council should not assume it can call for changes in project purposes without transgressing statutory purposes.

Response: The Council understands that the primary interpreters of the authorizing legislation are the federal operating agencies.

Comment: Direct Service Industries (749) said the Council's program should attempt to integrate the Endangered Species Act requirements to the extent possible, while noting which obligations are hydro-related and which are not. The Council "could help provide coordination among the diverse salmon processes by indicating the areas of consistency and inconsistency between the Final Recommendations of the Recovery Team."

Response: The Council endeavors to integrate Endangered Species Act requirements where appropriate, without losing sight of the fact that the Northwest Power Act has broader purposes than the protection of endangered species. The Council has done extensive work to identify areas of consistency and inconsistency between the Council's program and the Recovery Team's report.

II. INSTITUTIONAL ARRANGEMENTS AND AGENCY ROLES/IMPLEMENTATION PROCESS/MANAGEMENT/FISH OPERATIONS EXECUTIVE COMMITTEE

Comments: Laurie Solomon of Friends of the Clearwater/Cove Mallard Coalition (Moscow, Idaho) (397, 482) stressed the need to incorporate public input and participation in various aspects of the program in a role that is more than simply an ability to comment. Friends of the Clearwater questioned role of Independent Scientific Group in the absence of public input.

Response: In addition to the hearings and notice-and-comment procedure used in amendments processes, the Council provides many avenues for incorporating public input and participation in its work generally. This includes advisory committees, work-groups, seminars, etc. The Council fully intends to continue these efforts. Any reports made to the Council by advisory groups such as the Independent Scientific Group will be subject to review and comment by the public.

Comments: Upper Columbia United Tribes (566, 585, 901) urged the Council to formally analyze the Columbia Basin Fish and Wildlife Authority budget priority document (in 1995 and in future years) for: (1) consistency with the Council's Fish and Wildlife Program and (2) providing direct benefits to fish and wildlife. If the Council finds the document to be consistent with the program, the Council should send Bonneville Power Administration a letter supporting full implementation of the Columbia Basin Fish and Wildlife Authority plan. Upper Columbia United Tribes also requested that the Council act expeditiously to prevent Bonneville Power Administration from altering the implementation plan to suit its own whims, including funding projects that are not in the program.

Response: The Council is working with Bonneville and Columbia Basin Fish and Wildlife Authority to review the 1995 Columbia Basin Fish and Wildlife Authority budget priority document. Section 3.1B.1 of the Program calls for an expanded implementation planning process that calls for the participants (including all agencies and tribes) to prioritize and coordinate all program measures including research. The participants will prepare an annual implementation workplan which is to be submitted to the Council to ensure that it is

consistent with the Program. The Council works regularly with Bonneville to coordinate implementation with the terms of the program.

Comments: Upper Columbia United Tribes (566, 585, 901) said that the reference in Section 1.1 to treaty fishing rights should also recognize the fishing rights of executive order tribes, such as the Spokane Tribe's rights guaranteed under Reclamation law to fish and manage fish on Lake Roosevelt. Thus Spokane Tribe has a reasonable expectation that their resident fishery and fishing rights will not be damaged by the Council's program. In general, Upper Columbia United Tribes have never ceded any fishing rights and retain those rights throughout their aboriginal territory, which means the right to fish and manage fish in those areas.

Response: The Council has included reference to the rights of executive order Tribes in the amended Section 1.1 of the Program.

Comments: Upper Columbia United Tribes (566, 585, 901) said that federal project operators and regulators need to develop "mutually satisfactory consultation and coordinated management with the agencies and tribes. Important decisions constraining what can be done for anadromous and resident fish are made in forums without significant agency and tribal input, such as the Pacific Northwest Coordination Act agreement and US-Canada Treaty"; Council should perhaps require that agencies and tribes be included on the federal negotiating teams for both. The Shoshone-Bannock Tribes and the Columbia Basin Fish and Wildlife Authority also commented to this effect.

Response: The Council encourages power system operators to include agency and tribal representation in these forums, but cannot force such representation.

Comments: Upper Columbia United Tribes (566, 585, 901, 937) said that the Fish Operations Executive Committee must have membership of all upriver tribes or it may not be consistent with Act in terms of protecting Indian rights; also needed because Fish Operations Executive Committee may not be adequately considering tradeoffs between resident fish and anadromous, "which is needed to treat the Columbia River as an ecosystem" under the Act; Fish Operations Executive Committee should meet on rotating basis throughout the region. Reasonable solution would be for CRITFC to appoint one person, Upper Columbia United Tribes to appoint one person, and all other unaligned tribes to appoint one person.

Response: The Council has invited the Upper Columbia United Tribes and other upriver tribes to designate representatives to the Fish Operations Executive Committee. The arrangements suggested appear to be a reasonable starting point for discussions. However, these matters should be discussed more fully with other tribes and Fish Operations Executive Committee members.

Comments: Upper Columbia United Tribes (566, 585, 901), in a comment that suggests deleting much of Section 3, criticize various processes and committees for basin oversight, expanded implementation planning, subregional planning, management consultants, independent scientific review, and a regional biological analysis center. It is unclear whether the Upper Columbia United Tribes suggested deletion of all of Section 3 or of only those parts noted, but they do make clear that they believe these various provisions add expensive and lengthy process to a program already overloaded with process, without biological benefit to fish, and because no funding was provided to make possible the tribes' participation.

Response: The Council agrees that coordination of the various elements of the program is essential if the program is to succeed as a systemwide approach. Much of the process and committees called for in Section 3 of the Program has the support of a number of agencies and tribes. At the same time, the Council

recognizes that much of the process in the Program could benefit from a streamlined approach and has stated that the Council will hire independent consultants to perform a management review and streamline implementation. (3.1E).

Comments: Shoshone-Bannock Tribes (606) said that the Council's decision-making processes and institutional arrangements are flawed. The Tribes do not see the need for the Fish Operations Executive Committee or to participate in Fish Operations Executive Committee, since it has no authority to manage flows. Columbia Basin Fish and Wildlife Authority should coordinate and implement a fish and wildlife program drafted by resource managers that details hydropower system operations that best fit the needs of the fish.

Response: The Council believes that the Fish Operations Executive Committee provides a valuable forum for agencies and tribes to communicate their concerns and positions, particularly in-season water management issues. When conflicts are identified and cannot be resolved they are elevated to the Council. It is through this forum that Columbia Basin Fish and Wildlife Authority communicates proposals for hydropower system operations to address the needs of fish and wildlife, and river operators discuss their response.

Comments: Save Our Wild Salmon (628) advocates “greater control of fish-affecting hydrosystem operations by Northwest fishery agency and Tribes,” without stating a specific position on transfer from Bonneville Power Administration, implementation, etc.

Response: Measure 1.2C, which calls for exploration of transferring the administration of Bonneville’s Fish and Wildlife Program responsibilities to an entity created by the region’s state and federal fish and wildlife agencies and tribes, responds to this issue.

Comments: Regional Services, Inc. (Charles Pace) (726) said that the Council should not try to resolve Endangered Species Act issues and problems in the program; leave that to National Marine Fisheries Service.

Response: The Council agrees and has stated this explicitly in Section 1 of the Program. The Council hopes that the Endangered Species Act and the Northwest Power Act can function in a coordinated way.

Comments: Corps of Engineers (728) said that it is generally supportive of the institutional concepts discussed in the draft document. However, Council will need to work with the Governors to ensure that state agencies provide credible scientific information and present unified state positions on such matters as water resource management practices.

Response: The Council agrees and has included a number of measures (in particular see Section 3) to ensure that regional decisions will be based on the best available science.

Comments: Columbia River Inter-Tribal Fish Commission (729) said with regard to Section 2.2B Assess Program Measures, that it is unwilling to “trade off” any portion of the obligation to protect, mitigate, and enhance fish and wildlife resources lost due to construction and operation of the hydro system. “The Council must realize that to the extent the region is unwilling to meet this obligation through direct reductions in mortality to anadromous fish populations, it must be met with a combination of production programs, including supplementation.”

Response: Measure 2.2B is not intended to imply that the Council will “trade off” any portion of its obligations under the Act to protect mitigate or enhance fish and wildlife resources lost due to the construction and operation of the hydro system. The Council intends by the existing program language to periodically assess potential trade-offs and conflicts arising in the program.

Comments: Confederated Salish and Kootenai Tribes (778) said that upriver tribes and agencies are under-represented in Council’s program amendment process and in implementation and decisions on river operations.

Response: The Council is aware of this concern. The Council has attempted to increase the representation of the upriver tribes in decisions on river operations through increasing representation on the Fish Operations Executive Committee and periodic government-to-government consultations, but is open to other suggestions. The program amendment process is open to all parties, and the Council specifically invited recommendations from the upriver tribes and fish and wildlife agencies.

Comments: Wallowa County Court (907) said that National Marine Fisheries Service will and should have final say on recovery plan, not the Council.

Response: The Council concurs. Nothing in this program states or implies otherwise.

A. Proposed Role for Council to Develop Basinwide Watershed Plan

Comments: Northwest Environmental Advocates (697) said that the Council is not the appropriate entity to be responsible for basinwide ecosystem/watershed planning. It would be better and easier to place that responsibility in a federal agency with mandate, resources and implementing authority already suited to the task, such as Environmental Protection Agency with its mandate for water quality. The Council's best role is not to take over basin watershed and water quality planning, but to pressure the federal and state agencies to be more aggressive and to support their attempts to get more funding; for example, Council should call for integration of subbasin plans with watershed and water quality approaches and plans of the state agencies, and the Council should call for implementation of total maximum daily load temperature standards throughout the basin. Pacific Northwest Waterways Association (580), Oregon Municipal Electric Utilities (718), Port of Portland (702), Idaho Senator Larry Craig (716), Pacific Northwest Generating Cooperative (719, 759), Canby Utility Board (758), Oregon Representative Chuck Norris (763), Oregon Water Coalition (764), Tidewater Barge Lines, Inc. (765), Idaho Department of Water Resources (766), Douglas County Public Utility District (959) and Public Power Council (731) opposed any new initiatives in regional planning. The Direct Service Industries (749) opposed the proposal, saying that federal and state regulators have a depth of experience in applying land and water statutes that the Council could never achieve. Direct Service Industries are sympathetic to the lack of coordination in execution of all these laws, but the Council's proposal would not solve this problem, just add process without implementation authority or the accountability that comes with implementation. Direct Service Industries are also sympathetic to the importance of salmon to the region, but have grave doubts that basinwide planning should be reoriented around the salmon to the general exclusion of all other interests. At the same time the Council can play a valuable role in identifying non-hydropower measures that can assist in restoring salmon populations. Northwest Forest Resource Council (867) said the proposal appears similar to the attempts decades ago to create a Columbia Valley Authority; same concerns then apply today about creating such a super agency that would intrude on other existing federal agency jurisdictions and authorities; other concerns include broad and equitable representation of various interests, accountability, and scope of authority; also, what precedent is there for a state-appointed panel as proposed in this section to dictate to federal agencies? This proposal would create a bureaucratic nightmare worse than any we have experienced to date.

The Columbia River Inter-Tribal Fish Commission (729) also opposed the proposal. The Commission suggests instead that the Council call for the creation of a Columbia River Watershed Management Program to update and integrate subbasin plans. The Commission argued that although conflicting political and resource management missions and jurisdiction are a problem, they are not the real dilemma. The real problem is that "states and the federal government have persistently bent and broken existing laws in order to avoid having to alter those practices" that harm fish; thus the real issue is proper administration of existing laws; implementing the "experiment" of requiring existing management entities to obey existing laws "would put us far closer to truly sound watershed management than the much more experimental proposal of creating another planning body with no authority to require action."

Michael Blumm, Professor of Law at Lewis & Clark College (707) and CE Exploration Company (757) supported the proposal for basin watershed Council. WaterWatch of Oregon (748) urged the Council to assume a leadership role in basin watershed planning. Oregon Trout (747) supported the basin watershed proposal if new Council has "real clout to implement and enforce decisions"; do not delay current procedures while waiting to pass on watershed council idea. The Corps of Engineers (728) is generally supportive of the

idea of a single entity empowered to deal with all issues (regional and international) in the Columbia River Basin. They believe that such a body should be independent of those preparing the various plans. However, for a single federal agency to be designated to represent the federal interests ignores Endangered Species Act and may not take into account the authorizations and responsibilities of the different agencies. Bonneville Power Administration (750, 761) appears to support general concept of basin watershed planning proposal: "It is imperative that one organization take the lead in comprehensively planning and overseeing regional activities. . . . Before the Council's role expands, clear criteria, clear objectives, clear delineation of roles and clear responsibility to monitor and evaluate the cost-effectiveness of the basin planning and implementation are necessary." Good idea to coordinate but too soon to move on it; build on model watershed plans without central planning.

The League of Oregon Cities (738) and PacifiCorp (756) urged delaying consideration of basin watershed planning proposal.

Response: Although this proposal generated a great deal of comment, it is clear that a substantial majority of the region was not in favor of either amending the Northwest Power Act or expanding the role of the Council at this time. Based on the comment received, the proposed amendment was withdrawn for further consultation.

B. Monitoring and Evaluation/Independent Scientific Review and the Independent Scientific Group

Comments: Colville Tribes (868) said that proposed Section 5.5A.2 contains language requiring monitoring and evaluation of the impact of salmon flows on resident fish, whereas the Columbia Basin Fish and Wildlife Authority left that out of their comments. The Council should retain this section until it is replaced by something equivalent as a result of the Columbia Basin Fish and Wildlife Authority upriver/downriver process.

Response: The Council has left this measure in the amended program.

C. Implementation Process

Comments: Upper Columbia United Tribes (937) said that the Implementation Planning Process is broken. The following actions would provide \$1-3 million more for on-the-ground work, provide a strong Council role as Congress intended, and allow the agencies and tribes to develop the program:

- Northwest Power Planning Council and Bonneville Power Administration get together and determine a funding level.
- Columbia Basin Fish and Wildlife Authority develops a master plan.
- Plan goes back to the Northwest Power Planning Council for review, and out for regional review.
- Northwest Power Planning Council comments and changes, if necessary.
- Northwest Power Planning Council tells Bonneville Power Administration to fund.
- Bonneville Power Administration funds the plan.

In addition, resident fish and anadromous fish need to be considered together in a concurrent time frame as occurred in the 1987 Fish and Wildlife Program, and not in two separate programs. Such a combined program would help with upriver/downriver debate as well as would streamline the Council's program.

Response: The points made are good ones. As noted in the findings on Section 1, the Council has called for Bonneville and the fish and wildlife agencies and tribes to explore transfer of the administration of Bonneville's fish and wildlife program responsibilities to an entity formed by the fish and wildlife managers. Once it is clearer as to how this proposal might be addressed, the Council can consider amending the implementation portion of the program. The Council did not otherwise amend this section because the issue is in flux. While it is not possible to say what form the process will take in the future, the Council believes it would be unwise to abandon the old process before the new implementation process is in place.

D. Center for Regional Biological Analysis

Comments: Columbia Basin Fish and Wildlife Authority (629) opposed the regional biological analysis center proposed in Section 3.2F.1, because it is a complicated way to use what already exists; Bonneville and National Marine Fisheries Service should simply fund the Regional Analytical Work Group. Yakama Indian Nation (730) said that regional analytical methods coordination should be staffed by state, federal and tribal entities, with consultation from other experts when needed; center should be fully independent, "not weighted to any particular agency or tribes." Bonneville Power Administration (750)

Bonneville Power Administration does not support the development of a center for biological analysis; depending on how this group was managed and influenced by different agencies, there is great potential for politically influenced analyses with significant weight on program direction and regional actions.

Pacific Northwest Generating Cooperative (719) suggests adoption of a center for a regional biological analysis jointly administered and funded by National Marine Fisheries Service and Bonneville; acceptable analytical tools are critical to the program's success and "must be developed independent of political agendas or entrenched viewpoints." William Stelle, National Marine Fisheries Service (891) said the regional analytical center is worth full consideration.

Direct Service Industries (749) said they support focused research to promote salmon survival; program offer a confusing hodgepodge of new scientific entities, whose roles are unclear and potentially conflicting.

Response: The Council believes that while considerable progress has been made in the last few years in the development and coordination of biological analytical tools, substantial inefficiencies continue to hamper development of systemwide regional analysis. Therefore, the Council supports the development of a regional center, staffed by the various entities involved in regional efforts such as this program and activities in connection with the Endangered Species Act. The mission of the center will be to foster a coordinated and objective approach to development of analytical tools and analysis.

III. MAINSTEM

A. Mainstem Hypotheses

General Comments

Comments: We strongly support the approach of stating explicit hypotheses to aid monitoring, evaluation and research. Lee (79); Bonneville Power Administration (123); Mundy (111). The Scientific Review Group finds the approach both timely and much needed. Scientific Review Group (134) The draft sets the right tone for action without dictating specifics. Mundy (111); Calvin (34). The paper should encourage scientists to raise the right questions and try to find the answers. Calvin (34). This approach should also be used in other contentious areas. Edwards (114). While we may not agree wholeheartedly with the flow, velocity, survival hypothesis, the important contribution of this exercise is the development of a process to test the validity of the hypotheses. Douglas County Public Utility District (97). The hypotheses should guide both evaluation (adaptive management) and research (empirical studies). Pacific Northwest Generating Cooperative (117).

We commend the Council for recognizing that inriver and transportation passage alternatives are intertwined, complex, and not as well understood as we would like. Because water velocity is not the only variable affecting smolt survival and subsequent, adult returns, the Council's hypothesis approach should provide the necessary process to resolve this controversial issue. Bonneville Power Administration (123).

Response: The Council appreciates these comments.

Comments: Idaho Fish and Game urges the Council to take a position on the relationship between flow, velocity and survival. The term "hypothesis" is too weak; the statements now constituting the proposed flow, velocity and travel time hypothesis should be characterized as "positions." The bottom line is that increased flows mean increased fish survival. The next ten years may be important in advancing the region's scientific understanding of these relationships, but they also will be critical to the survival of weak stocks. Success or failure will depend more on strong action than aggressive learning. Idaho Department of Fish and Game (130).

Response: In the mainstem hypotheses amendment process, the Council declined to take a "position" on these questions. The Council said that to do so would imply that it knows more than it really does, and undermine one of the purposes of the hypotheses -- to advance scientific knowledge of these questions. Our knowledge of how to manage a developed river system in ways that minimize harm to wild species is imperfect, the Council said, and that is a reality the region simply has to face. Just as it is unproductive to contend that such uncertainties absolve us of the need to act, we cannot pretend that the uncertainties do not exist. The Council reiterated that uncertainty does not eliminate the need to act on the basis of existing knowledge. In stating hypotheses the Council stresses the need to learn from these actions. In the amendment process that began in August, the Council took further actions that can help test the hypotheses, while continuing to underscore the need for further analysis.

Comments: It will be difficult to ensure institutional support for a long-term evaluation. If either transportation or flow augmentation is discontinued, then one interest or another will try to derail the test. The Council should seek agreement among the parties that flows, spills, transportation and other established measures will continue throughout the test. Lee (79). Some assurance will be needed that manipulations of the fish populations will be held constant for the duration of the experiment; this could mean that all hatchery, harvest, and river managers would provide their best guess as to their actions over the period of the evaluation, and then stick to their prediction. Peterman (132).

Response: The Council kept this advice in mind as it considered substantive amendments to the mainstem passage sections of the fish and wildlife program in the fall of 1994. The amendments the Council adopted in December, 1994, call for a careful and direct comparison of inriver measures with transportation, in a spread-the-risk evaluation.

Comments: While we laud the Council's desire to foster scientific work on these issues, the hypotheses may actually impede progress by distracting attention from the central fact that there are no good data for a flow-survival relationship, and flow proponents will continue to mask this and resist evaluation. Pacific Northwest Generating Cooperative (117); Direct Service Industries (124). Instead of adopting the hypotheses, support the National Marine Fisheries Service/University of Washington studies with Passive Integrated Transponder tags. Douglas County Public Utility District (97); Pacific Northwest Generating Cooperative (117).

Response: One of the characteristics of this debate is that various sides feel that the existing data clearly points in a single direction -- albeit each side sees the data pointing in opposite directions. This is one reason the Council feels compelled to clearly state its own working hypotheses. The Council finds sufficient data to accept the hypotheses stated in the amendments, but strongly believes that better scientific information is needed. The Council supports the National Marine Fisheries Service/University of Washington studies, but there is a need to fit these studies into the entire life cycle of these fish. In the amendments adopted in December, the Council accepted recommendations of the fishery managers to call for significant new measures to improve mainstem passage, but also emphasized the need to evaluate the relationship further.

Comments: Because this will be an expensive undertaking, consider cost-sharing, prioritizing studies, and a funding cap. Change the provision on p. 9, lines 22-30 to call for Bonneville and the Corps of Engineers to fund the evaluations "as soon as possible." Bonneville Power Administration (123).

Response: One of the central purposes for the rulemaking is to emphasize the urgency of making progress on these scientific questions. While the Council encourages cost sharing in general, the questions to be addressed in this area of research are aimed directly at the effects of the hydroelectric facilities on salmon and steelhead. Bonneville has flexibility under Section 4(h)(10)(C) of the Northwest Power Act to allocate the costs of this work to other project purposes. For these reasons, the Council believes it is important to progress with this work on an expedited basis, and not to allow discussions of cost-sharing to slow it down. While the Council deleted the phrase "as soon as possible" from the final amendments, it did so because of substantive changes to this part of the amendments, not to undermine in any way the sense of urgency that should attend this work.

Comments: The Council should be cautious about relying on non-peer reviewed studies. Corps of Engineers (120). Supporting elements should contain only statements about which there is consensus in the scientific community. Pacific Northwest Generating Cooperative (117).

Response: The Council agrees that as a general matter, studies that have had review and analysis by independent scientists are entitled to greater credence. Similarly, consensus in the scientific community may be a good indicator of a strong hypothesis. Unfortunately, little information on either of the Council's hypotheses has appeared in peer-reviewed studies. To limit the supporting elements to those on which there is consensus would exclude most of the available information, which would be inconsistent with Section 4(h)(6)(B) of the Northwest Power Act. The Council must act on the best available scientific knowledge, regardless of whether peer-reviewed studies have been conducted. The Council also has a responsibility to give "due weight" to the expertise, authorities and rights of the fish and wildlife agencies and Indian tribes. At the same time, the Council encourages researchers to submit their results for peer review and supports peer review efforts such as that proposed by the Scientific Review Group.

Comments: The formulation of hypotheses may not be the “critical first step.” Instead, the hypotheses need to be presented in a context that makes clear their connections to the objectives of the Fish and Wildlife Program, the conceptual framework, and a problem statement specific to passage survival. At the same time, translating the hypotheses into evaluation efforts will take time and work. The Council should not forestall action while this process proceeds. Scientific Review Group (134). The Council should consider adopting realistic survival standards for smolt passage and other life stages to return adults. Douglas County Public Utility District (97).

Response: The Council agrees that the development of a conceptual foundation is important, and the final amendments ask the Independent Scientific Group to do this work. This foundation could help inform the development of survival standards for various stages of the salmon life cycle. The framework could address important areas for scientific inquiry that are not now addressed in the region’s fish and wildlife programs. While efforts are being made to develop this foundation, mitigation activities necessarily proceed.

One of the essential purposes of developing a framework is to ensure that management actions such as flow or velocity augmentation or transportation fit within an experimental program. The development of the framework should be overseen by the Independent Scientific Group, which will need flexibility in determining how best to evaluate key uncertainties. At the same time, the hypotheses and supporting elements do not themselves authorize particular mainstem operations, and the Independent Scientific Group should not understand this section as authorizing substantive changes in mainstem operations that are not called for elsewhere in this program.

Comments: Idaho Fish and Game urges the Council to adopt a 140,000 cubic feet per second water velocity standard for the Snake River, recognizing that the lower Snake dams dramatically decreased water velocities and salmon survival; and recruit/spawner ratios of 2 to 1 as a biological objective. Idaho Department of Fish and Game (130). Another commentator suggested a minimum 110,000 cubic feet per second through Lower Granite and 250-300 cubic feet per second at The Dalles. Menke (40). The Corps of Engineers commented that shaping the flow pattern in the river to mimic the pre-development timing and frequency of flow changes may be more beneficial than simple flow augmentation. Corps of Engineers (120). Anticipating the Council’s next rulemaking process, a number of commentators urge the Council to take action to improve survival in the mainstem, through flow augmentation, reservoir drawdowns, spill and ending transportation (Marks (129); Idaho Steelhead and Salmon Unlimited (118); Idaho Department of Fish and Game (130); Northwest Sportfishing Industry Association (106); Wonacott (107); Richmond (98); Kovalicky (99); Smith (95); Connell (96); Hayes (91); Williams (90); Wolf (92); Girvan (92); Evans (76); Williams (77); Scullen (78); Pauley (44); Tolleson (43)), or constructing a migration pipeline. Wolfe (75).

Response: The Council did not propose to adopt water velocity, recruit/spawner, or flow objectives in the mainstem hypotheses process, or to authorize particular changes in river operations. The purpose of the process was to state the rationale behind many important measures in other parts of the program, and to emphasize that they are experimental and need to be evaluated. However, the Council adopted several recommendations based on these suggestions in the amendments adopted in December, 1994. These recommendations are addressed separately in Findings.

Statement of the Hypotheses

Comments: The hypotheses are reasonable explanations of the available observations. To solve problems, we must start with internally consistent explanations of the facts, which are subsequently tested for validity. These hypotheses are acceptable starting points for this process. Mundy (111). The hypotheses are too vague; they should be as clear and concise as possible. Pacific Northwest Utilities Conference Committee

(122). The hypotheses lack sufficient detail to provide research direction, although they provide a clear indication of the general areas the Council believes should be pursued. Scientific Review Group (134).

The Council should state scientific, not policy hypotheses. Bonneville Power Administration (123); Pacific Northwest Generating Cooperative (117). The hypotheses should be stated in scientific format, or not characterized as hypotheses. Corps of Engineers (120). Bonneville offers specific null and alternative hypotheses. Bonneville Power Administration (123). It is appropriate to state the hypotheses as you have, rather than as null hypotheses. The low statistical power of most ecological data sets makes meaningful tests of such data difficult. It also is appropriate to avoid the idea that the hypotheses will be “tested;” rather, as the Council suggests, the hypotheses will be refined over time. Peterman (132).

Response: The hypotheses are intended to be starting points from which scientific experiments can be developed, as Dr. Mundy says. The Council is not equipped to develop detailed hypotheses in scientific structure and parlance. Rather, the Council’s purpose is to state the assumptions on which many important mainstem measures are based, acknowledge that our knowledge of these relationships is imperfect, and emphasize the need to learn more. Having done so, the Independent Scientific Group is better able to oversee the scientific efforts to address these issues. The Council changed the reference from “tested” to “refined.”

Comments: It is appropriate to focus on carrying evaluation through to adult returns. Peterman (132); Menke (37). We agree that adult spawners are the “bottom line,” but linking adult returns to any environmental variable in juvenile migration conditions is problematic; multivariate analysis will be needed. Juvenile survival will continue to be the most direct measure. Bonneville Power Administration (123). We agree with the Council’s recognition that mainstem passage survival is a function of more than just water velocity and transportation. Douglas County Public Utility District (97).

Response: The Council recognized both that adult returns are the ultimate question of interest, and that evaluating the effect of particular environmental conditions on adult returns is extremely difficult to discern. Indeed, parties as disparate as the fish managers and the Columbia River Alliance appeared to converge on this point in the fall 1994 amendment process. The Council assumes that individual evaluations will necessarily have to focus on particular aspects of the life cycle, including juvenile survival, estuarine and ocean survival, and the upstream migration. Ultimately, however, the region will have to find ways to link these individual studies to an overall picture of the life cycle to adult returns. The Council understands that the task is complex, and ultimate answers will be elusive.

Comments: I endorse the idea of coupling evaluation of the flow-survival relationship with evaluation of transportation effectiveness. Menke (37).

Response: The Council strongly believes that evaluation efforts will be facilitated by maintaining this linkage, which will provide a kind of basis for comparison. A fundamental problem faced by the region every year is the decision whether to transport fish or leave them in the river and attempt to improve flows and velocities. Both sides of the issue marshal scientific information to support their positions. In order to address this issue, the Council linked hypotheses on these key issues, and called for an ambitious evaluation to focus on the relative merits of these actions. A second fundamental question deals with whether either mode as now designed provides survival necessary to support rebuilding. This question should be addressed as part of the development of rebuilding schedules.

Comments: The hypotheses do not account for confounding variables (e.g., low survival in a low flow year might be explained by tributaries having frozen over because winter stream flows were low). The impact of higher flows on returning adults should be considered. Public Power Council (121).

Response: It is quite true that there are many such confounding variables and incidental impacts, which must be sorted out in a disciplined scientific process. It was not the Council's purpose in this process to identify and specifically account for each one, but to state our understanding of these relationships to make clear the program's rationale for action in other parts of the program, and to encourage and focus scientific investigation.

B. Flow Hypothesis

Comments: The hypothesis will not guide further studies; this is the same hypothesis that has been the basis for past studies. Pacific Northwest Generating Cooperative (117); Pacific Northwest Utilities Conference Committee (122); Corps of Engineers (120).

Response: The hypotheses are consistent with those implied in the fish and wildlife program throughout the Council's history. However, the Council believes that debate over the mainstem research has been hindered by a lack of clarity in the assumptions underlying mainstem actions. The Council hopes that by explicitly stating these assumptions, scientific evaluations will be facilitated.

Comments: The only uncertainties in the data regarding the flow-survival relationship are how beneficial flows are at given levels, not whether they are beneficial. Idaho Department of Fish and Game (130); Sierra Club (126). What are the "scientific uncertainties" the Council refers to in its issue paper? Sierra Club (126). This relationship cannot be quantified to the satisfaction of the opponents of flows, at least in the near term; any test will only produce more debate. The Council cannot wait to act until scientific verification is indisputable, although careful monitoring and evaluation of recovery measures is appropriate. Sierra Club (126); Friends of Earth (105). The relationship between higher flows and improved fish survival is not a hypothesis, it is proven. Action is needed. Friends of Earth (105); Northwest Sportfishing Industry Association (106); Sierra Club (126).

The hypothesis should posit a relationship between flow, travel time and fish survival. While data show benefits in low flow ranges, the benefits flatten out or disappear at higher flows. All supporting elements but the first paragraph of "e" should be deleted. Once more is known about other aspects of juvenile survival, additional hypotheses can be developed. Pacific Northwest Generating Cooperative (117). Smolt survival is affected by a host of variables, so there should not be an overemphasis on flow-survival. Bonneville Power Administration (123); Douglas County Public Utility District (97).

There is no defined relationship between travel time and water velocity. There are no data on the relationship between travel time and survival except at extremely low flows. Pacific Northwest Utilities Conference Committee (122).

Response: The Council received comments from parties who said that the available data clearly show a positive and definite flow/velocity-survival relationship. Other commentators said that the same body of information showed that there was clearly no such relationship. A similar debate surrounds transportation. This dichotomy simply reinforces the need for the Council to explicitly state its working hypotheses. The Council finds sufficient reason to believe that increasing water velocity increases salmon survival to adopt inriver objectives and measures recommended by the fishery managers, but also finds that there is uncertainty about the degree of benefit of particular measures. The flow-velocity-survival hypothesis and supporting elements acknowledge this. Within this broad hypothesis, there are a number of uncertainties, many of which are referred to in the supporting elements -- for example, the mechanisms that relate flow in the outmigration to returning adults, and the differences that may exist between races of fish, hatchery versus wild populations. The supporting elements are intended to make explicit what we assume to be true about these underlying mechanisms, so that they can be evaluated.

Comments: The flow-survival hypothesis will not help generate objective, empirical data, but is designed to serve a particular agenda. Eight of ten supporting elements refer to flow and water velocity, which include only information that tends to support your premise. Direct Service Industries (124).

Response: In stating its hypotheses, the Council seeks to clarify the assumptions under which it is working and upon which program measures are based. It is not seeking to characterize the views of different parties. The Council's purpose is to determine whether and to what extent flow and velocity augmentation and transportation benefit salmon and steelhead. In the final amendments, the Council added more detailed supporting elements to the transportation hypothesis, based on the U. S. Fish and Wildlife peer review study conducted by Mundy, et al., the Council's technical workshop on transportation, and the comments the Council received.

Comments: Studies would have to be partitioned to examine particular life stages. The hypothesis could be broken down in this fashion. Corps of Engineers (120); Bonneville Power Administration (123). Discrete components such as the "biological window" and other subjects listed in the supporting elements should be evaluated. Bonneville Power Administration (123).

Response: The Council assumes that aspects of the life cycle will have to be partitioned for experimental purposes, although this judgment is for the Independent Scientific Group in the first instance.

Comments: The hypothesis confuses the question of flow-survival and the question whether we can attain certain survival levels. The second question should not be addressed by the hypothesis. Bonneville Power Administration (123).

Response: This comment apparently addresses the need to both determine how velocity augmentation and transportation compare and to determine survival levels needed to support rebuilding. The Council proposes to address the first question through an adaptive experiment while the second should be addressed in the development of rebuilding schedules.

Comments: Slackwater reservoirs deplete energy reserves of juvenile salmon, and are likely to facilitate the horizontal transmission of disease. These factors are compounded by stresses from collection and containment in high-density tanks, raceways and barges. Menke (37).

Response: The effect of these factors should be apparent in an experiment comparing transportation and river passage, particularly if the experiment can include a comparison with fish that did not enter the bypass systems. It is unclear if an experiment that includes the latter aspect can be designed, but it should be considered.

Comments: The relationship between flows and survival is not correctly characterized by the Sims and Ossiander or Raymond data. Recent PIT tag data show much higher survivals. Bonneville Power Administration (123). Data on flows and survival are based on a river system that no longer exists; we need better data before making additional decisions. Pacific Northwest Utilities Conference Committee (122).

The Sims and Ossiander data emerged from particular river conditions that masked the benefits of higher flows. Taking these factors into account, the benefits of 140,000 cubic feet per second are clear, as documented by Raymond and Petrosky. Idaho Department of Fish and Game (130). The Iwamoto, et al. data referred to in the discussion paper are consistent with the Sims Ossiander data in that they tend to show that the first pool encountered by juvenile migrants does not appear to exact a high mortality, even under moderately low flows. Cumulative effects through several pools, however, show much higher mortality; it is a mistake simply to extrapolate from the Iwamoto data. Idaho Department of Fish and Game (130).

Response: The Council agrees that there are many problems in interpreting the Sims and Ossiander data. At the same time, while the research methods that are being used by Iwamoto et al. are promising, it is too early to draw conclusions from that research. The Council also is reluctant to expand information from a portion of the river to the entire river. For this reason, we feel that installation of PIT tag detectors in the lower river should receive the highest priority.

Comments: The “uncertainties” section of the flow hypothesis should be deleted. Uncertainties should be considered in evaluation; as written, however, this section appears to state an alternative hypothesis that would make testing difficult. Oregon Department of Fish & Wildlife (119). We agree that these uncertainties are critical. Douglas County Public Utility District (97).

Response: The purpose of the “uncertainties” paragraph following the flow-velocity-survival hypothesis is to clarify the nature of the uncertainty the Council sees. By doing so, the Council hopes to focus research, monitoring and evaluation on these uncertainties.

Comments: Supporting element a: The University of Washington study of sub-yearling survival in the mid-Columbia was seriously flawed by use of lower river tule chinook releases as controls. Consistent releases of tagged sub-yearlings from Priest Rapids hatchery provide an opportunity to evaluate survival if a suitable control can be found to separate ocean effects. Douglas County Public Utility District (97). We caution you against using non-peer review studies such as Petrosky (1992), which have technical problems. What are the “similar relationships” noted on p. 5, lines 17-18? Corps of Engineers (120). Figure 1 hypothesizes one line, but others may be as reasonable; what is the unit of observation, a year? Calvin (34).

Response: The Council is aware of the limitations of this study and that the analysis is still being finalized. The Council has not endorsed the results but mentioned them to summarize the limited data available on the needs of summer juvenile migrants. The “similar relationships” have been developed by the fishery managers particularly in response to the settlement discussions associated with *Idaho Department of Fish and Game v. National Marine Fisheries Service, et al.* Other hypotheses for Figure 1 are certainly possible. The Council did not endorse this particular representation but provided it for illustrative purposes. The unit of observation is one year.

Comments: Supporting element c: Many factors affect stock productivity, not just juvenile migration conditions. Douglas County Public Utility District (97).

Response: The Council agrees. Accounting for confounding variables such as this will be a challenge to research, monitoring and evaluation.

Comments: Supporting element d: It is likely that much of the mortality that occurs in the estuary and the ocean is unrelated to juvenile migration conditions. Douglas County Public Utility District (97).

Response: Certainly this is true. However, it also seems plausible that conditions in the river during the outmigration can affect both the time of entry into the estuary and nearshore oceanographic conditions. These factors could affect survival. The Council is interested in how human actions affect survival rates at all life stages, including the estuary and ocean.

Comments: Supporting element e: It is possible that there is a threshold above which increases in flow or velocity do little good. Rebuilding these populations should not be viewed solely as a problem of river conditions. Douglas County Public Utility District (97). The slope and intercept should probably be called

parameters, not variables. Also, the intercept is not properly defined (the intercept is the value of the variable at the point where the other variable is zero). Calvin (34). Avoid the debate over which of the two lines in figure 2 is correct, recognizing that only a portion of the effects of water velocity occurs in downstream migration. Oregon Department of Fish & Wildlife (119).

Response: The Council agrees that it is possible that there is a threshold above which flow increases do little good, with full reservoirs, and that rebuilding these populations should not be viewed solely as a question of river conditions; other sections of the Council's program address habitat, harvest and hatchery issues. The Council changed the amendments to refer to slope and intercept as "parameters." The Council agrees that it should at this point avoid the debate over which of the two lines in figure 2 is correct, and the amendments recognize that the effects of water velocity may occur in other parts of the life cycle.

Comments: Supporting element f: A number of variables are mentioned, and you might mention that most of them are not easily measured. Calvin (34).

Response: The debate on this issue over the past decades has demonstrated that none of these factors is easily measured. The factors mentioned in the comment are included to expand the discussion of possible elements of the relationship.

Comments: Supporting element g: It is possible that spring chinook data are a surrogate for sockeye, but it is also possible that sockeye respond differently. Douglas County Public Utility District (97).

Response: The Council agrees. However, based on the discussion at the Council's technical workshop on flow-survival, the Council believes that the assumption stated in element g is a suitable working assumption.

Comments: Supporting element i: Instead of saying that ocean conditions can vary independently of river or estuary conditions, acknowledge that river and estuary conditions can compound the effects of unfavorable ocean conditions. Oregon Department of Fish & Wildlife (119). Research in the estuary and ocean is important, Douglas County Public Utility District (97), but will be difficult to do. Corps of Engineers (120). There is a possibility that ocean and atmospheric conditions will change to improve the productivity of Oregon and Washington stocks, which would confound interpretation of results. Peterman (132).

Response: The Council changed the amendments in response to the first comment. The Council agrees that the effects of estuary, ocean and atmospheric conditions will be difficult to evaluate, and are likely to make difficult the evaluation of the effect of flow and velocity on adult returns.

C. Transportation Hypothesis

Comments: A fuller process, comparable to that used for the flow-survival hypothesis, should be used to develop a transportation hypothesis. The process should include independent review of the transportation data and a workshop with experts to identify key elements of a hypothesis. Oregon Department of Fish & Wildlife (119). Remove the transportation hypothesis from the rule. Sierra Club (126).

Response: Based in large part on the commentator's suggestion, the Council held a second technical workshop to discuss and refine the transportation hypothesis. The U. S. Fish and Wildlife Service review of transportation data conducted by Mundy, et al., constitutes a thorough review of the transportation data, and the Council relied on this review in this process.

Comments: At best, under some conditions, transportation may not decrease salmon survival. Low transport benefit ratios are confirmed by the Columbia River Basin Authority report and recent PIT-tag data. Sierra Club (126). We support adoption of the flow-survival hypothesis, but it should be apparent that transportation is a failure. Washington Trollers Association (89). The paragraph summarizing uncertainties surrounding the transportation hypothesis should say that transportation may, unavoidably, cause harm, not just result in uncertain benefits. Menke (37).

The paper overemphasizes the lack of data. There are more data on transportation than on spill and turbine survival; recent results are statistically significant, and show a positive relationship for transportation. Corps of Engineers (120); Direct Service Industries (124). Delete the qualifier “under some passage conditions;” Unlike the flow-survival relationship, we have adequate data about the benefits of transportation. Pacific Northwest Utilities Conference Committee (122). The transportation hypothesis should assert that transportation produces higher survival benefits than inriver migration. Pacific Northwest Generating Cooperative (117).

Response: The Council understands the Mundy review to say that transportation can increase salmon survival under some adverse river conditions, but there is insufficient evidence to indicate that transportation alone could rebuild upriver runs. Like the velocity-survival data, the information on the effectiveness of transportation has led to strongly held, but conflicting, opinions by different parties. This can only be resolved by focused research and meaningful action.

Comments: It is possible with transportation that we are losing significantly more fish in the ocean due to impacts of stress and disease. If there are backup data to support the transportation hypothesis, include them. It is doubtful that any of the transportation improvements can offset the effects of stress and disease. Menke (40).

Response: These questions can only be resolved by research. On the other hand, it is also clear that the benefits of any mode of passage must be evaluated in light of whether it can support rebuilding. The Mundy review, and the present condition of the runs, suggests that existing actions such as transportation have not been sufficient, particularly when compounded by adverse natural survival conditions in the ocean and elsewhere.

Comments: The return of transported smolts to spawning areas has meager scientific data; this could be an uncertainty that should receive additional emphasis in research. Douglas County Public Utility District (97).

Response: The Council agrees that the return of transported fish is an area of uncertainty that merits emphasis in research. The paragraph summarizing the uncertainties regarding transportation reflects this.

Comments: Supporting element h: This element is supported by the recent independent review of transportation, funded by National Marine Fisheries Service. Douglas County Public Utility District (97). Acknowledge that virtually all transportation studies show a positive relationship between transportation and fish survival, and delete paragraph “h”. Pacific Northwest Generating Cooperative (117).

Response: The Council has elaborated on supporting element h, based on the Mundy review and the Council’s technical workshop on transportation. The supporting elements in the final amendments

acknowledge that there appears to be a positive correlation between transportation and fish survival under some conditions, but these benefits are in relation to river conditions.

Comments: Add a supporting element asserting that the effect of predation on survival of transported smolts may be different in the lower Columbia River. Poe (125).

Response: While this was not included as a specific supporting element for the transportation hypothesis, predation is a major element of inriver passage mortality, and should be considered in transportation evaluations.

D. Research Process

General

Comments: In carrying out the experimental work, try to ensure that all parties understand the risks and potential benefits of adaptive management. For example, to those who ask why these experimental actions are undertaken, ask what alternatives are more likely to work? Avoid knee-jerk actions that cannot be evaluated. The common assumption that a new action is the solution is the main reason why it is so hard to interpret historical data, because there was no experimental design. Peterman (132).

Response: The Council agrees with these comments. By calling on the Independent Scientific Group to oversee the process of developing an adaptive framework, the Council hopes to minimize the tendency to assume that mitigation measures require no evaluation.

Comments: In the next stage of experimental design, highest priority should be on getting high statistical power for the two main working hypotheses. Before the experiment starts, decide on rigorous and firm criteria for evaluating the results (e.g., a difference of 2 percent between the mean survival rates of transported and nontransported fish will be needed to continue the transportation program). Consider a staircase research design. Insist on doing the transportation experiment with enough tags to estimate smolt-to-adult survival rate well. Peterman (132).

Response: The Council agrees that power of test is a critical factor in experimental design. Professor Peterman's help throughout this process has been invaluable, and we hope that he will continue to address these issues as the actual experimental designs of the spread-the-risk and other evaluations are developed.

Comments: Bonneville Power Administration does not agree that the Fish Operations Executive Committee should coordinate the research to address the amendment. Fish Operations Executive Committee is a policy body. We suggest use of a technical study group linked with and appointed by the Independent Scientific Group. Adopt a three-tiered process: A technical study group should be appointed by the Independent Scientific Group to formulate hypotheses and study designs, and work with researchers to implement a comprehensive study plan. Policy makers, such as the Fish Operations Executive Committee, should secure buy-in among operating agencies, tribes, and fish and wildlife agencies. Bonneville Power Administration (123).

Insist on independent scientific review of all steps of the program. Peterman (132); Corps of Engineers (120). The experimental program should not be developed, implemented and evaluated by the same entities; external input is essential. Douglas County Public Utility District (97). Testing should be initiated by

an independent scientific (not politically representative) body, such as the Independent Scientific Group. This group should develop experimental design criteria; selection criteria for prioritizing research proposals; a process to permit scientific peer review of the findings. Periodic reports should allow peer review and communication to decision makers and the public. Different scientific panels could work on different aspects of this work. Edwards (114). An independent scientific committee formed by the Council, Bonneville, National Marine Fisheries Service and the Corps of Engineers should report to the Council's Fish and Wildlife Committee, not the Fish Operations Executive Committee. Pacific Northwest Generating Cooperative (117). The proposed policy and technical groups are too much like the Implementation Planning Process groups; select the technical group with extreme care. Poe (125).

The Corps of Engineers and Bonneville should create a process for establishing and reviewing regional research policy, and discuss issues with the Fish Operations Executive Committee. Corps of Engineers (120).

The manner in which the research program is organized depends on how high a priority the region puts on these questions, compared to other critical uncertainties. I rate it as high, but not at the top. It deserves a well-organized effort supported by Bonneville Power Administration, with greater emphasis by the Policy Review Group. Calvin (34).

The initial task for the technical work group should be to develop a framework for monitoring, evaluation and research. This group should oversee the assessment. Oregon Department of Fish & Wildlife (119).

Response: The Council agrees that the research, monitoring and evaluation process is most suitably overseen by independent scientists, and these responsibilities should not be lodged with implementing agencies. Accordingly, the Council has changed the final amendments to create an oversight role for the Independent Scientific Group. The Independent Scientific Group has also been asked to develop a framework for monitoring, evaluation and research. The Council calls on the implementing agencies to ensure that sufficient resources are made available to the Independent Scientific Group to carry out these additional tasks.

Comments: A number of commentors had suggestions for the manner in which the research should be carried out:

- It should be possible to combine research on flows and transportation. To the extent possible, Bonneville would be interested in implementing study designs for water velocity and transportation evaluations in which the river is manipulated to provide some control of flows. Bonneville Power Administration (123).
- When research proposals are submitted, evaluate their potential power, bias and precision, and rank them by simulating their expected performance, as is done for proposals for alternative harvest regimes. Peterman (132).
- Within nine months of the end of a migration season, comprehensive data should be archived and made publicly accessible at region's universities. The principal investigators should publish a paper reviewing the data at least every three years in a peer reviewed journal. The Council should pay page charges for at least two commentaries on these papers. If a peer-reviewed journal does not accept a paper, the Council should determine why. The value and reliability of these investigations should be reviewed by the National Research Council five years after the hypotheses are adopted. Lee (79). Review and evaluation of research proposals should be patterned after peer review process for scientific journals, including at least one reviewer from outside the region. Poe (125).

- Recognize that an adaptive approach will require monitoring to adult returns, and the primary tools will be coded wire tags and Passive Integrated Transponder tags. Oregon Department of Fish & Wildlife (119). Passive Integrated Transponder tags are unlikely to provide enough data on adult returns, because return ratios are so low. Fish might have to carry two tags -- a PIT tag and a coded wire tag to gather data. Bonneville Power Administration (123). Passive Integrated Transponder tags are unlikely to tell us much about ocean mortality. Menke (37).
- For 1995, Bonneville and the Corps of Engineers are planning a full-scale transportation evaluation using PIT and coded wire tags. The Council's action should be coordinated with this work. Bonneville Power Administration (123).

Response: The Council appreciates these observations, which will be passed on to the Independent Scientific Group as they develop the adaptive management framework and experimental program. The suggestions for screening proposals and peer review are creative, and merit consideration. Similarly, coordinating research with ongoing projects, and using appropriate tags to generate the best information on adult returns are important considerations.

Comments: The Council should not attempt to define criteria for sufficiency of information to validate the hypotheses; this is a scientific task. Pacific Northwest Generating Cooperative (117); Calvin (34). Sufficiency of information is a technical question, not a political question, and should be addressed at a scientific level. Bonneville Power Administration (123). The Council should not try to define a threshold regarding the sufficiency of information to establish a scientific hypothesis. Pacific Northwest Generating Cooperative (117).

Response: The Council agrees that it should not seek to define such criteria.

Comments: Call on the fishery managers to provide test fish. Oregon Department of Fish & Wildlife (119); Corps of Engineers (120).

Response: The Council calls for the fishery managers to provide test fish in Section 5.0F.7 of these amendments.

Comments: The studies referred to on p. 9, lines 41-43 should not be limited to the Lower Granite-to-Bonneville reaches. Corps of Engineers (120). Expedite the identification of specific indicator stocks. Oregon Department of Fish & Wildlife (119).

Response: The Council does not intend that studies addressing its hypotheses be limited to the Lower Granite-to-Bonneville area. Indeed, the hypotheses stress that the bottom line is how conditions and actions in the mainstem affect the return of adult fish. The identification of indicator stocks is called for in the Council's program. They will be an important aspect of development of rebuilding schedules.

E. Passive Integrated Transponder Tags

Comments: We support expansion of PIT tag studies and funding for installation at dams. Douglas County Public Utility District (97). The Corps of Engineers has included John Day and Bonneville PIT tag detectors in its Columbia River Juvenile Fish Mitigation Program to expedite funding, has notified Congress of this change and is awaiting Congress's concurrence before releasing funds. Corps of Engineers (120).

Bonneville supports and is funding installation and use of PIT tag detectors in the lower Snake, and mid- and lower Columbia. We also support installation of facilities in the estuary. Pending installation of permanent facilities, we support portable facilities. Bonneville Power Administration (123).

Response: The Council finds widespread support for installation of PIT tag facilities, and conduct of PIT tag studies, but given the urgency of the questions the region is attempting to address, the schedule for installation needs to be accelerated. With this in mind, the Council has called for more ambitious efforts to install appropriate facilities.

III. RESERVOIR IMPACTS/CONSTRAINTS/RESIDENT FISH

A. General

Comment: Upper Columbia United Tribes called for developing a coordinated flow augmentation plan each year based on run-off forecasts. It noted the plan should include a description of the projected impacts to resident fish in Grand Coulee, Hungry Horse, Libby and Dworshak reservoirs. It should also specifically evaluate tradeoffs between anadromous fish and resident fish and be consistent with equalizing the benefits to both types of fish.

Response: During this amendment process, the Council analyzed the projected impacts and evaluated tradeoffs using the best available scientific information for these reservoirs. The result was 1) the adoption of integrated rule curves for Hungry Horse and Libby reservoirs, and 2) a call for no significant reduction in nutrient retention time in Lake Roosevelt. The Council's understanding is that the fish managers intend to evaluate resident fish, anadromous fish and wildlife impacts and tradeoffs from system operation and submit a report next year. The Council encourages this analysis and the submission of a report addressing these matters.

Comment: Shoshone-Bannock Tribes (606) said the fishery managers, in consultation with the appropriate agencies, will integrate the flow augmentation volumes identified from the middle and upper Snake River through Brownlee Reservoir with the natural resource needs and the existing hydropower and irrigation operations of the middle and upper Snake River and with the rest of the Columbia system. Flow volumes that are to be provided for salmon must also provide fish and wildlife resource needs in the upper-river areas, where most of the flows originate.

Response: The Council agrees with this comment and encourages the fish managers to evaluate resident fish, anadromous fish and wildlife impacts and tradeoffs from system operation and submit a report next year (see response 1).

Comment: Chelan County Public Utility District (622) supported the concept of having a set of criteria for review of proposals to impose constraints on hydro project operations, as proposed in Section 2.2E.6. The first criterion should be the existence of peer-reviewed science substantiating the linkages between such project constraints and protection of fish stocks at risk. Columbia Basin Fish and Wildlife Authority (629) would delete proposed Section 2.2E.6 establishing criteria for reservoir constraints. Supports having a set of criteria as a good idea, but Council should not develop these criteria. Instead wait until agencies and tribes submit their report to the Council in mid-February, which will examine and try to resolve issues of operational criteria. Mark Reller stated concerns about the proposed reservoir constraint criteria in Section 2.2E.6. He questioned whether these type of criteria (e.g., availability of peer-reviewed science substantiating the links between the constraints and the stocks at risk, or consideration of the effects of the constraints on other species, on hydropower and on other river users) have been fairly applied to mainstem flow, spill, and drawdown proposals and actions.

Response: Criteria have been adopted in Section 2.2E.6. The Council encourages the fish managers to use these criteria in evaluating resident fish, anadromous fish and wildlife impacts and tradeoffs from system operation. If the fish managers identify other useful criteria, they should submit them to the Council for review.

Comment: Washington Department of Fish and Wildlife (751) said fisheries managers are working to provide, by December, proposals regarding reservoir rule curves necessary to protect resident fish and

wildlife. Columbia Basin Fish and Wildlife Authority has informed the Council that February/March is more likely.

Response: The Council encourages the fish managers to pursue this activity and looks forward to receiving a report (see above).

Comment: Idaho (766) urges the Council to call on the Corps of Engineers and the Bureau to minimize the impacts of reservoir drafting on resident fish and wildlife. It notes that operations can be coordinated to benefit resident fish and wildlife and anadromous fish. It states that the Council should direct the Bureau to consider resident fish and wildlife impacts in its operations now, and not wait until the resident fish and wildlife amendment process.

Response: The Council adopted a number of measures designed to minimize the resident fish and wildlife impacts of salmon flow augmentation measures (Montana integrated rule curves, Grand Coulee nutrient retention times, considerations in Fish Operations Executive Committee planning and Fish Passage Center implementation). The Council did not receive recommendations for the Bureau *per se* to develop special protections, and is not free to adopt them without notice and public comment.

B. Montana Reservoirs

Comment: Jim Abbott, Member of Canadian Parliament, representing Kootenay East Constituency of British Columbia, stated that reservoir fluctuations have serious negative consequences for resident fish and wildlife and for cultural resources in the Canadian portion of the Columbia Basin. He noted that extreme drawdowns of Libby potentially create serious problems for waterfowl in Creston Valley. Fluctuations also expose and erode Ktunaxa/Kinbasket Heritage Sites and U.S. activity exacerbates problems caused by low snowpack in recent years. He states that Canadians must have a voice in these actions.

Response: The Council adopted integrated rule curves for Libby reservoir. These rule curves will prohibit, in most instances, severe drawdowns.

Comment: The Corps of Engineers said that it has already mitigated for operation of Libby and that no further mitigation for flood control actions should be required. The Corps of Engineers agreed with proposed funding of the additional generating units at Libby, as stated in Section 10.3B.9, although this may require legislative measures in addition to funding.

Response: The program calls for mitigation of resident fish losses caused by exceeding drawdown under the integrated rule curves at Libby Dam. This would be mitigation in excess of losses caused by flood control operations of the dam under normal conditions (integrated rule curves). The amount of loss and mitigation would be determined through negotiations between the Corps of Engineers and the fish managers.

The Council notes the Corps of Engineers comments regarding installation of additional generating units at Libby Dam. These comments should be addressed in implementing program language regarding the added generators (see section 10.3B.9)

Comment: Pacific Northwest Utilities Conference Committee (733) urged the Council to provide up to 1.2 million acre-feet from Libby to maintain reservoir flows of 11 to 20 thousand cubic feet per second at

Bonnors Ferry during sturgeon spawning season “for the purpose of testing the benefits” of flow augmentation to sturgeon spawning. Columbia Basin Fish and Wildlife Authority stated that Libby Dam should provide flows for Kootenai sturgeon as determined by the agencies and tribes.

Response: The Council did not receive a recommendation on this subject, and is not free to adopt them without notice and public comment. Implementation of integrated rule curves should help address this issue. In addition, releases to provide flow for salmon and steelhead mitigation lower in the Columbia River Basin should benefit sturgeon, too.

C. Grand Coulee

Comment: Upper Columbia United Tribes supported calling for designation of a water retention time at Lake Roosevelt (Section 10.3E.3).

Response: The biological evidence for a higher retention time for water needs to be further developed. The Columbia Basin Fish and Wildlife Authority members plan to discuss this further and report to the Council in February. In the meantime, the Council adopted language that calls for no significant reduction in nutrient retention time in Grande Coulee reservoir below existing conditions.

Comment: Bonneville Power Administration suggests that the daily draft rate at Grand Coulee be increased from 1.5 feet per day to 2 feet per day, providing about 1,200 average megawatts per day, as a way to maintain the ability to meet hourly loads.

Response: The Council did not receive a recommendation on this subject, and is not free to adopt this proposal without notice and public comment.

D. Albeni Falls/Lake Pend Oreille

Comment: Upper Columbia United Tribes stated that the Pend Oreille measure should also include language funding Kalispel Tribe to assess impacts of Pend Oreille study on resident fish in Box Canyon Reservoir. It also stated that if Council approves Pend Oreille amendment, Coeur d’Alene trout pond recommendation should also be “fast tracked.”

Response: The Coeur d’Alene Tribe’s trout pond recommendation has been submitted in the resident fish and wildlife amendment process that will be initiated early next year. The Kalispel Tribe proposal to assess impacts of Lake Pend Oreille lake level changes should be submitted as a recommendation in that rulemaking, if desired.

E. Dworshak

Comment: Direct Service Industries notes that federal projects such as Dworshak were authorized with limited purposes and authorities, and fish enhancement is not one of them. The Council must consider whether and to what extent recommendations for project operations are lawful. In some cases, including massive releases from Dworshak Reservoir, they are not. Changing Dworshak operation to provide fish enhancement that substantially reduces power production is illegal without 1) Congress’ approval; 2) a reduced

allocation of project costs to power generation and, 3) non-federal sponsor funding. Public Power Council states that Dworshak is now largely operated for fish, which is not a project purpose. The Council should not assume it can call for changes in statutory project purposes without transgressing statutory purposes for the projects.

Response: Operation of Dworshak Dam is under the authority of the Corps of Engineers, which also interprets the authorizing legislation for its projects.

IV. HABITAT AND PRODUCTION

A. General

Comment: Bonneville Power Administration (750) made a general comment for all of Section 7 stating that implementation would be facilitated by a clear statement in the program that the primary reason for Section 7 is biological production and habitat. Many of Bonneville Power Administration's comments on Section 7 were relatively minor wording changes to specific measures (i.e., Bonneville Power Administration suggests changing "expeditiously fund" to "continue to fund" for a measure that Bonneville Power Administration considers ongoing).

Northwest Forest Resource Council (867) commented that the Council must involve potentially affected local land owners and businesses in development and review of habitat and production measures.

Response: The Council believes that the program is infused throughout with the premise that its activities have as their goal the survival of fish and wildlife. The thrust of this section is to ensure habitats and production will meet the biological needs of fish. In addition, suggestions for minor wording changes, for the most part, are not responded to. The Council has set forth a subregional and subbasin approach which will give opportunities to local land owners and businesses in the development and review of habitat and production measures.

B. Habitat

Comment: In Columbia Basin Fish and Wildlife Authority's (629) comments, it revised a number of the habitat provisions in the draft amendments, including revisions in the draft amendments. Some of these alterations reflected recommendations from Columbia River Inter-Tribal Fish Commission that were not incorporated into the draft rule, but many more are alterations of or additions to what Columbia River Inter-Tribal Fish Commission recommended. That is, Columbia Basin Fish and Wildlife Authority recommended wholesale changes in the habitat provisions that are not based on any August 1994 recommendations. The more significant alterations are noted below. Where nothing is said, assume either the habitat provision proposed by the Council corresponded to Columbia River Inter-Tribal Fish Commission's recommendation and Columbia Basin Fish and Wildlife Authority left it alone, or Columbia Basin Fish and Wildlife Authority altered the proposed provision to reflect precisely what Columbia River Inter-Tribal Fish Commission recommended. While those changes are sometimes noted, most of the time they are not. The main emphasis in the following comments is on Columbia Basin Fish and Wildlife Authority's additional changes.

Response: The Council wishes to acknowledge the time and effort Columbia Basin Fish and Wildlife Authority put into its comments. To the extent their comments brought forth new issues and new proposed

sections which went beyond the recommendations and the Council's proposed amendments, the procedural rules of both the Northwest Power Act and the Administrative Procedures Act preclude the Council from adopting them during this rulemaking process.

Comments: Bonneville Power Administration (750) commented generally with relation to most of the habitat section of the program that the measures in Sections 7.6 -7.9 should include resident fish and wildlife considerations to reflect the program's ecosystem and watershed approach.

Response: While primarily addressing anadromous fish, Sections 7.6 -7.9 are to be read and implemented in such a way as to be consistent and coordinated with goals, policies, objectives, and other measures that address the entire program including resident fish and wildlife.

C. Land Management Activities

Comments: A number of comments were received supporting the Council's land management proposed amendments. Bonneville Power Administration asked the Council to urge states and federal agencies to ensure biologically sound grazing practices and enforce water quality standards for mining and logging. Idaho Department of Fish and Game's Anadromous Fish Management Plan which opposes any activities resulting in significant loss or degradation of habitat capable of supporting self-sustaining fish populations was submitted. Pacific Northwest Utilities Conference Committee suggested increasing riparian conservation areas, modifying grazing to be consistent with riparian conservation standards, and prohibiting recreational activities "that impact riparian reserves." The Mazamas called for aggressive action to restore degraded watersheds and riparian areas by better land management practices and regulations (attaching documents to that end, including program brochures and explanations about the work of the Pacific Rivers Council and a copy of the book by Bob Doppelt, et al., Entering the Watershed: A New Approach to Save America's River Ecosystems). Similarly, the Society Advocating Natural Ecosystems is in favor of stopping mining and grazing in riparian zones. Boise Cascade (594) suggested the Council incorporate Endangered Species Act principles such that activities on public (primarily federal) lands address the restoration of threatened and endangered species, while the responsibility on private lands is to address maintenance of these species.

Response: In Section 7.7 and appendix of the plan, the Council addresses these concerns. The program language supports biologically sound grazing practices as well as mining and logging activities that comply with water quality standards as Bonneville Power Administration requests. The Council does not have the authority to stop mining and grazing in riparian zones, as requested by Society Advocating Natural Ecosystems. The Council knows its program is felt to be too aggressive by some in calling for not only preservation but also improvements to riparian areas, and recognizes it may not be as aggressive as others would like it to be. The Council's goals are consistent with Idaho Department of Fish and Game's Anadromous Fish Management Plan. While recognizing its limited authority, the Council believes, in answer to Boise Cascade's suggestion that Endangered Species Act principles be used, that the need for habitat protection for anadromous fish goes beyond just federal land areas. In an ecosystem, everything is linked: there is no distinction between the artificial, man-made boundaries of public and private land. The evidence demonstrates that maintaining the current degraded condition of Columbia Basin watersheds would continue to hamper efforts to rebuild salmon and steelhead populations. The Council calls for participation by all private and public landowners to work together in improving watershed and therefore fish habitat.

D. Land Management Activities: Water Quality -- Including in Mainstem and Estuary

Comments: Bonneville Power Administration said the Council should urge states to enforce water quality standards and work with the Federal Energy Regulatory Commission to include minimum stream flow requirements to maintain water quality at federally licensed hydroelectric projects. Oregon Department of Environmental Quality expressed a desire to work more with the Council and stated the Council should include the objective that all program actions are to protect water quality, including restricting pesticide use in sensitive watersheds, and designing and maintaining road drainage systems in habitat areas to prevent pollution. Northwest Environmental Advocates commented that state water quality agencies and Environmental Protection Agency have not done a good job implementing Clean Water Act requirements and that the Council should pressure federal and state agencies to be more aggressive and support their attempts to obtain additional funding.

Response: The Council does urge the states to enforce water quality standards, as both Bonneville Power Administration and Northwest Environmental Advocates request. It also urges states to work with Federal Energy Regulatory Commission on appropriate issues. The Council would be pleased to work with the Oregon Department of Environmental Quality program. Its stated objectives are consistent with the program's goal, policies, and objectives. Program language calls for meeting state and federal water quality standards. The Council will work with the agencies responsible for enforcing standards to procure adequate funding.

E. Water Quantity/Water Rights

Comment: Columbia Basin Fish and Wildlife Authority (629) suggests specific changes, altering Sections 7.8F, Water Regulation; 7.8G, Instream Flows; 7.9, Subbasin Water Projects; and 7.10A, Accelerated Screening. Additionally, Columbia Basin Fish and Wildlife Authority submitted several new sections, including Section 7.8F.2 calling for funding of a programmatic study to evaluate cumulative impacts and mortalities associated with cumulative passage delays that salmon encounter while navigating passage through many diversions; Section 7.8F.3 providing increased funding for state water resource agencies to increase monitoring and evaluation of water use and diversions given that excessive water withdrawal is a major factor affecting fish production and that in many critical watersheds there is an insufficient level of monitoring and enforcement to prevent unauthorized or illegal withdrawals of water; and Section 7.8F.4 calling for funding to evaluate the use of "private-sector auditing systems (such as that used in Canada) to monitor water use in the Columbia basin."

Other new sections include: Section 7.8F.7 calling on the Bureau of Reclamation to immediately cease contracting for the sale of uncontracted firm yield of any Bureau project, to immediately cease renewal of water contracts for more than one year until fish flows and water quality are improved, to prepare a programmatic Environmental Impact Statement on the impact of renewed water contracts, and to develop a plan for a surcharge on all water and power sales to generate funds for a fish and wildlife restoration affected by Bureau projects (this proposal is fashioned on the Central Valley Project Improvement Act.). Also, Section 7.8G.5, which would add to the water leasing demonstration projects a call to investigate the feasibility of replacing surface water diversions with ground water sources in appropriate tributaries and developing at least one demonstration project. Columbia Basin Fish and Wildlife Authority noted that the replacement of surface diversions with ground water may improve surface flow in critical spawning and rearing areas and negate the need for fish screens. California Department of Fish and Game, with other agencies, has successfully

implemented several of these projects in the upper Sacramento River Basin to benefit chinook salmon and steelhead.

Columbia Basin Fish and Wildlife Authority revised other sections. Existing Section 7.8F.2, concerning improved enforcement of the duties of water rights holders, was revised into a new Section 7.8F.5 that provides that diversions should not only have flow measuring devices but also lockable headgates and that calls for an annual progress report by state water resource departments. Various provisions of Section 7.9, Subbasin Water Projects, were altered, mostly in minor ways. Changes proposed to the Willamette subbasin measures include: update Section 7.9A.2 to reflect that the McKenzie temperature control studies are complete and the results indicate that temperature control devices would be beneficial and stating that the modifications should be 100 percent federally funded; modify Section 7.9A.3 to ensure that both minimum flows and ramping rates below Willamette projects be modified to prevent fry stranding and loss of fish production; and Section 7.9A.8 to reflect that the instream flow study at the Eugene Water and Electric Board projects was completed several years ago and the licensing process for the Leaburg/Waltermville project is nearly complete.

With regard to the Umatilla Subbasin, new language in Section 7.9B.2, concerning McKay Reservoir, called on the Bureau to report semi-annually on progress toward ending water spreading in the Umatilla basin, to ensure that no new water is spread, to reduce the irrigation district contracted space in the reservoir by the amount that had been delivered without authorization, to reallocate that water to instream uses with senior water right dates, and to recover the government's full cost of water delivered outside irrigation district boundaries.

In the Grande Ronde Subbasin provision, Columbia Basin Fish and Wildlife Authority deleted the specific language on a water temperature evaluation in Section 7.9C.1 and called more generally for the implementation of riparian protections and restoration projects through the model watershed. The changes were intended as an update and to indicate that addressing water temperature problems alone will not solve the problems in the subbasin.

With regard to the irrigation diversion screening provisions in Section 7.10A, Columbia Basin Fish and Wildlife Authority made a number of minor editorial changes that are not summarized here. More significant changes include those to Section 7.10A.3 calling for a prioritized list of screening projects and consideration of innovative approaches to end diversions rather than simply adding screens to diversions, such as switching to electric pumping on groundwater sources. Columbia Basin Fish and Wildlife Authority also added language calling for a list of diversions where inadequate screens are a secondary problem when compared to the way in which the diversion simply impairs instream flows. Columbia Basin Fish and Wildlife Authority explained this change by noting that chinook and steelhead no longer utilize many small tributaries because of low instream flow as a result of surface diversions; often insufficient instream flow is a greater problem than the lack of a fish screen.

With regard to Section 7.10A.4, concerning funding for screening, Columbia Basin Fish and Wildlife Authority deleted the Council's proposal for an increase in funding to \$15 million per year to expedite the screening effort, stating instead that progress is being made and should continue. Columbia Basin Fish and Wildlife Authority explained that nearly 50 fish screens are currently being installed per year in Idaho and Oregon and to further accelerate the program would require additional personnel and infrastructure. It noted that pre-project coordination with water users is the major limiting factor to the programs and that an 8-year program (by 2002) at this pace would assure that the screens installed in the Basin are of high quality.

Columbia Basin Fish and Wildlife Authority added language to Section 7.10A.5 reflecting that many inadequate screens still exist on public lands and that the Forest Service and Bureau of Land Management

need to proceed with screening actions. Also, these screens must meet Fish Screening Oversight Committee criteria and implementation must be coordinated with the state anadromous fish screen programs.

Columbia Basin Fish and Wildlife Authority modified proposed Section 7.10A.7 to call for the states to amend their water laws to require the forfeiture of water rights after three, not five, years of unscreened or substandard screened diversions. Columbia Basin Fish and Wildlife Authority noted that potential forfeiture of water rights is a good incentive to provide screening, but five years is too long to wait. Columbia Basin Fish and Wildlife Authority also added language calling on the states to evaluate government subsidies for the funding of screens where the water users have been diverting significantly more water than allowed by their water right. Columbia Basin Fish and Wildlife Authority explained that taxpayer subsidies for fish screens have been greater in many instances than what they would have been if users were only diverting the amount allowed under their right.

Response: As noted above, the Council was not able to include many of Columbia Basin Fish and Wildlife Authority's comments as amendments because they were not the subject of recommendations, or otherwise proposed in the draft amendments, and therefore could not be adopted without proper notice and comment (Sections 7.8F.2-5, 7.8F.7, 7.8G.5, 7.9B.3, 7.9C.1, 7.10A.3). The Council strongly supports consideration of these ideas in the revision of subbasin plans. In various provisions of Section 7.9, Columbia Basin Fish and Wildlife Authority made minor alterations incorporating updates into the program. The Council adopted these changes. With regard to Section 7.9C.1 concerning the Grande Ronde Subbasin, the Council believes it is important to continue with the water temperature study. The Council did not agree with Columbia Basin Fish and Wildlife Authority's proposed deletion of the proposal for \$15 million per year to expedite screening efforts. We retained this provision, believing that it is necessary to expedite screening efforts which are vital to achieve the habitat goal. Columbia Basin Fish and Wildlife Authority suggested a timeline of completion by 2002 which we feel is not soon enough. We continue to call for completion of these efforts by 1996, which we believe to be a reasonable length of time, more effective and necessary for protecting fish resources.

The Council incorporated Columbia Basin Fish and Wildlife Authority's suggested revisions to Section 7.10A.5 requiring screens to meet Fish Screening Oversight Committee criteria. The Council believes that these criteria, but their specific addition to this section adds clarification. Columbia Basin Fish and Wildlife Authority asked that Section 7.10A.7 be amended to call states to amend their water laws to require the forfeiture of water rights after three, not five, years of unscreened or substandard screened diversions. In the draft amendments, this issue was presented in Section 7.6 as a three year limit and in Section 7.10A.7 as a five year limit. The Council has decided the three year standard will be more effective and adopted it in this section.

Comment: Oregon Water Resources Department submitted a host of instream flow and water rights comments. These included: the proposed amendment to require forfeiture of water right for unscreened diversions creates complex legal problems for water rights not originally conditioned on screening; Oregon Department of Fish & Wildlife's screening program provides appropriate enforcement authority; resources have not yet been identified to accomplish the full range of actions called for in the Council's program to increase instream flows on available space in Bureau projects such as McKay; the Oregon Water Resources Department is concerned about expressions in the program that state water laws are not being enforced as Oregon Water Resources Department's monitoring indicates few problems.

Response: The Council recognizes that forfeiture of water rights for unscreened diversion may cause legal problems as suggested. But the threat of water rights forfeiture is likely to be very effective in obtaining compliance of this illegal activity. The Council calls on the states to develop legislation that will

authorize forfeiture in cases where objectives are being ignored. The Council will work with Oregon Water Resources Department to address concerns about limited resources available to implement program measures. In addition, the Council requests reports on state water law monitoring and is pleased that these reports indicate few problems.

Comment: Save Our Wild Salmon (628) called for the operation of all Bureau of Reclamation reservoirs to maximize flow benefits in mainstem and in tributaries for salmon spawning, rearing and migration and for other aquatic species, the increase of available water by eliminating waste and unauthorized use through administrative and legislative procedures which would adopt and enforce strong water conservation laws and standards, field assessments for long-term streamflow commitments that should be integrated into Bureau of Reclamation projects, watershed management plans to be conducted where information on fish flow needs in various tributary reaches is inadequate, new authorities to protect instream flows where existing laws are insufficient, screen promptly all unscreened water diversions, fully mitigate fishery impacts before new state or federal diversions are approved, and to finance instream flow purchases.

Response: Save Our Wild Salmon's requests were not the subject of recommendations, or otherwise proposed in the draft amendments, and so the Council could not adopt them without notice and comment. It is the law that fishery impacts be fully mitigated before new state or federal diversions are approved. The Council is aware that water laws are not consistently and uniformly enforced, and we encourage that the proper authorities do so. The program contains measures which address and are consistent with the other requests here.

Comment: Bob Hoeffel, a consultant for the Oregon Water Coalition (388) submitted comments opposing inclusion of the Umatilla Basin Project in the Council's program and opposition to any significant Council action on water spreading. He makes a general criticism that the draft amendments reflect too little consideration for agriculture and irrigation. More specific comments included deleting proposed Section 7.8H.4 (irrigation surcharge); opposing the change in Section 7.8J.1 calling for "interstate mechanisms" for coordinated planning to protect Columbia water from additional harmful appropriations; and a criticism about existing Section 7.9B.2 which calls for the use of 6,000 acre-feet in McKay Reservoir for flow augmentation in the Umatilla, on the ground that this water is still agricultural water and the project purposes cannot be changed.

Response: The Council dealt with the Umatilla Basin Project several years ago and did not reopen it during this rulemaking process. The Council disagrees that it gave little consideration to agriculture and irrigation. When the survival of wild stock is at stake, the Council is required by law to develop a program to protect, mitigate, and enhance fish and wildlife, 16 U.S.C. §839b(h)(7), and the needs of agriculture and irrigation do not have priority. The Council believes that water spreading is an issue that needs to be addressed and potentially could provide additional instream flows for fish. The other issues raised are new ones and could not be considered during this rulemaking process.

Comment: Corps of Engineers (728) stated that the Council "should go beyond the issue of spread water and review the efficiency of all water use. By eliminating inefficient water use, more water would be left inriver than by draining all the storage in the Snake River Basin."

Response: The Council calls for review of the efficiency of all water use, as well as water spreading, in the program.

Comment: WaterWatch of Oregon (748) had a number of comments. It supported continued moratoria on new water withdrawals in the basin; stated the Council's language needs to be stronger urging

states to eliminate wasteful uses of water and to ensure that conserved water provides some instream flow benefits; supports language in Section 7.9A calling for use of stored water for minimum flows in Willamette basin; supported an irrigation surcharge; stated that minimum flow provisions in Umatilla Basin are stuck in the Oregon Water Resources Department's administrative process and thus requests the Council to add a new Section 7.9B.13 calling on Oregon Water Resources Department to "Process water rights providing for McKay Reservoir storage and releases for instream flows."

Response: The Council has taken a strong position urging states to eliminate wasteful water use. We would be happy to work with the affected parties to assist them moving the process forward in the Umatilla Basin Project. The proposed language does not address a recommendation and, therefore, can not be amended into the program at this time.

Comment: Bonneville Power Administration (750) asked the Council to urge states to compel compliance with diversion screening requirements and limit withdrawals from already over-appropriated streams and river reaches. Bonneville Power Administration stated the Council could be instrumental in helping the region develop an interstate compact for coordinating the recognition and protection of instream water rights.

Response: The program already calls on the states to complete compliance with diversion screening requirements and limit withdrawals, as needed to benefit fish, from streams. We encourage Bonneville, and the region, to develop an interstate compact as described and will participate in any such effort.

Comment: Idaho (766) supported obtaining additional water for instream flows only on a willing seller/buyer basis and supported a call for water bank prices to achieve market levels, but opposed the waiver of water bank rules, such as the last-to-refill rule, which protects spaceholders who have not leased their water. Idaho also stated the elimination of obstacles to downstream use of this water for salmon is not objectionable, but indicated it does not have the authority to curtail valid water rights in downstream areas. Idaho does have an effective moratorium on new water rights, but cannot ensure that downstream states have the same protection in place.

Response: The Council recognizes that Idaho does not have the authority to control water rights outside its boundaries. Oregon and Washington have similar moratoria on new water rights. The program already includes the purchase or lease of water on a willing seller-buyer basis.

Comment: The Bureau of Reclamation (870) commented it is interested in expanding water conservation demonstration projects to full-scale activities.

Response: This is a new proposal, but the Council encourages the Bureau to submit proposals to expand water conservation demonstration projects to full-scale activities.

F. Watershed Enhancement and Management/Watershed and Habitat Protection and Enhancement Projects/Model Watershed Program

Comment: The Council received comments which included suggested additional amendments to the Draft Amendments to the 1994 Columbia River Basin Fish and Wildlife Program from the Kalispel Tribe of Indians. It opposed language in Section 7.7A.1 that allows state agencies to select the lead agency for

watershed activities. The Tribe also opposed program language “that funds or identifies non-managing agencies as lead agencies” such as the U.S. Soil Conservation Service. “This is unacceptable to the Tribe as we feel that only fish and wildlife managers should be funded for projects/programs or identified as lead agencies within the Council’s Program.” The Kalispel Tribe stated that a “separate bullet” in Section 7.7 should be included to “identify the ‘tribal role’ in habitat protection and enhancement throughout the system.” The Tribe also noted that it has been more than two years since the it has received reports from Washington state concerning watershed activities.

Response: Watershed activities include all interested and affected entities, including the tribes. The Council does not select the lead agencies; the states do. Tribes are not precluded from being selected as the lead agency by any language in the program. The Council is not in the position to determine which agency or tribe could be most effective in the different states, and particularly would not like to preclude the selection of any entity which might be most effective in getting the full involvement and trust of private landowners as well as public entities. The local subbasin efforts are to include "all interested parties" among whom the Council expects full participation by the tribes. The Council will arrange for the tribe to receive the reports from Washington State concerning watershed activities.

Comment: The Yakama Indian Nation requested that the Council include the new section 7.6A.3 - "Fund an entity with resource mapping expertise to evaluate, classify and digitally map riparian plant community status in all anadromous fish-bearing watersheds in the Columbia River Basin." A detailed description of the proposed amendment and implications of its adoption was attached to the comments.

Response: The Yakama Indian Nation's request was not the subject of a recommendation, or otherwise proposed in the draft amendments, and so the Council could not adopt them without notice and comment.

Comment: Columbia Basin Fish and Wildlife Authority (629) submitted a variety of comments and program revisions most of which were addressed in the Findings, but also stated that lists of potential land purchases or exchanges be updated. In addition, it noted that the cost of exchanges and purchases should include investments needed to benefit anadromous fish habitat or production, pointing out the cost of screening could be a significant factor.

Response: These comments were incorporated in program language at Section 7.8E.1.

Comment: The Shoshone-Bannock Tribes supported the use of the subregional process to update and implement the subbasin plans as the foundation for watershed actions. In their comments, the Corps of Engineers expressed support for the Council’s watershed projects and other provisions. The Corps of Engineers stated that the model watershed concept should be expanded to all watersheds supporting listed species as rapidly as funds and capability allow.

The Oregon Water Resources Department commented the Council should call for even greater levels of support and funding for watershed management efforts. Oregon Department of Fish & Wildlife supports expedited watershed management activities and commented that measures must focus on those that can be implemented without lengthy process or litigation, pointing out there is a need to distinguish between near-term and long-term activities. Oregon Department of Fish & Wildlife endorses viewing and managing Columbia basin as a single ecological system or watershed, and using a “structured watershed approach to restoring fish populations” by integrating subbasin plans and model watershed plans into Columbia River Basin Watershed Management Plan which it believes can be done without additional legislation, orders, institutions or directives.

Save Our Wild Salmon (Save Our Wild Salmon) submitted their Wild Salmon Forever plan which sets forth a set of general suggestions focused on the restoration of habitat by watershed management. Save Our Wild Salmon stated a number of goals, such as ensuring the existence of adequate habitat to support the ecological roles of wild anadromous fish and protecting and restoring adequate flow quantity and quality to support wild salmon populations. The Save Our Wild Salmon plan then specified a number of “actions” needed to achieve the goals, most stated very generally, such as “[p]rotect and restore Federal, State, and private lands,” “[r]emove and/or reform dams,” “[r]ecognize the watershed as the primary scale for habitat protection and restoration,” “[e]xtend PACFISH protections to upland as well as riparian habitats,” “[e]liminate livestock grazing impacts,” “[r]educe polluted runoff (apply Clean Water Act),” and “[e]ncourage integrated pest management and sustainable farming (apply Farm Bill).”

Friends of the White Salmon River, Trout Lake Chapter, noted the beginning development of watershed enhancement planning in the White Salmon watershed and elsewhere and asked the Council to take a more active role in surveying, evaluating, and coordinating watershed enhancement efforts.

Some comments included suggestions, modifications or clarifications. Boise Cascade cautioned the Council not to implement the Upper Grande Ronde Plan without prior review by an interdisciplinary team and due approval through the National Environmental Policy Act process. The Lower Columbia Basin Audubon Society (Pasco) commented that the Council should include in the program a call for the designation of the entire Hanford Reach as a National Wild and Scenic River and the establishment of a National Wildlife Refuge north and east of the river.

Response: The Council agrees that watershed approaches should be applied to all subbasins in the Columbia and Snake basins as rapidly as feasibly possible. The factors and ideas suggested above should be considered in updating subbasin plans and in the subregional process.

Comment: Bonneville Power Administration suggested the region needs to work further to clarify the distinctions between the roles of funding agencies, commenting that off-site mitigation funded by Bonneville Power Administration should be directly linked to credit for hydrosystem mitigation and that the Council take this opportunity to promote and develop cost sharing of watershed enhancement activities. Bonneville Power Administration asked for the deletion of Section 7.6D., "Expedited Process for Funding Projects," because it does not conform to the principles of biological and cost accountability. Bonneville Power Administration commented that priorities for expedited funding will arise out of the watershed planning programs and processes.

Response: The Council agrees that rate payers should receive credit for off-site mitigation activities and that cost-sharing is an important element in implementing the program habitat section. The Council retained Section 7.6D because we believe it is important and needed.

G. Tributary Passage

Comment: Columbia Basin Fish and Wildlife Authority (629) modified a host of the tributary passage provisions in Section 7.10, and modified the passage and flow provisions in the Yakima Basin provisions of Section 7.11. The changes concern Sections 7.10D, Dryden Dam on the Wenatchee River, 7.10E, Green Peter and Foster Dams in the South and Middle Santiam Rivers, 7.10F, Willamette Falls on the Willamette River at Oregon City, 7.10G, Clackamas River Dams, 7.10H, Eugene Water and Electric Board’s Leaburg and Walterville Facilities on the McKenzie, 7.10J, Marmot Dam, Portland General Electric’s Bull Run/Sandy River project, 7.10K, Starbuck Dam, 7.10L, Passage into Historic Habitat (one change to add the Deschutes

to the list of subbasins to be evaluated), 7.11, Yakima River Basin, 7.11A, Additional Water Storage (delete references to re-regulating dams), 7.11B, Passage (implement passage recommendations), and 7.11C, Flows (implement minimum flow recommendations). In general, these program revisions update the situation at these projects, noting what evaluations have been completed, what project modifications have been called for, initiated or completed, what the next step is at various projects. These program revisions all tend toward a call for expedited study or, usually, installation or modification of facilities to introduce or improve juvenile or adult passage.

Response: Comments that were updating program language (i.e. deleting completed actions, incorporating results of actions called for, etc.) were incorporated. New actions could not be incorporated because they do not address recommendations that are the subject of this rulemaking.

Comment: Friends of the Cowlitz/Friends of the Toutle (287) asked for a variety of actions to establish salmon in various tributaries, minimize water diversion, improve spawning habitat, and develop other energy opportunities to replace hydro. Save Our Wild Salmon (628) proposed the systematic review of all existing dams that lie within or have blocked wild salmon habitat to determine whether they should remain in place. Save Our Wild Salmon asked for the removal of unnecessary dams, called for a moratorium on new dams in anadromous fish habitat, upgrading dams not removed with state-of-the-art fish passage, adequate flows, and watershed restoration funding to address past damage, and also suggested the decommissioning funds be obtained from owners and users.

Response: These topics should be addressed in updating subbasin plans and provided to the Council as projects through the subregional process.

Comment: There were a number of comments specifically directed at Enloe Dam. Columbia Basin Fish and Wildlife Authority (629) called for Okanogan Public Utility District to provide passage by the end of 1996 or dam removal completed by 1999, depending on which alternative provides the optimum anadromous fish access and in consultation with National Marine Fisheries Service, Yakamas, Colvilles, Columbia River Inter-Tribal Fish Commission, WDFW and USFWS (the same program language regarding Condit Dam submitted by American Rivers et al. (109, 715), discussed in the Findings). Okanogan County Public Utility District (753), however, commented that the Enloe Dam provision in tribal restoration plan subbasin plan failed to note that fish never scaled natural falls below the dam, and that first talk to the Canadians before providing passage into Canadian waters. Richard B. Price, attorney for Oroville-Tonasket Irrigation District, (704) commented that the Canadian government will oppose introduction of salmon stocks above Enloe Dam, that the natural falls below Enloe Dam blocked salmon runs before the dam existed and that the statement that Enloe Dam blocks 95 percent of anadromous habitat in Similkameen River is in error.

Response: The Council did not receive any recommendations regarding Enloe Dam, therefore, this is not an appropriate topic for the rulemaking. These comments should be addressed in updating the Okanagon subbasin plan.

Comment: Pacific Rim International (579) supported a comprehensive supplementation program and asked for continued consideration of their proposal for a captive broodstock program.

Response: The extent of supplementation and need for captive broodstock programs will be determined by the fish managers in updating subbasin plans.

H. Specific Production Proposals/Supplementation/Fall Chinook/Sockeye

Comment: In addition to its comments that envision most of the production planning, approval and implementation take place within the context of the subbasin planning process, Columbia Basin Fish and Wildlife Authority (629) made specific comments on production projects and supplementation as follows: Insert a new section 7.3B Final Planning and Implementation of High Priority Supplementation Experiments, calling for: 1) Fish managers to use supplementation guidelines in Chapter III.C of the Integrated System Plan and Regional Assessment of Supplementation to evaluate and plan for high priority supplementation projects, by June 30, 1995; 2) fish managers, following Council review, to implement the projects; 3) National Marine Fisheries Service to provide a schedule for expeditious review of projects for Endangered Species Act compliance; and 4) Bonneville to fund evaluation, risk assessment, planning and implementation of projects. Columbia Basin Fish and Wildlife Authority asked for expedited supplementation of Snake River fall chinook, Sections 7.5B.1, 7.5B.6-7; funds for project maintenance of the Umatilla facility, Section 7.4I, rather than construction and operation, as well as funding for construction and operation of juvenile release and adult holding facilities, Section 7.4J; and for Bonneville to fund Hood River Production Project, Nez Perce project, and Pelton Dam fish ladder project consistent with Council's 1992 letter. Columbia Basin Fish and Wildlife Authority asked for additions to: Section 7.4O.1 for the investigation of artificial spawning channels, on-site streamside incubators, acclimation ponds, and other technologies, coordinated with portable acclimation facility demonstration projects under 7.4F; Section 7.5A.1 to add various elements to Snake River sockeye project; and to include Wallowa and Warm Lakes in the feasibility study of sockeye reintroduction as well as to develop a protocol for fostering natural lake production. William Stelle of National Marine Fisheries Service (891) commented that supplementation should occur on an experimental basis and supported the Council's participation in the hatchery survey being prepared by Columbia Basin Fish and Wildlife Authority.

Response: The Council incorporated these requests into the program.

Comment: The Yakama Nation (730) generally agreed with Columbia Basin Fish and Wildlife Authority's comments on Section 7, with the following additions and exceptions: The Yakama Nation does not condone marking all hatchery-produced fish, either for genetic identification or for selective fisheries, Section 7.2D; National Marine Fisheries Service should not be the sole authority for determining when emergency actions are appropriate, Section 7.4C.2. The Yakama Nation remains unconvinced that the genetic refuge is a prudent or viable management strategy and suggested the deletion of Section 7.5C.

Response: The Council deleted Section 7.5C because of the lack of agreement that genetic refuge would be a viable management strategy. If, during the subregional planning process it is determined to be needed, it can be incorporated then. The Council asks National Marine Fisheries Service to develop guidelines in Section 7.4C for determining when immediate actions are required for emergency cases. The Council strongly suggests that National Marine Fisheries Service include opportunities for input by fishery managers and other interested parties when doing so. The Council believes that fishery managers should have the option to mark hatchery fish when to do so would assist in the protection, mitigation, and enhancement of fish.

Comment: Columbia River Inter-Tribal Fish Commission (729) deferred to the comments of the Yakamas, adding its support for a combination of production programs, including supplementation to the extent the region is unwilling to meet its obligation to protect, mitigate and enhance anadromous fish through direct reductions in mortality to anadromous fish populations.

Response: This comment is consistent with the program, which calls for a mix of measures for both hatchery and wild fish.

Comment: Upper Columbia United Tribes (585) asked for the deletion of Section 7.3A.2 commenting the Regional Assessment of Supplementation project has reached its useful end and the process does not further on-the-ground supplementation efforts. It also asked for the deletion of sockeye provision in Section 7.5A.1 stating the stock is functionally extinct so money is wasted as well as Section 7.5F stating sea-run cutthroat trout is found predominantly in rivers below Bonneville, so is not a ratepayer responsibility under Act.

Response: The Council declined to delete the sockeye provision in Section 7.5.A.1 as National Marine Fisheries Service has not come to Upper Columbia United Tribes' conclusion. This stock is endangered and the Council is obligated to use its efforts to protect, mitigate and enhance their survival. The Council finds that the Regional Assessment of Supplementation project provides training and tools to help evaluate situations and to determine if the problem will require supplementation or if, perhaps, improvement of habitat is required. Most anadromous fish are found in free-flowing tributaries of the lower Columbia. There has been a potentially substantial loss of cutthroat trout above Bonneville which is the responsibility of ratepayers to mitigate.

Comment: Doug Taki of Shoshone-Bannock Tribes (605, 606) opposed Columbia River Inter-Tribal Fish Commission's recommendation for the production of sockeye based on "technical" comments received as project leader of Shoshone-Bannock Tribes' sockeye research project, and not from Shoshone-Bannock Tribes policy-makers. He stated Shoshone-Bannock Tribes, in coordination with Idaho Department of Fish and Game, Sawtooth Basin Technical Oversight Committee and others have better understanding of specific habitat available in and the carrying capacity of each lake for sockeye production that supplementation based simply on massive numbers of smolts for each lake could have negative effects that far outweigh any recovery advances already made that Columbia River Inter-Tribal Fish Commission comments that due to "current broodstock rearing protocol" there are no true sockeye left and that there is a need to bring in sockeye from Columbia River stocks are false and opposite to all efforts made by Shoshone-Bannock Tribes and Idaho Department of Fish and Game to restore the unique ESU of endangered Snake sockeye, and that most recent genetic analyses do not show problems. Taki also stated that the Council should set interim rebuilding targets for sockeye of 1,000 naturally produced sockeye, and he noted that Shoshone-Bannock Tribes suggested to the Recovery Team a recovery goal of no less than a mean of 6000 adults over two life cycles returning to the upper Salmon Basin. Finally, he objected to the deletion of the specific reference to Shoshone-Bannock Tribes and Idaho Department of Fish and Game as entities to be funded for sockeye program in proposed revision to Section 7.5A.

The official comments of the Shoshone-Bannock Tribes echoed all of Taki's comments and added others. The Council's proposal to continue the Snake River sockeye captive broodstock program through a second generation should be evaluated with extreme caution to prevent stretching the progeny from such a small gene pool too far. They are in the process of combining their tributary harvest management framework with the integrated natural and artificial production needs of the Salmon River. The integration of salmon harvest and production management in the Columbia River Basin has remained unrefined too long. They want artificial production reform in the Salmon River system to include pathogen-free water, reduced or eliminated handling of the fish, the elimination of erythromycin injections of naturally spawning salmon, the development of techniques to obtain hatchery broodstock without trapping and handling the entire run at the hatchery weirs, and the development of low technology, natural rearing and release facilities. Shoshone-Bannock Tribes request Council support for progress towards the implementation of their natural production facilities and associated Tribal trainee programs in the Yankee Fork, Lemhi River, and Johnson Creek and need low-

technology, natural production facilities in place now for the 1996 and 1997 returns. Finally, the Shoshone-Bannock Tribes want to coordinate with the other resource managers in the Salmon River and Council support for this process.

Response: The Council added language to the program to address the concern about genetic risks of the Snake River sockeye captive broodstock program through a second generation. These comments address issues and concerns which should be brought up in the updating of the subbasin planning process. The Council suggests that the Shoshone-Bannock Tribes participate in those efforts.

Comment: Save Our Wild Salmon (628) asked for the following principles to guide conservation efforts while artificial propagation research and debate continue: (1) do no harm to wild salmon stocks; (2) for re-creating self-sustaining populations in natural waters, stock fish that are as locally adapted and undomesticated as possible in as small amount as possible for as few years as possible; and (3) operate, evaluate, and revise propagation programs as part of an ecological approach to fishery management. With these principles in mind, federal, tribal, state, and private managers of aquatic resources should develop stocking policies to implement management regimes for wild salmon. These policies should include: (1) complete a full inventory of the biological diversity of native salmonids in the region, and identify the habitat needs of each species for each life history stage; (2) natural production should be the region's top priority; stocking hatchery-produced salmonids should be done in accordance with the natural capacities and needs of the receiving waters and their biotic communities; (3) do not accept artificial production in lieu of habitat protection and restoration; (4) devise fish culture that is less domesticating; (5) rigorously monitor and evaluate stocking programs and act on results; (6) when sufficient reason exists to suspect that stocking will yield unsatisfactory returns or will harm a wild population, do not stock; and redirect funds saved by downsizing hatchery programs to other essential improvement programs, especially habitat preservation and restoration.

Response: The Council's program generally supports Save Our Wild Salmon's stated principles and addresses the above-stated policies to some degree, recognizing that there is no consistency among the agencies and tribes on these policies.

Comment: Columbia River Inter-Tribal Fish Commission and National Marine Fisheries Service (910) comments consisted of an exchange of letters and other information between Columbia River Inter-Tribal Fish Commission and National Marine Fisheries Service in September 1994, at the time of the U.S. v. Oregon conflict over the fall chinook fishery, concerning general agreement regarding fall chinook supplementation using Lyons Ferry hatchery stock (with newspaper article).

Response: The program language reflects the Columbia River Inter-Tribal Fish Commission and National Marine Fisheries Service agreement.

Comment: Corps of Engineers (728) supported production goals in the Integrated System Plan. Corps of Engineers also stated the ongoing programmatic Environmental Impact Statement for hatchery production could address most of the supplementation issues, and that Lyons Ferry is essentially a Snake River fall Chinook supplementation/captive breeding hatchery and changes in management at the hatchery could be used to accomplish the Council's goals. Pacific Northwest Utilities Conference Committee (733) supports "reprogramming Lyons Ferry fall chinook production into supplementation in the Hells Canyon reach."

Response: These comments should be brought to the subbasin planning process.

Comment: Idaho Department of Fish and Game submitted two issue papers discussing strategies for preserving weak stocks: “Recovery Plan Recommendations for Hatchery Production” (1994) and “Operation of Compensation Hatcheries with a Conservation Framework” (1993). The first report explains how to use hatchery and natural production in combination to preserve genetic diversity within the Snake River spring/summer chinook. Its approach is to make limited use of hatcheries as an interim tool to preserve the stocks pending improvements in migration habitat conditions. The second report analyzes using supplementation consistent with genetic considerations to optimize production of mixed hatchery/natural stocks. Both papers recognize that the productivity bottleneck constraining adult returns is caused by poor migration survival. Columbia River Inter-Tribal Fish Commission submitted five papers in support of the concept of outplanting. The first discusses the status of Columbia Basin salmon stocks based on redd counts. The second describes a risk-based protocol for supplementation of barren habitat and diminished salmon populations. The third concludes that achieving the doubling goal requires an increase in egg-to-smolt survival as well as changes in the hydropower system. The fourth proposes standards for a workable conservation unit for salmon, and argues that extirpation is likely if such a unit is not developed. The fifth provides a modeling tool for screening proposed supplementation projects and evaluating existing projects.

Response: These are excellent discussion papers and should be used and reviewed by the agencies and tribes in the updating of the Columbia and Snake subregional planning and subbasin plans. These papers should also be reviewed by National Marine Fisheries Service, particularly where there are differences in policy in the use of artificial propagation under the Endangered Species Act.

I. General Comments on Hatchery Programs and Production

Some commentors supported hatchery operations as being an important way to make up for system losses of fish, while others criticized them as potentially doing further damage.

Comment: Northwest Forest Resource Council (867) stated that 1) artificial production is the only way to make up for the loss of over 30 percent of historical base habitat regardless of system losses and 2) to overcome the problems caused by past hatchery practices, concerted fisheries management efforts have to be made today to use hatchery production programs that are complementary to wild fish populations.

Response: The Council agrees and the program recognizes that we cannot reach our doubling goal with natural production alone, but must use hatchery production in such a way as to complement and rebuild wild fish production.

Comment: Upper Columbia United Tribes comment asked for the deletion of the requirement in Section 7.4B.1 for hatchery master plans. Upper Columbia United Tribes stated the process has delayed low capital Coeur d’Alene hatchery and will delay others, expressing the concern that if it continues, “it is likely that cutthroat and bull trout in tributaries of the Coeur d’Alene Reservation will be extirpated.”

Response: The Council did not delete the requirement for hatchery master plans. The measure (7.4B.1) only calls for detailed master plans where there is not a National Environmental Policy Act or Endangered Species Act document that provides enough information to evaluate new artificial production projects. The Council wants the process to move more quickly and is encouraging the speedy development of master plans. Delays which occurred in the past were caused not so much by the requirement of a master plan, but by lack of consensus on production objectives and methods and the lack of basic biological information.

Comment: Direct Service Industries (749) commented current hatchery operations harm wild salmon stocks and pointed out there are few proposed amendments for hatchery issues. They commented that immediate reductions in hatchery production injuring wild salmon stocks would be appropriate.

Response: The program contains several measures focused on improving hatchery operations (see Section 7.2 Improve Existing Hatchery Production), including but not limited to the formation of the Integrated Hatchery Operations Team and the development of hatchery policies, performance standards and an independent audit of hatcheries for compliance. There are several measures related to questions of carrying capacity and biological interactions between wild and hatchery fish. As a result of the listing of some salmon stocks under the Endangered Species Act, ongoing hatchery programs are being reviewed and programs modified.

Comment: Pacific Northwest Utilities Conference Committee (733) commented that hatchery operations should be altered and enhanced to support terminal fisheries, to improve hatchery fish quality and survival and to avoid negative impacts to natural populations; implement hatchery audit process proposed by Integrated Hatchery Operations Team on a more aggressive schedule than Integrated Hatchery Operations Team suggested.

Response: The Council agrees with the Pacific Northwest Utilities Conference Committee comments on the need to change hatchery operations and has included several measures to facilitate these changes. The Council encourages timely hatchery audits and has asked for such audits at least once every three years.

Comment: Chelan County Public Utility District (622) questioned the scientific justification for studying the effects of high-level sound on survival of hatchery fish, and the Corps of Engineers (728) supported increased research on hatchery noise levels. The Corps of Engineers suggested the establishment of a hatchery management committee to unify state and federal hatchery production methods, and goals for the Columbia River Basin, but does not support reprogramming to shift lower-river production upriver until questions of competitive effects of natural production are answered.

Response: The Council has called for a study to find out if noise is a problem for fish survival, such study to be completed as quickly as possible. The Council agrees there is a need to unify state and federal hatchery production methods and believes that Integrated Hatchery Operations Team committees can fill that role. The Council has asked for studies to be initiated concerning carrying capacity and to examine the competitive effects of hatchery production on native stocks.

V. HARVEST

Comments: Pacific Northwest Waterways Association (580) said to mark all hatchery fish and allow inriver commercial harvest only of hatchery fish.

Response: The Council's program (8.3D.3) provides for the marking of all hatchery-reared chinook to facilitate selective harvest in the future, pursuant to the findings from the marking feasibility study called for in 7.2D.3. The program also contains other measures (see Section 8.3 Develop Alternative Harvest Opportunities) to facilitate selective harvest of hatchery fish while letting weak or listed stocks return to the spawning grounds.

Comments: Upper Columbia United Tribes (585) said that ratepayers should not fund a commercial fishing buy-back program; Upper Columbia United Tribes members who lost fishing opportunities by lower river interceptions and by Grand Coulee construction were never compensated; if buy-back program continues, upper river tribes are entitled to a compensation program; states should employ instead the concept of limited-entry fisheries, revoking or refusing to renew licenses to get numbers down; delete Section 8.5C.2, which provides for expanded enforcement program to protect weak stocks, as no data to show this program is effective; last sentence in Section 8.5F, concerning increasing abundance of some Canadian runs, may need to be changed in light of recent news about dramatically lower than expected returns of sockeye.

Response: The Council's buy-back and lease-back measures are designed to secure a voluntary reduction of harvest over and above what the Council has identified as a "fair share" in the reduction of overall mortality needed to recover weak and listed stocks. These measures are not designed to redress compensation levels for fishers who have lost opportunities to harvest salmon as a result of impassable dams. The Council's program does contain measures that provide for resident fish substitutions in such cases. Entry into the existing commercial salmon fisheries in the ocean and Columbia River is limited to a certain number of permits by the states. Fishery managers in Oregon must reissue permits to qualified fishers when the number of permits drop a below level established by the state legislature. The Council's program allows for a voluntary and temporary suspension of permits (lease-back) or a buy-back of permits above the minimum level required by the state. The Council reviews the enhanced law enforcement program annually but has not come to a conclusion as to its overall effectiveness. There may be a opportunities to increase law enforcement efforts in the area of habitat protection while scaling back fisheries enforcement. The Council believes that the statement about the increasing abundance of some Canadian salmon stocks being intercepted by fishers from the United States is accurate. Annual variation around an increasing trend is to be expected.

Comments: Washington Trollers Association (603) said, regarding Section 8 of the program, that the "almost total lack of scientific data make meaningful comments difficult."

Response: Measures calling for a reduction of harvest or a change in the location of harvest or the continuation of existing fishing regimes in some cases are based on data bases retained by the fishery managers. Where the Council called for a reduction in harvest, it was not prescriptive but left to the fishery managers (including their scientific data bases) to determine how best to manage the fisheries. For many of the measures that related to improving harvest management, the Council asked the fishery managers to evaluate the need for additional information and return to the Council with their suggestions.

Comments: Columbia Basin Fish and Wildlife Authority (629) did not change or comment on a number of the proposed harvest amendments; these provisions are not noted here. Columbia Basin Fish and Wildlife Authority also made a number of changes to other proposed harvest provisions, which are broken down as follows:

Comment: Editorial changes to introduction for Section 8: Removed references to alternative capture technology (because there are no corresponding measures) and mass marking (which would cause more damage than representational marking). Delete reference in introduction to Section 8 and in Section 8.5D to include Idaho and upper river tribes in the Columbia River Compact, which would conflict with *U.S. v. Oregon* and treaty rights.

Response: The Council's program included measures for developing alternative harvest opportunities, but the measure titles were not always descriptive (see Section 8.3 Develop Alternative Harvest Opportunities). Expanding membership in the Columbia River Compact, which establishes commercial fishing regulations, is not intended to conflict with *U.S. v. Oregon* but only allows the state of Idaho and other Indian Tribes to participate in fishery management decisions that directly impact production and harvest activities in their areas.

Comment: Section 8.1: Change measure 8.1A.2 to provide "management goals and timelines" for Snake River chinook and sockeye as opposed to "providing explicit protection." Change measure 8.1A.4 to provide closure of ocean salmon fisheries as needed for protection of Snake River fall chinook. They felt measure as written was too prescriptive. Delete measure 8.1A.6 concerning management restrictions based on amount of information available to manage the fishery as it "contravenes the statutory management and operational responsibilities of the fishery management agencies and is unacceptable."

Response: No change was made in measure 8.1A.2 as the existing language signifies a greater level of protection than establishing "goals and guidelines." The Council agreed with Columbia Basin Fish and Wildlife Authority that measure 8.1A.4 was too prescriptive and it was rewritten. Measure 8.1A.6 was retained as written because it provides an example of how fishery managers could approach more conservative management of harvest and it is not intended to be prescriptive or "contravene the statutory management and operational responsibilities of the fishery management agencies."

Comment: Section 8.2: Delete last paragraph under 8.2 "Fishery managers should adopt more conservative.....of fishing effort" because it "contravenes the statutory management and operational responsibilities of the fishery management agencies." Delete reference in Section 8.2B.1 to fishery above Snake confluence as inconsistent with treaty rights; *U.S. v. Oregon* is the best place to address this issue. Also, the proposed language appears to condition "usual and accustomed" fishing areas. Deleted Option 2 in Section 8.2C Fall Chinook but did not provide a rationale. Deleted 8.2F.6 calling for pass through of harvest savings because this issue must be dealt with in *U.S. v. Oregon*.

Response: The last paragraph in the introduction to Section 8.2 was retained to provide general guidance to harvest managers that more conservative regulations are need to help ensure increases in the escapement of weak and listed stocks. We agree that *U.S. v. Oregon* is the best form to discuss the harvest strategies for sockeye. The original language was not changed to highlight the area above the confluence of the Snake River as a possible site. The Council acknowledged the treaty right by including the language "while respecting tribal treaty rights" in the original draft. Option 2 was deleted because of the uncertain impact on fisheries, particularly treaty fisheries, if there is no reduction in the Canadian fisheries intercepting Snake River fall chinook. The Council added language to reduce the exploitation rate below 50 percent and linked harvest "to measures of recent productivity and recent and projected escapement." Measure 8.2F.6 was not deleted because the Council believes that the actions called for are needed if lease-back and buy-back are to be implemented. The fishery managers are free to use whatever forum most appropriate, including *U.S. v. Oregon*.

Comment: Section 8.3: Delete the proposal for a direct subsidy to known-stock fisheries in Measure 8.3A.1, as such a direct subsidy “will compete with higher priority Program needs and is not appropriate.” Modified Measure Section 8.3A.2 to make a more ‘affirmative statement.’ In terminal fishery study (Measure 8.3C.1), deleted reference to experimental fish releases, as the measure is only for a feasibility study and the release of fish “would be an implementation action and in this instance would probably violate genetic impact and supplementation guidelines.”

Response: In Measure 8.3A.1, the Council retained the provision for subsidies because they believed them to be important for having the participation by fishers. The question of priority will be dealt with later in the Implementation Planning Process. The Council believed that it was necessary to provide a standard for “adequately managed” and in this situation the Council choose “...harvest at levels exceeding those in this program or where the release of fish would aggravate mixed stock fishery problems.” The release of experimental fish was retained in Measure 8.3C.1. The release of fish is necessary to fully evaluate the “potential” of terminal fishing sites. If the releases “violate genetic impacts and supplementation guidelines,” then the site is probably not suitable and no releases would be made.

Comment: Section 8.4: Revise proposed Measure 8.4C.3 to reflect that Bonneville will fund fishery managers to refine estimates of abundance and fishery impacts. Section 8.4D to reduce harvest of non-targeted species puts an impossible burden on fish managers and may contravene their authorities; instead, fund fish managers to study strategies for achieving this objective.

Response: Measure 8.4C.3 and 8.4C.4 now correctly show the Implementor to be the fishery managers and the funding source to Bonneville and the United States Department of Commerce. The Council is asking the fishery managers to study the problem with “the goal of reducing genetic impacts of harvest.” in 8.4D.2. Measure 8.4D.1 (now 8.5B.2) was retained as written because the Council is asking only for a report based on existing data sources.

Comment: Section 8.5F: Delete Measure 8.5F.4 because measure “appears to contravene the statutory management and operational responsibilities of the fishery management agencies and Tribes.”

Response: This measure was retained because the Council believes that additional reductions in U.S. fisheries will be necessary, “absent further reductions in harvest in Canadian fisheries.” The Council is not telling the fishery managers how to make the needed reductions.

Comment: Corps of Engineers (728) -- The Corps of Engineers also supports opening of the *U.S. v. Oregon* proceedings.

Response: The court has jurisdiction over the parties with standing in *U.S. v. Oregon*. It is our understanding that the Technical Advisory Committee (harvest management issues) and the Production Advisory Committee (natural and hatchery production issues) are open to observers. The Council has no legal standing with respect any aspect of *U.S. v Oregon* proceedings.

Comments: Direct Service Industries (749) said that the first step toward salmon recovery is marking hatchery fish and requiring selective harvest, which can be achieved promptly through methods employed for decades in the basin. A principal problem has been lack of implementation of program measures, such as the one calling for marking all hatchery-reared chinook by 1995 to facilitate selective harvest. There is no more important step that can be taken to improve salmon populations in the Columbia Basin, and the Council should feel even more urgency about making these changes than in engaging in vast

experiments on flow and survival. Bonneville Power Administration's program to reduce illegal harvest has had dramatic positive results in reducing interdam losses, but it makes no sense for Bonneville Power Administration ratepayers to pay the states to enforce their own laws.

Response: The program does contain a measure calling for the marking of all hatchery-reared chinook by 1995 pursuant to findings from the marking feasibility project called for in 7.2D.3. In the final analysis, it will be the managers decision as to what stocks to mark for selective harvest to complement their overall management program. The Council believes that enhanced law enforcement is appropriate for Bonneville funding. The fishery agencies had an existing program that needed to be enhanced to help reduce mortality between dams. If the dams were not in the river, additional enforcement efforts might not be needed.

Comments: Bonneville Power Administration (750) said that the harvest section is a mix of related ideas and measures, rather than a cohesive and comprehensive treatment of harvest management; preservation of genetic diversity and limits on mixed stocked fisheries and on harvest of weak stocks should be coordinating philosophy of this section of the program. Sport fisheries and U.S./Canada treaty negotiations should be separate measures, not grouped under Section 8.5 (Pursue Other Harvest Measures).

Response: Several formatting and language changes were made to address some of Bonneville Power Administration's general and specific comments.

Comments: Bonneville Power Administration's limited funds would be better spent aiding the fishing industry by developing terminal fisheries and by researching terminal gear technology than by funding the lease-back or buy-back of fishing licenses; if a buyout of Zone 1-5 licenses were implemented, there would have to be agreement that the fish could pass through Zone 6.

Response: The Council believes that all of the above measures should be implemented. A new measure was added to specifically address the need to "pass through" to the spawning grounds weak stocks saved by reductions in fishing capacity or intensity (see Measure 8.2F.6).

Comment: Washington Department of Fish and Wildlife (751) endorses Columbia Basin Fish and Wildlife Authority's comments on the Fish and Wildlife Program. The department suggests the inclusion of language extracted from the Recovery Team's Recommendations as follows:

"Fisheries managers should establish an exploitation rate schedule over all fisheries affecting Snake River fall chinook. The allowable exploitation rate in any given year should be directly linked to measures of recent productivity and escapement. The schedule should reflect the ultimate intent of restoring runs to levels that can sustain spawning escapement objectives and healthy fisheries."

Response: The Council agrees and a slightly modified version of this language was added to Section 8 (see Measure 8.2C.1).

Comments: Idaho Department of Fish and Game (766) said that its Anadromous Fish Management Plan, 1992-1996, encourages the restoration of sport and treaty fisheries for salmon and steelhead in light of short- and long-term utilization objectives developed by public advisory groups and Idaho tribes. Harvest in ocean and Columbia River fisheries is identified as one of three major mortality factors and, being human-caused, can be reduced. The Idaho Plan proposes to integrate and coordinate Idaho anadromous fish management with the remainder of the Columbia River Basin. Fisheries policies and principles from the Idaho

Department of Fish and Game Policy Plan, 1990-2005, are also included to provide for tribal and non-tribal long-term fishery benefits of natural, wild and hatchery stocks. Commercial fishing in Idaho will not be permitted. Efforts should continue to modify Columbia River and ocean harvest processes.

Response: Many of the measures in Section 8 respond to Idaho's concern about reducing fishing mortality and improving the processes and data used in harvest management.

Comments: Northwest Forest Resource Council (867) included a copy of its comments on the PACFISH Environmental Impact Statement; the harvest comments focused on reducing Canadian interception of northwest salmon relative to U.S. fisheries. Analysis of total marine mortality is partitioned into commercial catch and incidental fishing mortality. The overall suggestion is to "reduce excessive mortality rates while protecting, enhancing, and restoring freshwater salmonid habitat."

Response: The array of measures developed for Section 8 are focused on controlling fishing mortality while seeking ways to harvest the more robust stocks of salmon.

William Stelle, National Marine Fisheries Service (891) said that harvest is problematic; need to develop unified policies; need to meet rebuilding goals under Pacific Salmon Treaty.

Response: The array of measures developed for Section 8 are focused on controlling fishing mortality while seeking ways to harvest the more robust stocks of salmon. These measures should complement the policies developed by the National Marine Fisheries Service. The Council also considered the report of the Recovery Team in amending Section 8.

VI. COSTS/COST EFFECTIVENESS/FUNDING

A. Cost Estimates/Cost Analysis Issues/Cost Effectiveness and Methodology

Comment: Idaho (766) commented that the Corps of Engineers is biased against drawdown and its cost and timelines are too high and long, attaching as an appendix the December 1993 analysis by its construction consultant Edward McLean, "Lower Snake River Drawdown: Comparison Study of Estimated Construction Cost and Construction Schedule," which shows much lower costs and construction times.

Don Reading, Idaho's consulting economist also commented on the cost of drawdowns; most drawdown costs are power costs (which include capital costs to modify the dams as well as lost power production), and that is the best basis for comparing alternatives; System Operation Review and Huppert reports agree that the cost of a two-month, four-pool drawdown would be about \$150 million -- about a 5-8 percent wholesale rate increase; Natural Resources Defense Council estimated the cost much lower (\$116 million regionally, \$50 million to the West), for a 5-6 percent rate increase; Council staff's higher estimate results from: (1) staff's use of the Salmon Strategy as the base period; (2) staff assumes a wider range of actions in addition to drawdown; and (3) staff's assumptions (level of real interest rates, number of years for pay-back, and value selected for levelization) are more pessimistic; even under Council staff's analysis, however, there would be a 9-10 percent rate increase, bringing rates back to where they were 10 years ago in real terms, and at half the national average. Mr. Reading also offered a table showing cost-effectiveness of various options, with drawdowns more cost-effective than heavy flow augmentation or heavy transportation.

Regarding the use of the Environmental Defense Fund's cost-effectiveness analysis in selecting flow augmentation measures, Idaho Department of Fish and Game believes it would be unduly rigid for the Council to require this or any other particular methodology, especially where the method is largely undefined. Idaho Department of Fish and Game has a number of specific concerns about the Environmental Defense Fund methodology, especially the "decay" function that reduced the biological benefits of an alternative for each year it was delayed in implementation, an approach that seemed to put a premium on land fallowing and other non-structural approaches and biased against structural approaches; also questioned the reliance on the System Configuration Study, which substantially overstates the cost of drawdown. Moreover, acquiring the amount of water Environmental Defense Fund identifies through land fallowing is simply unrealistic, especially the shorter time period for acquisition used; delays and political obstacles could be very long and high, which needs to be considered in the analysis. Finally, the report does not analyze the likelihood that each option would achieve rebuilding goals, or some other biological standard. It would be better for the Council to include a more general directive in the program to consider costs and benefits.

Response: The Council received numerous criticisms of the cost estimates prepared by the Corps of Engineers. It used the Corps of Engineers' estimates, however, where available to compare the cost of recommended measures. The Council used the Corps of Engineers' estimates because of the level of detail generally provided and the ability to compare between alternatives. Comments, such as those referred to by the State of Idaho, which challenged the estimates, were useful for suggesting means of shortening construction schedules and reducing costs. The Council suggests that these comments be incorporated into project designs and future evaluations.

With respect to the comment on the Environmental Defense Fund analysis, this comment was considered in the provisions for obtaining Upper Snake river water for flow augmentation, and appropriate changes were made. The Bureau of Reclamation and Bonneville are encouraged to use a variety of mechanisms to secure water from willing sellers.

B. Funding Issues

Comment: Bureau of Reclamation (595) said that it does not have authority nor a source of funding to mitigate for fish losses when drafting limits are exceeded at Hungry Horse for flood control requirements, as stated in Section 10.3A.7; Corps of Engineers has flood control responsibility for whole basin, and Bureau operates Hungry Horse as directed by Corps of Engineers for flood control purposes. Congressional authorization would be necessary in either case.

Response: The referenced assignment of responsibility was an element of the existing program. The reference to the Bureau of Reclamation was changed in this amendment process to refer to the Corps of Engineers. The Council will review with the Corps of Engineers any questions about the need for Congressional authorization.

Comment: Doug Taki, of Shoshone-Bannock Tribes (605) objected to the deletion of the specific reference to Shoshone-Bannock Tribes and Idaho Department of Fish and Game as entities to be funded for sockeye program in proposed revision to Section 7.5A.

Response: The amended language identifies the various entities involved in the current sockeye program. In general, the Council prefers to structure measures so that specific entities are not identified to be funded to implement the measure. In this way, participation of additional entities, such as is the case with the sockeye program, can be obtained.

Comment: Columbia Basin Fish and Wildlife Authority (629) said, with regard to the issue of economic mitigation in Section 9, that the appointment of an economic transition and renewal panel is premature, given uncertainties in the fish and wildlife program, biological opinions, the Endangered Species Act recovery plan and the settlement in *Idaho, et al. v. National Marine Fisheries Service*; reconsider when the impacts of these initiatives are clearer.

Response: The necessary work to develop a mitigation strategy will be complicated and difficult. The Council expects that, by identifying responsible entities and a schedule for developing a strategy, the needed work can occur to speed implementation of the program.

Comment: Washington Department of Transportation (703) said that if drawdowns take place, it “strongly supports” mitigation plans to address direct and secondary impacts to physical facilities.

Response: The Council continues to call for mechanisms to provide this mitigation as an element of the program.

Comment: Pacific Northwest Generating Cooperative (719) opposed the amendments to Section 9 concerning economic mitigation plans; language of Act and legislative history clearly demonstrate that Council has no authority under the Act to compensate any party for fisheries or cultural losses.

Response: The Council acknowledges that it lacks authority to direct mitigation for such losses. However, the Council believes that such mitigation is appropriate and desirable given potentially disproportionate impacts to these and other sectors.

Comment: Corps of Engineers (728) said the Council should continue to support Bonneville’s recouping of costs and continued investment of appropriated funds by the Corps of Engineers and other implementors. In some cases consideration should be given to cost sharing as already provided for in statutes pertaining to the Federal action agencies. The costs should be borne equitably by all parties; e.g., the use of irrigation water will have to be considered or it will not be possible for salmon restoration to occur.

Response: The Council provides for continuation of the current procedure for appropriating funds for dam modifications and other measures implemented by the Corps of Engineers. These costs are then repaid according to the designated allocation for hydropower as a share of the project purposes. The Council attempted to identify opportunities for additional cost sharing of those measures that do not have clear provisions in law allocating repayment or distribution of expenses. In addition, the Council believes additional federal assistance is needed to allow Bonneville to fund and repay its share of these measures without becoming an uneconomical supplier of electricity.

Comment: Public Power Council (731) said the Council should determine the extent of the hydropower-related effect on the salmon runs and focus on achieving sound biological objectives at the minimum economic cost; when the subject of funding salmon measures does come up, Public Power Council expects to support full utilization of Section 4(h)(10)(c) of the Northwest Power Act. Chances of obtaining significant amounts of money from taxpayers seem remote; instead of searching for more funding, the Council and region ought to be searching for cost controls, budget limitation and elimination of unnecessary projects as a way to lower costs. Council should not assume it can rely on Bonneville Power Administration transmission services for revenue to fund fish and wildlife measures.

Response: In 1987, the Council estimated the extent of the losses of salmon due to construction and operation of the hydroelectric system. The Council addresses the use of biological objectives for the selection of measures in Section 4 of the revised program. The Council is determined to review the ability to adjust or reallocate current program funding to implement the added measures in this program. Doing so requires more information about current contracts than Bonneville has provided to date. The Council supports the use of the mechanisms provided by Section 4(h)(10)(c) to provide assistance for program funding and incorporated this expectation into the discussion of program funding in Section 1. The Council has not eliminated from consideration any alternative source of funding for program implementation. Additional discussions are needed.

Comment: Bonneville Power Administration (750) said the allocation of expenses under Section 4(h)(10)(c) is vital to its ability to fulfill the purposes of the Northwest Power Act; Bonneville needs the Council's support for implementation of this section; Bonneville has thoroughly interpreted this section, and the Council should not adopt a contrary interpretation; Bonneville Power Administration's allocation under Section 4(h)(10)(c) is properly limited to amounts expended under Section 4 and should not include lost revenues.

Bonneville Power Administration opposes the assignment of all or most program funding authority to ratepayers; this assignment is based on the concept that the doubling goal is within historic loss estimates due to hydropower; if a historic loss estimate is used to allocate costs, hydropower losses should bear their proportionate amount; hydropower share in the Columbia system should be estimated in comparison to declines in stocks in non-hydro basins; mitigation costs should be shared each year among river operators and fishery management agencies to encourage a common interest in efficient solutions.

The Council is correct that there are myriad potential funding sources for habitat improvements; region needs to work further to clarify the distinctions between the roles of funding agencies; off-site mitigation funded by Bonneville Power Administration should be directly linked to credit for hydrosystem mitigation; the Council should take this opportunity to promote and develop cost sharing of watershed enhancement activities.; delete Section 7.6.D., Expedited Process for Funding Projects, because it does not conform to the principles of biological and cost accountability; Council's program emphasizes coordinated watershed planning, and it is out of the watershed planning programs and processes that priorities for expedited funding will arise.

Council should delete Section 9 from the program; economic mitigation is not appropriate for the program because it neither protects, mitigates or enhances fish and wildlife, nor does it ensure an adequate, efficient, economic, reliable power supply; other funding sources, not Bonneville Power Administration, should fund economic mitigation; focus of economic mitigation should be on facilitating the transition from one economic structure to another, not on "mitigating disproportionate impacts" or compensating for "economic and cultural losses"; there does not appear to be any established process for spreading the impact of any costs beyond Bonneville Power Administration ratepayers, and so it is inappropriate to say such a process is "readily available."

Response: The Council views the mechanism of Section 4(h)(10)(c) as a potential means to preserve Bonneville's ability to provide an economical power supply while funding the implementation of these additional measures. The Council has not had the opportunity to thoroughly review Bonneville's interpretation of the language and has not developed a conflicting interpretation. The Council will place a high priority on assisting Bonneville in implementing use of the section.

Bonneville is correct that the doubling goal is within the historic loss estimates for the hydropower system. An accurate discussion of the relative distribution of costs for salmon rebuilding measures would

require additional estimates of costs, losses and economic impacts to other industries, land owners, tribes, and land and water management agencies; both within the Columbia River system and in other basins. The Council did not receive any summaries of direct costs or economic impacts that would have supported such a deliberation of relative allocations in this rulemaking. The Council agrees that there should be a common interest among all parties in efficient solutions but did not generally assign to the officials charged with resource management a share of the costs for redressing past impacts from development of the Columbia River Basin.

The Council accepts the general comments concerning identification of alternative funding sources and participation in watershed enhancement activities and other measures. The Council has separately pursued developing improved planning and implementation coordination with Bonneville and other parties. The Council expects these efforts to continue and has assigned staff to do so.

The Council did not delete section 7.6.D because it views the measure as improving implementation. The measure should incorporate management improvements and efficiencies and should not violate any principles of biological and cost accountability. It simply seeks a mechanism to get agreed-upon projects implemented more quickly.

The Council did not delete Section 9. The Council acknowledges that it does not have directive authority for economic mitigation. However, the Council believes that appropriate mitigation is necessary for orderly implementation of the program. The comment correctly identifies the uncertainties present in this effort. It is for that reason that the Council seeks to convene the best assistance available for regional development of an economic mitigation strategy.

Comment: Direct Service Industries (759) said that Bonneville Power Administration ratepayers are paying to offset the effects of drought, overfishing, Idaho water withdrawal, and other habitat degradation in ways that were never intended by Congress, are unlawful, and are destroying Bonneville Power Administration's competitiveness; Bonneville Power Administration ratepayers are obligated to pay only for measures to mitigate losses caused by the dams, not for fish enhancement costs. Estimates for historic losses associated with hydropower are grossly inflated, and do not take into account habitat, harvest and other factors that depleted populations. Also, given the estimates that of the total loss attributable to the dams (whatever it is), about half of the historic salmon loss is due to the effects of mainstem dams on migration and the other half is the result of lost habitat as the result of no fish passage at Chief Joseph and Hells Canyon, then ratepayers should only have to pay half as much as they are now. Council should do a better job of assessing the contributions to salmon recovery that should be made by others, and then bring public scrutiny to bear on the agencies and tribes for failing to implement Council program measures.

Response: The Council did not revisit the assessment of historic losses, which the Council developed in a process that included extensive public review in 1986. While this comment, and others, asserted that these estimates are incorrect, there was no alternative evaluation offered. The Council attributes a significant portion of historic losses to loss of habitat due to dam construction as well as losses due to impacts on survival through the hydropower system. These losses, taken together, form the obligation for mitigation borne by the power system.

The Council agrees that a better job should be done in assessing the contributions made by others to salmon recovery. Additional effort is needed on the part of all who benefit from the system. At the same time, the contributions of others through direct contributions, volunteering, restriction and loss of economic and cultural uses and other participation is poorly understood and displayed. The Council adopted several measures specifically addressing this need. For its part, the Council will continue to develop its monitoring of program implementation and efforts to promote participation.

Comment: Idaho (766) opposed the use of program funding for new habitat projects on federal lands except where benefits are exceptional and alternative funding sources have first been explored.

Response: The Council adopted revisions to its subregional planning approach to integrate land and water management. The Council believes that a certain level of Bonneville funding on federal lands is appropriate, particularly where it acts as a catalyst for larger effort. Appropriate management direction should be in place. The Council expects that cost sharing will be incorporated and that provisions for long term operations and maintenance are established when ratepayer funding is contributed. The Council's cost estimates assumed a moderate increase in Bonneville funding for habitat projects.

Comment: Lincoln County, Montana (Libby) Board of County Commissioners (598) said that electrical rates will increase and system reliability will decrease for most options, and both will adversely affect residents and businesses in northwestern Montana and "may drastically affect the competitiveness and viability of some major employers"; Council should consider a "reduced rate for communities making major sacrifices for the dams located in their areas."

Response: The Council's analysis of rate impacts from implementing these additional measures is in Appendix B. Bonneville's rate structure is determined through its ratemaking procedure. The Council adopted the measures in Section 9 to direct a coordinated regional consideration of disproportionate local impacts resulting from the implementation of these measures.

VII. POWER PLANNING ISSUES/POWER SYSTEM IMPACTS

A. Power System Impacts/Energy Cost Estimates/General Power System Issues

Comment: Pacific Northwest Utilities Conference Committee (733) -- After all non-power constraints are met, maximize system availability, reliability, flexibility, and efficiency; follow rules of Pacific Northwest Coordination Act; refill by July 31 to meet following year's power and fish needs; maintain needed flexibility to meet hourly demands.

Response: With the adopted measures, not all projects are not able to meet refill objectives by July 31. There are specific July elevations specified for Dworshak and Grand Coulee, for example, that allow drafting to meet July and August flow objectives. The Council did provide language clarifying the operators' ability to maintain flexibility to meet hourly demands.

Comment: Direct Service Industries (749) said that various flow options and recommendations call for incorporating flow measures into firm planning, but that could substantially increase the cost of salmon measures. The Council offers no rationale for incorporating flow measures into firm planning, while river operators need the flexibility to implement measures however is best suited to maximizing the power system. This suggestion should be dropped.

Response: The only measures that Council calls for incorporation into firm planning are the original 1984 water budget (including the 1 million acre feet draft from Dworshak) and drafts at Grand Coulee to 1280

feet above mean sea level and Dworshak to 1520 feet above mean sea level in July. The remainder of the flow augmentation measures are to be provided through operational management.

Comment: Bonneville Power Administration (750) is unsure how the Council determined the rate increase estimates presented in the amendment; at a minimum, this process should be fully described for public review; also, Bonneville Power Administration expects that the rate increase estimates in the amendment may be understated because they do not capture the risk of bad years; it should also be made explicit that the cost increases calculated are regional and that the full cost of these increases is assumed to be paid by Bonneville Power Administration ratepayers.

In the summary of effects of reservoir elevations, effects on Treaty reservoirs should be described to avoid giving the impression that there are none; also, the results of the Detailed Fishery Operations Plan analysis do not make clear whether Canadian storage was used.

In Appendix B-1, the cost of replacing lost Firm Energy Load Carrying Capability is assessed at 35 mills per kilowatt hour minus any salvage value, which implies the acquisition of a non-displaceable, non-dispatchable resource; this seems inappropriate for any of the options; in all cases, a displaceable resource, such as a combustion turbine, should be used to replace lost firm energy load carrying capability, as was done in Option 4.

The Council appears to have assumed that the lost hydro energy-producing capability can be replaced megawatt-hour for megawatt-hour with power purchases or combustion turbines. Bonneville does not think that is true.

To analyze the power impacts of the drawdown alternatives, Snake flows must be measured at Ice Harbor Dam, not Lower Granite; the effects of drafting and refilling for drawdown alternatives are not apparent at Lower Granite, but would be at Ice Harbor.

Response: The Council used the same method to develop estimates of potential rate impacts as it has in previous rulemakings. Modeling of power system changes is calculated using power system models. Estimates of non power system changes are provided from amendment proponents, comment, and staff estimates. These are then interpreted as rate impacts using calculations of adjustments to Bonneville's revenue requirements. The assumptions used for these estimates are available as part of the Council's record. In estimating potential rate impacts from the measures, the Council did not assume that Bonneville would pay the full regional costs of power system impacts; only the portion of impacts to the federal power system. The Council is familiar with the risk of bad years. However, these are properly an element of rate design where revenue requirements are considered along with the probability of poor water and poor markets as part of an overall risk assessment.

The effects of measures on Treaty reservoirs were not displayed in the staff summary. For brevity, the summary displayed effects on major U.S. storage reservoirs of significant concern. The effects on Canadian reservoirs were calculated and are available as part of the Council's record.

The Council acknowledges the comment on the estimate for replacing lost Firm Energy Load Carrying Capacity. The Council revised its assumptions and now assumes replacement by dispatchable, displaceable combustion turbines.

The comment expressed a valid concern about the assumption of replacing lost hydro energy-producing capability on a megawatt-hour for megawatt-hour basis. However, changing this assumption will require a revision to policies guiding Pacific Northwest power planning. Current practices use the flexibility of

the hydro system to make up differences on a one-to-one basis. The Council recognizes that the region is quickly running out of this flexibility and will address this issue in the revisions to the regional power plan in the coming year.

The Council continued to use measurement of Snake River flows at Lower Granite, rather than Ice Harbor as was suggested. The purpose is to provide an evaluation of the effectiveness of drawdown conditions for meeting the 140 thousand cubic feet per second flow objective equivalence. This measurement will occur at Lower Granite which will be the first reservoir to be drawn down.

B. Adequacy, Efficiency, Economy and Reliability of The Region'S Power Supply (AEERPS)

The Council received many comments on the adequacy, efficiency, economy and reliability of the region's power supply with the adoption of the proposed fish and wildlife amendments. For the most part, these comments are addressed in the Council's paper, "Assuring an Adequate, Efficient, Economical Power Supply and the Ability to Carry Out the Other purposes of the Northwest Power Act," Appendix C. In this section of the response to comments, we point summarize the comments received, refer readers to Appendix C on most points, and responds here to other comments.

General

Comments: The Council consulted with Administrator Hardy of the Bonneville Power Administration, who said first, that he would be concerned that if Grand Coulee had to be operated on upper rule curves, there may be blackouts this winter. He emphasized that Montana reservoirs and Albeni Falls must be available to help with emergency situations. He said that Detailed Fishery Operations Plan flows in particular would leave reservoirs dry, and his staff commented that several options under consideration (especially Detailed Fishery Operations Plan/Option Four) could violate the adequate, efficient, economical and reliable power supply requirement in the Northwest Power Act. In connection with operating John Day reservoir at minimum operating pool, the system may need to vary from that level for load following purposes outside the fish migration season.

Response: The Council did not call for Grand Coulee to be operated on upper rule curves or adopt Detailed Fishery Operations Plan objectives in firm planning. The flow/velocity objectives are objectives the region will endeavor to meet with a combination of flow augmentation, velocity improvements, and other measures. The Council shares the Administrator's concerns over system reliability, and in the Council's finding in section 1 of the program, recognizes that some reservoirs may have to be drafted to maintain system reliability in emergencies. The Council recognizes that John Day may be used for load-following outside the fish migration season, and that under some conditions a slightly higher elevation and daily flexibility may be required.

Comments: Lincoln County, Montana (Libby) Board of County Commissioners (598) said that electrical rates will increase and system reliability will decrease for most options, and both will adversely affect residents and businesses in northwestern Montana and "may drastically affect the competitiveness and viability of some major employers." The Council should consider a "reduced rate for communities making major sacrifices for the dams located in their areas." Upper Columbia United Tribes (585) said that Options 3-5 not achievable without either severe impacts to resident fish or to adequate, efficient, economical and reliable power supply; increased rates (and other economic costs) have greater impact on tribal members due to lower income and greater unemployment.

Response: The fish measures will increase rates, and in section 1 of the program the Council estimates these impacts (see also Appendix B, Rate Analysis). The Council agrees that there may be impacts to particular customer classes, which may be addressed in Bonneville's rate-setting process (see Appendix B, pp. 18-20). The amendments contain protections for resident fish.

Legislative Intent

Comments: Michael Blumm, Professor of Law at Lewis and Clark College (707) said that the Council does not need to define adequate, efficient, economical and reliable power supply, except in the context of showing why any measure is rejected on the basis of its affecting adequate, efficient, economical and reliable power supply. Congress expected fish and wildlife restoration to be a factor in the power system, not a conflicting element. Bonneville's inability to meet repayment or to conduct conservation programs might be an ultimate bottom line; but phasing in some measures should reduce conflicts and costs. Timing can affect the meaning of an economical power supply. Overall fish and wildlife costs are still small relative to power system costs, even to Washington Public Power Supply System-related costs. "With fish and wildlife costs small relative to power expenditures, and average regional power costs cheap compared to other regions in the country, the circumstances under which a fish and wildlife program measure could jeopardize an economical power system would seem to be truly extraordinary."

Norm and Shelley Cimon of La Grande (487) said that the Council should begin with the view that ecosystem to support salmon must allow for fast flowing stream conditions, and that Council's efforts to provide a better system for fish means the Council must take a broad approach to the adequate, efficient, economical and reliable power supply question, emphasizing power marketing, hydropower alternatives, the fact of the growing wealth of the region, etc.

American Rivers/Natural Resources Defense Council/Trout Unlimited (715) said the adequate, efficient, economical and reliable power supply standard requires Council to restore fish but to mitigate the cost to power system. In assessing economic impacts, the Council should consider the effects on the region's power system caused by uncertainty over what will be required to protect dwindling salmon runs. The Council should also consider how Bonneville Power Administration can structure its business arrangements to support higher flows in spring and summer, how the power system can discourage electric use in the winter, and how Bonneville Power Administration can retain flexibility without financial penalty to meet fish flow needs. To answer these changes, Council must investigate how changes in rates, power sales contracts, Pacific Northwest Coordination Act, and other business arrangements can be used to reduce "costs" of fish measures.

Columbia River Inter-Tribal Fish Commission (729) said "[i]t is axiomatic that the plain meaning of the statute's language is the single most important source for understanding statutory intent." Besides the Act's language, "the most persuasive evidence of legislative intent is the report of the committee sponsoring enactment of the bill." The Ad-Hoc Committee Report is not a report of a legislative committee and does not reflect the views of the tribal representatives who participated only to a certain extent, mostly as observers, in the activities of the committee. Columbia River Inter-Tribal Fish Commission cites a number of sections of the Act and the committee reports to bolster their argument that Congress fully intended the internalizing of all fish and wildlife costs that were caused by the development and operation of the power system and that Congress believed that mitigation for salmon losses could be substantially achieved through changes in hydropower operations. More important, treaty rights are a limit on hydropower operations and the power supply, and not the opposite, and the Council and others must devise a power supply that accommodates the treaty rights.

Bonneville said that, as a general rule, program measures that would burden the ability of the power system to reliably provide electric power, cause economic hardship, or reduce Bonneville Power Administration's ability to provide low-cost competitive electric service would not be consistent with the fish/power balance Congress intended by adequate, efficient, economical and reliable power supply in the Act; any changes to the operation and use of the hydro system must be adequately planned, economic and efficient changes that consider comprehensively the burden being imposed on Bonneville Power Administration's provision of electric service.

Response: The Council believes that the Act calls for a broad judgment on the adequacy, efficiency, etc., of the power supply, considering the factors discussed in Appendix C, and that there is no precise formula for making the judgment. The Council's view of Congressional guidance in the legislative history is summarized briefly at Appendix C, p. 16. The Council agrees that burdens on consumers are a factor, and should be addressed where burdens are undue (see Appendix C, pp. 16-20). The Council also agrees that the hydropower system is an integral part of the region's power supply, and an important part of the judgment. The question under the Act, however, is the adequacy, etc. of the region's power supply, not just its hydropower supply. The Council agrees that the adequate, efficient, economical and reliable power supply issue may be raised with respect to any single measure or the program as a whole.

Comments: Public Power Council (731) said it is not the province of the Council to single-handedly define what is an adequate, efficient, economical and reliable power supply; Bonneville Power Administration and utilities have ultimate responsibility for meeting region's electrical power needs. The Council should work with Bonneville Power Administration and the power industry to identify interim definitions for purposes of applying the test established in Section 4(h)(5) of the Act. Do not define the adequate, efficient, economical and reliable power supply in the short time frame of this rulemaking; at most, adopt a temporary definition and work at refining it in the future. Pacific Northwest Utilities Conference Committee (734) said the Council should defer rulemaking or any precise definitions of adequate, efficient, economical and reliable power supply in this rulemaking. adequate, efficient, economical and reliable power supply is a power issue, not a fish issue, and Council should delay decisions on this issue until Bonneville Power Administration defines in a rulemaking or at least to its own power plan revision. It will be Bonneville that "will balance the regional definition of adequate, efficient, economical and reliable power supply against program measures," when Bonneville Power Administration "evaluates the Council's amended program for purposes of implementation.

Bonneville Power Administration (750, 926) said it, and not the Council, should make this determination. It had not had sufficient time to fully respond to the Council's questions on adequate, efficient, economical and reliable power supply. It intends to undertake its own adequate, efficient, economical and reliable power supply determination as part of the Business Plan or in a separate policy development. The Council should work closely with Bonneville Power Administration in describing program measures that might affect the adequate, efficient, economical and reliable power supply, and rely on power system managers to determine what constitutes an adequate, efficient, economical and reliable power supply. While it is clear Council must do some balancing of fish and power concerns in this rulemaking, it is more appropriate for Council to fully address this issue in its power plan revision and defer final adoption of the fish and wildlife program until that time.

Direct Service Industries said the Council cannot assure the region an adequate, efficient, economical and reliable power supply (AEERPS) by adopting measures first and figuring out what constitutes an adequate, efficient, economical and reliable power supply afterwards. Before the Council may make an adequate, efficient, economical and reliable power supply determination, it must first determine, for each measure: (1) accurate and detailed information on the costs and biological effectiveness; (2) the cause of the adverse fisheries impacts addressed by the measure, that is, whether it is a hydropower problem or instead overharvest, farming, weather, etc.; and (3) specific and certain sources of funding. Public Utility District No. 1 of Douglas County (600) said it is "essential that the meaning and intent of words like economical and reliable be established before [Council] can judge merit of each recommended amendment." The Council has not done this in this draft.

Response: On the question of who must make the determination, section 4(h)(5) of the Act states that the Council, not Bonneville, must make a determination of this matter. The Council need not make the adequate, efficient, economical and reliable power supply determination before making fish and wildlife decisions; rather, it has made the determination simultaneously with its fish and wildlife decisions. The Council has surveyed information on costs and biological effectiveness of the proposed measures individually and in total, and has addressed causes and funding responsibilities with regard to the measures themselves.

In addition to having consulted with Bonneville in the course of this amendment process, the Council will work with Bonneville and others during the power plan revision. The Council did not defer fish and wildlife revisions until the power plan revision process, in part because Congress specifically indicated that fish and wildlife measures should not be delayed pending power plan development.

Comments: Public Power Council (731) said the Council should preserve the hydroelectric system. Congress did not intend the Act to result in replacing the unique hydroelectric opportunity with non-renewable thermal generation. The Council's implied endorsement of extraregional sales and non-preference sales, in pursuit of an adequate, efficient, economical and reliable power supply would be an ill-considered step away from public preference and the region. Pacific Northwest Utilities Conference Committee described the economic and social benefits protected by adequate, efficient, economical and reliable power supply, and the risks to public health and safety that will flow from degradation below adequate, efficient, economical and reliable power supply. Power adjustments for fish were contemplated under Act, but not any significant alteration of the power system. Council has no authority to order even a short-term deprivation of adequate, efficient, economical and reliable power supply; adequate, efficient, economical and reliable power supply is in the Act to ensure that hydrosystem is not sacrificed to fish and wildlife measures. Council must take hydrosystem as it finds it for purposes of adequate, efficient, economical and reliable power supply analysis; if fish measures push system over the brink of uneconomical or unreliable or inadequate, Act is violated, even if other factors drove the system to the brink.

Pacific Northwest Utilities Conference Committee said that the clear language of Act and its legislative history indicates the Council cannot divorce the hydrosystem from concept of adequate, efficient, economical and reliable power supply; e.g., the Act came into existence because of competing demands for low-cost federal hydropower; the Act recognizes the "unique opportunities provided by Federal Columbia River Power System". Thus while adequate, efficient, economical and reliable power supply refers to "power" supply, Congress understood that a coordinated hydrosystem must remain an integral part of that power supply. "The Act clearly did not contemplate that the hydro system could be sacrificed to fish measures so long as it could be hypothetically replaced by other resources (especially non-renewable resources), for the right price."

Direct Service Industries said adequate, efficient, economical and reliable power supply has five distinct elements -- the four parameters and the concept of "assure." Any fisheries measures adopted by the Council, funded by Bonneville Power Administration, or implemented by Bonneville Power Administration, the Corps of Engineers or the Bureau must meet the adequate, efficient, economical and reliable power supply standard, and each agency must independently measure the fish and wildlife measures against the adequate, efficient, economical and reliable power supply standard, since adequate, efficient, economical and reliable power supply is not just a fish and wildlife program standard applicable to the Council, it is also a general purpose of the Act, and each agency is explicitly instructed to act consistently with the purposes of the Act.

Response: The Council took note of the view that the hydropower system must itself be protected on p. 2 of Appendix B. The Council is not obliged to publish its findings in advance for public comment, or defer to a Bonneville consideration of the issue. The Council issued a discussion paper on the issue, and consulted with Bonneville, the utilities and others in determining the appropriate analysis, information, and potential impacts.

Financial Impacts to Bonneville

Comments: The Montana Council members submitted an analysis by Tom Trulove produced under contract (531) which examined the costs and impacts and proper standard for judging when power system will no longer be adequate, efficient, economical and reliable; arguing for a basic "Bonneville Power Administration survival test" and for cost-effectiveness planning and sensitivity to local and regional differences in impact and economic situation. Columbia River Alliance (587) said that the key to maintaining an economical and reliable hydroelectric power system, while protecting and recovering weak salmon and steelhead stocks, is to make management decisions that reflect basic cost-effectiveness criteria.

Response: The Council considered financial impacts to Bonneville in considering whether the fish and wildlife measures permit Bonneville and the Council to carry out the purposes of the Act. This is not, however, a cost-effectiveness determination, which is governed by Section 4(h)(6)(C) of the Act. The Council recognizes that Bonneville's Treasury obligations are a factor Bonneville considers in operational and other decisions (see Appendix C, pp. 20, 32-33).

Adequacy and Reliability

Comments: Industrial Customers of Northwest Utilities (698) said the region no longer has an adequate or reliable power supply, since drought and non-power requirements are leaving reservoirs 60 percent full rather than average of 90 percent full, resulting in increasing reliance on out-of-the-region spot purchases to meet firm load. They are also concerned about definitions of term economical; entire adequate, efficient, economical and reliable power supply term meant to be a constraint on the fish and wildlife program. An "economical" power supply cannot be predicated on funds from other sources, such as Congressional appropriations and 4(h)10(C) reallocations. The program should be based solely on "cost impact to Bonneville Power Administration, other regional utilities, and ultimately, their customers." With a number of Bonneville Power Administration's customers leaving or thinking of leaving, "a clear case can be made that the economical limit has already been exceeded." Defining economical "on the basis of program costs versus the value of the regional economy or on a comparative analysis of Northwest rates versus rates in other regions completely misses the point," economical should be viewed instead from the perspective of utilities and customers that have to pay the costs.

Pacific Northwest Utilities Conference Committee and Direct Service Industries (749) said on the issue of "adequacy," that because of the dominance of hydro in the region, adequacy on an annual basis is based upon energy considerations and not peak considerations, which is the norm elsewhere; annual adequacy is evaluated by use of critical year planning, combining load forecasts, usable reservoir space, historical streamflows and runoff forecasts to provide a level of generation that can be "guaranteed with a relatively high level of certainty." Reductions in usable storage and operational flexibility have reduced planned generation and the level of certainty. Adequacy on daily or weekly basis must be measured against severe winter weather conditions; record peaks in February 1989 and December 1990. An adequate power supply "should get the region through an Arctic outbreak of up to two weeks duration without running out of reservoir storage". The system has been planned to accommodate multiple contingencies. At the current time, with increasing fish operations limiting capacity and flexibility and with heavy reliance on extra-regional resources, "it is quite possible region will be unable to cover subsequent contingencies."

Public Power Council supports the Pacific Northwest Utilities Conference Committee comments on standards for adequacy and reliability of the power supply. The Council should not adopt any measures that place constraints on the operational flexibility of the system in a manner that impedes the ability to meet load. Direct Service Industries said that an "adequate" power supply is one that can meet firm loads in the Pacific Northwest. When a proposed measure would derate the system, the Council must show how environmental and siting concerns for any new transmission or generation would be overcome. Congress never envisioned that the Northwest would become a net importer of energy by reason of the fisheries program. The Council's primary focus must be on the continued adequacy of the hydropower supply, not the region's power supply as a whole.

Don Reading, consulting economist for Idaho (766), said adequacy and reliability should not be a problem, given that the power plan shows a total of 6,500 average megawatts of power available from conservation, renewable resources and others at a real levelized cost of 3.4 cents per kwh. It would make

sense to begin acquiring gas-fired resources to ensure adequacy in the long run. In addition, it is likely that more transmission capability will be built, and this will make it easier for different regions to support each other; and it liberalizing water and power planning away from rigid critical year planning could also help to provide an adequate and reliable power supply while operating the system to be more fish friendly.

Response: The Council discusses the adequacy of the power supply in Appendix C, p. 5, and the region's reliance on purchases in Appendix B, p. 3. For concerns over reliability, see below.

Comments: Bonneville Power Administration said the Council should recognize that the terms "adequate" and "reliable" as used in the Act refer to commonly understood utility practices for insuring service on a continuous basis and commonly applied utility industry standards. The issue for the Council is whether or not its fish and wildlife program impairs the power system's ability to meet accepted utility industry standards of reliability. A financially depressed Bonneville will be unable to maintain an adequate and reliable power system. Bonneville Power Administration will have difficulty assuring adequate, efficient, economical and reliable power supply if it is expected to operate on the edge of power system or financial constraints; and if Bonneville Power Administration's customers perceive Bonneville Power Administration's power system as threatened, this can lead to load instability or withdrawal and force a loss of adequate, efficient, economical and reliable power supply.

Reliability cannot be determined without knowing which projects can be used under various options. In analyzing high-flow options, for example, the Council appears to have assumed that Libby and Hungry Horse would be drafted first and Grand Coulee last. Whether its Libby and Hungry Horse or Grand Coulee that is empty when power is needed significantly affects reliability. And given the current state of the power system, reliability is a major concern with the significant flow proposals, especially Detailed Fishery Operations Plan (analysis does not indicate that additional spill by itself presents a reliability problem). In general, a thorough analysis of the effects of the various flow options on power system reliability was not possible given the information the Council presented in its plan; one issue is whether the capacity costs listed on pages 52-57 of Technical Appendix B are sufficient to restore system reliability; without additional information about the options, this was not possible to assess.

Operating Hungry Horse, Libby and Albeni Falls at higher levels would degrade the power system and cause reliability problems; Bonneville Power Administration analysis shows there would be reliability problems during a period of severe weather in winter if these projects were operated to their upper rule curves; on an hourly basis, reliability problems occur without any contingencies during an Arctic outbreak if the generation from the three headwater projects is not made available; sufficient energy cannot be purchased to replace the lost generation; without these projects, the remainder of the system is unable to meet peak loads even when combined with purchasing all import capability; insufficiency is as high as 5,000 megawatts in some hours. While operating headwater projects to upper rule curves on a monthly basis otherwise appears feasible, it has severe economic impacts, averaging \$93 million in low runoff years (below 90 million acre feet), with a maximum of \$132 million in the lowest year.

In its suggestions for how to maintain the ability to meet hourly loads, Bonneville Power Administration suggests that the daily draft rate at Grand Coulee be increased from 1.5 feet per day to 2 feet per day, providing about 1,200 average megawatts per day.

In a response to a request for clarification on actions the federal system would take to maintain reliability, Bonneville Power Administration replied that "[a]ctions for reliability will be taken only to meet firm load needs and only to the extent that reasonable purchases are insufficient." During the time of the year

when storage for anadromous fish flows is taking place at federal projects (Hungry Horse, Libby, Dworshak, Albeni Falls and Grand Coulee), “such storage will be temporarily drafted for reliability purposes under the following conditions:” “[d]uring periods when major temperature departures below normal are forecasted”; “[t]he loss of a major resource (i.e., Washington Nuclear Plant 2 or a large Grand Coulee unit)”; “[t]he loss of either the Northern or the Southern Intertie.” Bonneville Power Administration also stated that it had the responsibility under the Pacific Northwest Coordination Act, the Northwest Power Pool and the Western Systems Coordinating Council “to maintain reliability standards for voltage and transmission stability” and that “system instability could result in local or regional blackouts.”

On the issue of “reliability,” the Direct Service Industries said this is “the constant availability of electricity to customers in terms of quality, quantity, duration, cost and adequacy.” Given the unique nature of electricity as a human necessity and the possibilities of utility management and coordination, “reliability exists when interconnected systems are in balance or can be quickly returned to balance after any disruption. Utilities fulfill this requirement by following “time-tested standards and practices,” one such standard defined by the North America Reliability Council, with minimum criteria for reliable interconnected operations. The transmission system is an important part of reliability, measured by “an agreed to set of rules (criteria) determining acceptable frequency, duration, and magnitude of adverse effects on consumer service.” The primary transmission criteria are the Western System Coordinating Council Criteria for Transmission System Planning plus each individual utility’s reliability criteria. Acquiring new resources within the region and/or importing more power from outside the region to meet firm load both adversely affect the reliability of the transmission system without adjustments. The Council cannot assume that system reliability can be assured over the long term. Fish measures of substantial cost and questionable benefit have already caused the system to become unreliable. An operational plan that results in consistent curtailments of one quarter of their power cannot be fairly characterized as reliable. The Direct Service Industries provide transmission stability reserves, and so the continued economic vitality of Bonneville Power Administration service to the Direct Service Industries loads is vital to the continued reliability of the entire Northwest power system. Thus, an economical power supply and a reliable power supply are interrelated. “To the extent that the Endangered Species Act threatens the economy of the Region’s power supply, the Council has an affirmative obligation under the Northwest Power Act to remedy that situation.”

Response: The Council did not depart from traditional standards of adequacy and reliability. Some fish measures will limit the flexibility of the system, but the Council’s findings address reliability concerns. The system’s longer term adequacy is addressed on pp. 5-10 of Appendix C. In addition to addressing power needs, the Council is attempting to respond to the Endangered Species Act developments by developing a program the Council believes the region can implement, rather than having one imposed on the region.

Economical Power Supply

Comments: On the issue of an “economical” power supply, Bonneville said that if costs were imposed as the result of some of the options, they could not be recovered in competitive rates and Bonneville Power Administration is likely not to be able to make its full Treasury payment. Public Power Council said the cost of fish and wildlife measures should not undermine Bonneville Power Administration’s ability to implement all the purposes of the Act. There probably is no “bright line” to tell when fish and wildlife costs are so great that the region can no longer be assured of an economical power supply, that Bonneville Power Administration is uncompetitive, or that power costs are “unreasonable.” It is probably easier to identify specific examples when the costs have become a burden to consumers -- plant closures, for example, are a drastic, delayed reaction and as a delayed reaction the Council should not rely on economic dislocation to be the indication of loss of an economic power supply. Personal or regional income or electrical rates in other parts of the country are not appropriate frames of reference for the discussion of an economical power supply

in the region. Unlike National Marine Fisheries Service, the Council has a mandate to assure the power system stays economical, and so the Council must carefully consider any recommendation that calls for more expenditures of money for salmon by Bonneville Power Administration. The Council should reject any measures that would threaten Bonneville Power Administration's Treasury payment if implemented between now and the end of the current fiscal year. Council should insist that fish and wildlife measures be cost-effective; this is fundamental to the Council's assignment to balance the needs of the fish and wildlife program with the assurance of a healthy power supply system. Public Power Council expects to support full utilization of Section 4(h)(10)(c) of the Northwest Power Act; obtaining significant amounts of money from taxpayers seems unlikely; Council should not assume it can rely on Bonneville Power Administration transmission services for revenue to fund fish and wildlife measures.

Bonneville said that these factors are part of the equation: 1) no unreasonable costs; 2) not a burden to ratepayers; 3) no costs for mitigation of impacts caused by factors other than the power system; 4) preserve low-cost hydropower as envisioned in the Act; 5) be able to pay for the federal investment in the Federal Columbia River Power System; 6) maintain Bonneville Power Administration's ability to sell power; and 7) avoid undue impacts on customer classes. Fish and wildlife program costs should not be allocated to other Bonneville products, such as transmission; generation costs are to be allocated to power customers, and transmission costs to transmission users.

Direct Service Industries said that an "economical" power supply is not simply a ceiling at which power costs become uncompetitive. Instead, economical is determined measure by measure. Central to the interpretation of the term "is an appreciation that the [Act] was primarily a power act; the principal goal was the allocation of federal power among competing users. An interpretation of 'economical' that does not preserve the value of this allocation is not credible." An economical power supply (1) must not pay to mitigate adverse impacts caused by factors other than the hydro projects, nor (2) undo the statutory allocation of federal power by making federal power uncompetitive, nor (3) include measures that impose costs on the power system that exceed their fisheries value.

An economic power supply must consider the economic impact of program measures on each customer class; for industrial customers it is no longer the case that the Northwest has the lowest cost power. For the preference utilities and their residential customers, the rates are approaching parity with other generation. The Act requires that an economic power supply leave Bonneville Power Administration competitive and able to make its treasury repayments. The Council cannot call the system "economical" based on a comparison to national power costs or power costs as a percentage of regional GNP, if the result is the collapse of Bonneville Power Administration. Bonneville Power Administration has already determined that it has no reserves and no short-term ability to raise rates to cover new fish measures. And the Council cannot assume, legally or otherwise, that fish costs imposed on Bonneville Power Administration, which it cannot recover in power rates because Bonneville Power Administration has become uncompetitive, can be recovered through "redistribution," taxpayer funding, or in Bonneville Power Administration transmission charges for non-federal power sales that recover more than transmission costs. The Council has no authority to cause redistribution or taxpayer funding.

An "economical" power supply is also one that shows a "prudent" use of resources, which means that it "requires that each measure be tested -- weighing the cost against the fisheries gain." Measures cannot be funded "which will not reliably result in increases in juveniles and adults."

Don Reading, consulting economist for Idaho (766) said that economic and efficiency in the sense required by the Northwest Power Act and other power laws means internalizing externalities to the greatest

extent possible and producing a maximum optimized output given system constraints, including the maintenance of fish and wildlife populations.

Response: The Council responded to these views on pp. 16-35 of Appendix C. The Council believes that rates in other parts of the country are informative, not determinative. Burdens to consumers are relevant, and the Council considers them in Appendix C, at pp. 16-20. The Council recognizes that there are limits to Bonneville's financial resources, especially in the new competitive environment (see Appendix C, at pp. 20-35), and that this can affect the Council's and Bonneville's ability to carry out the purposes of the Act.

Efficiency

Comments: Pacific Northwest Utilities Conference Committee, Direct Service Industries (749) said that an "efficient" power supply in general means a system in which "resource operation maximizes power and energy production." It also refers to efficient use of resource, including considerations of resource renewability and ability to match generation to load. In the hydrosystem, efficiencies include the water storage, shaping, shifting and load following capabilities; hydro is 90 percent efficient, while thermal plants are 30-50 percent efficient; various efficiencies allow Bonneville Power Administration and operators to serve loads in excess of system load carrying capacity, such as historically reliable service to Direct Service Industries top quartile; since 1991, system capabilities reduced to extent Bonneville Power Administration has to restrict top quartile in all months except April-July runoff. Public Power Council supports the comments of Pacific Northwest Utilities Conference Committee on the mechanics of efficiency of the power supply. From an environmental perspective, it is inefficient and therefore inconsistent with stated purposes of the Act to transmit thermally generated power a long distance to replace renewable resources available in the region. The Direct Service Industries said that assuring an "efficient" power supply was intended to impose an additional and distinct requirement that preserves the flexibility of the hydrosystem, taking advantage of the unique capabilities of the hydrosystem (recognized in the Act), such as its water storage and shaping capabilities and its efficiency in generation compared to thermal plants, qualities that have allowed Bonneville Power Administration to serve loads in excess of system load carrying capability. The obligation to assure an "efficient" power supply prohibits the Council from adopting fish measures that (in the context of other measures that are adversely affecting fish) would eliminate or substantially reduce this capability. Contrary to this prohibition, since at least 1991 system capability has been significantly reduced.

Response: The Council addresses the efficiency issue beginning on p. 14 of Appendix C. The Council does not agree that maintaining an efficient power supply for the region requires operating the dams for the most efficient power operation, but the most efficient power operation within the constraints imposed by law, which includes not only the Northwest Power Act's fish and wildlife provisions, but those of the Endangered Species Act.

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