Recommendations of the State of Oregon for the Mainstem Columbia and Snake Rivers to be Adopted as Amendments to the Northwest Power Planning Council's Fish and Wildlife Program

Council Document 2001-4 Dated March 14, 2001

INTRODUCTION

The state of Oregon submits the following proposed amendments for the mainstem Columbia and Snake rivers to be adopted in the Northwest Power Planning Council's (Council) Columbia River Basin Fish and Wildlife Program (Program). As discussed in the 2000 Program, the purpose of the mainstem plan will be to "recommend ways in which the hydrosystem operations called for in the biological opinions could be adjusted, so as to assure that those operations meet the needs of ESA-listed stocks and the dictates of the Northwest Power Act." (Northwest Power Planning Council 2000-19, Basinwide Provisions, Section D.6, p.25). Although not specifically requested, we have also provided recommendations on operations and measures to meet the requirements of the Clean Water Act (CWA) since meeting clean water standards are integral to meeting fish recovery and mitigation goals of the Program and opinions. Meeting CWA standards is also critical to establishment of a multi-species program and protection and enhancement of mainstem spawning and rearing habitats of anadromous and resident fish and other aquatic species and habitat utilized by wildlife.

The Council's 2000 Program recognizes that significant losses of anadromous and resident fish and wildlife have occurred due to hydrosystem development and operation and that "To be consistent with the Power Act, these losses establish the underlying basis for population objectives for the program as a whole." (Council 2000-19, Basinwide Provisions Section C.2, p.16). Specific short- and long-term biological objectives for anadromous and resident fish and wildlife are established in the 2000 Program to fully mitigate for fish and wildlife losses in the long-term. Because decisions by the federal agencies regarding long-term configuration of the hydrosystem have been deferred for at least eight years and the Council will amend the Program within five years, our recommendations are primarily focused on meeting short-term fish and wildlife mitigation objectives of the 2000 Program. We emphasize that our recommendations are not intended to meet and will fall <u>far</u> short in meeting long-term Pacific Northwest Electric Power Planning and Conservation Act (Power Act) mitigation requirements. In the long-term, alternative strategies such as breaching of dams identified by the federal agencies may be necessary to meet both Endangered Species Act (ESA), Power Act, and CWA requirements. The Council's proposed research, monitoring, and evaluation plan described in Section 9 of the 2000 Program will provide critical information to monitor progress towards meeting short-term objectives of the mainstem plan.

We have limited our recommendations on hydrosystem operations (primarily flow, spill, transportation, temperature and dissolved gas management, juvenile bypass improvements, and predator control) to those that we believe will make significant progress towards meeting the short-term fish and wildlife objectives in the 2000 Program. Our recommendations are based on: Oregon Department of Fish and Wildlife (ODFW) proposed mainstem amendments for the 1994 Program (Attachment 1); proposed amendments to the draft 2000 Program submitted by Oregon (Attachment 2); Oregon comments on the National Marine Fisheries Services' (NMFS) draft 2000 Biological Opinion on operation of the Federal Columbia River Power System (FCRPS) (BiOp) (Attachment 3); ODFW comments on the Federal Caucus' Conservation of Columbia Basin Fish: Basinwide Salmon Recovery Strategy (Attachment 4); Oregon comments on NMFS' proposed recovery plan for Snake River salmon (Attachment 5); and ODFW comments on NMFS' White Papers (Attachment 6). As requested, we discuss how our recommendations are consistent with the Council's vision for a multi-species, habitat-based mainstem plan; discuss the relationship to recently released biological opinions on hydropower operations; and provide the requested information on power reliability issues and impacts of recommendations on power supply.

Columbia Basin anadromous and resident fish and wildlife are truly at a critical point where the future persistence of several species is clearly in danger. For example, despite exhaustive efforts under the Council's Program and programs established under ESA, Columbia Basin anadromous fish runs continue to decline and within 15 years many salmon populations from the Snake and upper Columbia rivers could face extinction under current mainstem management plans (Mundy 1999; Oosterhout and Mundy 2001). The Council has estimated that 10-16 million salmon and steelhead alone have been lost due to impacts of the hydrosystem. Since 1982, the Council has acknowledged that construction and operation of the FCRPS is the primary cause of basinwide declines in fish runs and that mainstem survival must be dramatically improved. As an example, the state and tribal fishery agencies on the Plan for Analyzing and Testing Hypotheses (PATH) have estimated that smolt-to-adult survival (SAR) of Snake River spring/summer chinook must be improved 280-850% to meet the Biological Opinion 24 year survival standards for recovery of ESA listed Snake River salmon (Peters and Marmorek 2000). Even greater improvements in survival would be needed to fully mitigate for hydrosystem impacts as required under the Power Act.

From the start in 1982, the Council's program focused on the importance of improving mainstem survival of juvenile and adult salmonids recognizing that "Downstream passage is especially dangerous for juveniles because of the effects of dams and slow-moving reservoirs, such as turbine, bypass, and spill-related mortalities, predation, migration delays and high water temperatures." Key strategies of the Council's 1994

Program (NPPC 1994) and NMFS' 2000 BiOp (NMFS 2000) to improve mainstem survival of juvenile salmonids is improvement in inriver survival and production by augmenting flows, improve inriver survival by reducing predation-caused mortality, maximizing fish passage efficiency and survival at all projects, protection of biodiversity and favor fish passage methods that are consistent with natural fish migration and river processes, and reduce proportion of juveniles transported.

Wildlife and their habitats have also been significantly impacted by the operation of the hydrosystem. For example, fluctuating reservoir levels caused by dam operations have created barren zones, which expose wildlife to increased predation. The trees, shrubs, and grasses that would normally grow at the water's edge and provide wildlife nesting and feeding habitat are lacking in many areas and limited in function and value to wildlife and fish where they do exist.

Because of the urgent need to address the critical status of ESA fish populations, we have primarily focused on actions that need to be implemented in the short-term to immediately improve mainstem survival and production of these species. Our recommended short-term objective is to significantly improve mainstem survival and production of anadromous and resident fish and wildlife by enhancing in-river migration, habitat, and water quality conditions in the Columbia Basin to meet ESA requirements of the opinions, short-term Power Act mitigation requirements for listed and unlisted anadromous and resident fish and wildlife established in the 2000 Program, and water quality requirements of the CWA. Because reliance on juvenile fish transportation is a poor substitute for improving mainstem habitat conditions and presents unacceptable risk to juvenile outmigrants in the long-term, our goal is to also reduce the proportion of fish transported at Columbia and Snake River dams. The key measures of our recommendations to improve mainstem survival and production of anadromous and resident fish and wildlife are as follows.

<u>Anadromous Fish</u>

1. *Flow augmentation for juvenile migration and mainstem spawning*- improve inriver survival and production by implementing modified Biological Opinion and other operations to meet flow targets in the Snake and Columbia rivers; seek additional water to consistently meet flow objectives for all fish species.

2. *Spill*- maximize fish passage efficiency and survival at all projects in the Snake and Columbia Rivers by implementing modified Biological Opinion spill including 24 hr spill at all projects; conduct risk assessment of increasing spill in the short-term above 120% TDG waiver; modify projects to maximize spillway and project survival.

3. *Juvenile fish transportation*- implement "spread the risk" transport policy where no more than 50% of juvenile migrants are transported; improve in-river conditions by providing recommended flow and spill and improvements to bypass systems; bypass fish as needed to manage the proportion of fish transported.

4. *Juvenile bypass improvements*- continue to test and implement surface bypass and collection systems; evaluate and if necessary modify screen bypass and sampling systems and bypass outfalls to improve survival of bypassed fish.

5. *Turbine improvements*- operate turbines units at FCRPS dams for optimum fish passage survival; continue investigation and installation of minimum gap runners; implement Biological Opinion actions to develop new turbine design and technologies to improve juvenile and adult turbine survival.

6. *Predator control*- improve inriver survival by reducing predation losses due to fish, avian, and pinniped predators.

7. *Planning for alternative actions if non-breach options fail to meet ESA requirements*- conduct necessary planning and evaluations to ensure that alternative actions including breaching of Snake River dams can be implemented on a timely basis in non-breach alternatives fail to meet performance standards.

<u>Resident Fish</u>

1. *Flow augmentation for white sturgeon spawning* - configure and operate the hydropower system consistent with salmonid recovery to maximize spawning and rearing success of white sturgeon in reservoirs; maintain optimum discharges during time of white sturgeon spawning.

2. *Bull trout upstream and downstream passage* - develop performance standards and measures to ensure that upstream and downstream passage for bull trout are not impeded at FCRPS dams.

3. *Address known limiting factors to resident fish* – evaluate limiting factors and identify priority resident fish needs; implement specific actions to reduce limiting factors.

Wildlife

1. *Mitigate for measured construction/inundation wildlife losses* – protect remaining priority riparian/riverine habitats through fee-title acquisition, perpetual conservation easement and/or long-term cooperative management agreement; implement habitat restoration actions on protected lands.

2. *Mitigate for operational impacts* – assess direct and indirect operational impacts to wildlife using the Habitat Evaluation Procedures methodology and through the subbasin planning process; protect key habitats through fee-acquisition, perpetual conservation agreement, and/or long-term cooperative management agreement; implement habitat restoration actions on protected lands.

3. *Address known limiting factors to wildlife* – evaluate limiting factors and identify priority wildlife needs; implement specific actions to reduce limiting factors.

Water Quality

1. *Dissolved gas management*- in the long-term, modify projects to reduce dissolved gas levels under spill operations to meet the 110% TDG state and federal standard.

2. *Temperature control*- in the long-term, modify projects and implement actions to reduce temperature to meet the 68F state and federal standard.

3. *Toxic contaminant management*- in the long-term modify projects and dredging activities and implement actions to reduce toxic contaminants to meet state and federal standards.

PROPOSED PROGRAM AMENDMENTS FOR THE MAINSTEM COLUMBIA AND SNAKE RIVERS

Oregon's approach to proposing amendments for the mainstem Columbia and Snake rivers is to respond to the three broad questions posed by the Council and then provide short-term objectives, strategies, and measures for anadromous fish, resident fish, and wildlife. Where information exists, and to the extent possible, given the time available to prepare our recommendations, we have attempted as part of our justification, to qualitatively characterize the benefits and attendant risks of each proposed amendment. For our operational recommendations, the benefits and risks are summarized in columns in Table 2. We recommend that the Council conduct hydro-regulation modeling and

other appropriate analyses to better determine the benefits and risks of each proposed amendment it considers. Oregon stands ready to assist the Council in this effort.

Consistency with the Basinwide Provisions in the Council's Program

Oregon recognizes the Northwest Power Planning Council's Fish and Wildlife Program (Council document 2000-19) is primarily a habitat-based approach to fish and wildlife restoration and mitigation. Much of that approach focuses upon tributary habitat and the development of subbasin plans as a key factor in addressing the habitat requirements of fish and wildlife species. Oregon agrees that recovering key habitat will address a critical factor in the decline of fish and wildlife species.

Habitat considerations not only include the tributaries, however. Historically, the mainstem Columbia and Snake rivers were among the most productive spawning and rearing habitats for salmonids and provided essential resting and feeding habitat for mainstem resident and migrating fish. The riprarian corridors of the mainstem Columbia and Snake rivers provided essential habitat for both terrestrial and aquatic species of wildlife. Protection and restoration of mainstem habitat conditions must be a critical piece of this habitat-based program. Oregon has constructed a series of amendments to the Council's basinwide provisions to improve mainstem river habitat and water quality conditions.

Oregon's proposed amendments to the mainstem provisions of the Council's program are consistent with the specific planning assumptions contain in Basinwide Provisions section A.2. Specifically, Oregon's proposed amendments focus on "rebuilding healthy, naturally producing fish and wildlife populations by protecting, mitigating and restoring habitats and the biological systems within them, including anadromous fish migration corridors." (Council 2000-19, Basinwide Provisions Section A.2, p.13)

We propose "Actions to improve juvenile and adult fish passage through mainstem dams, including fish transportation actions and capital improvement measures" that "protect biological diversity by benefiting the range of species, stocks, and life-history types in the river" and we "favor solutions that best fit natural behavior patterns and river processes, while maximizing fish survival through the projects." We believe "survival in the natural river should be the baseline against which to measure the effectiveness of other passage methods." (Council 2000-19, Section A.2,p.13)

Our proposed amendments support the Council planing assumption that "Mainstem hydrosystem operations and fish passage efforts should be directed at re-establishing natural river processes where feasible and consistent with the Council's responsibility for

maintaining an adequate, efficient, economical, and reliable power supply." (Council 2000-19,Section A.2, pp.13-14)

Oregon's proposed amendments are consistent with the Scientific Principles on the 2000 Fish and Wildlife Program (Council 2000-19, Basinwide Provisions Section B.2, p.15) The amendments relate specifically to Scientific Principles 1, 4, 5, 6, 7 and 8.

Consistent with the Council's Hydrosystem Passage and Operations Primary Strategy, Oregon's proposed amendments attempt to "provide conditions within the hydrosystem for adult and juvenile fish that most closely approximate the natural physical and biological conditions, provide adequate levels of survival to support fish population recovery based in subbasin plans, support expression of life history diversity, and assure that flow and spill operations are optimized to produce the greatest biological benefits with the least adverse effects on resident fish while assuring an adequate, efficient, economical, and reliable power supply." (Council 2000-19, Basinwide Provisions Section D.6, p.25)

The Council recognizes the ESA obligations of the National Marine Fisheries Service and the US Fish and Wildlife Service in prescribing detailed operating conditions for the hydrosystem in their biological opinions. The Council also noted that it had a broader mandate to address impacts to non-listed species, resident fish and wildlife affected by the hydrosystem.

Oregon offers our amendments to the mainstem provisions of the Basinwide Program "to recommend ways in which the hydrosystem operations called for in the biological opinions could be adjusted, so as to assure that those operations meet the needs of ESA-listed stocks and the dictates of the Northwest Power Act." (Council 2000-19, Section D.6. p.25)

Relationship to NMFS and USFWS Biological Opinions

In this document, Oregon makes specific recommendations how the BiOp's should be modified to meet the short-term fish and wildlife mitigation objectives of the Council's 2000 Program. The BiOp's and our recommendations will help moderate extinction risk, will increase the frequency of rebuilding opportunities, and will provide harvestable hatchery surpluses, but are unlikely to provide the magnitude of survival increases necessary to ensure recovery of ESA listed stocks (Oregon 2000a). The NMFS BiOp off-site mitigation actions in tributaries proposed in the Reasonable and Prudent Alternative will be ineffective in avoiding jeopardy for the 12 ESUs, in part because the actions do not address major limiting factors constraining recovery of these populations (Oregon 2000a). For example, survival rate declines for listed Snake River spring/summer

chinook populations occurred primarily after migration from tributaries in the smolt-to-adult stage, rather than in the spawner-to-smolt stage (Oregon 2000b).

The BiOp's as well as Oregon's recommendation will not meet long-term Power Act mitigation requirements nor the Council's vision for the Program. Oregon has previously provided the Council our long-term objectives for the basin (Attachment 2) which calls for the Program to evaluate and fully mitigate for hydro losses to fish and wildlife as well as comply with standards of the Clean Water Act. To meet the long-term objectives of the Program will require bold alternative strategies to the BiOp including consideration of breaching of Snake River dams or other alternatives to significantly increase mainstem survival. As an example, analytical risk assessments by PATH and by NMFS CRI (Cumulative Risk Initiative) indicate that mainstem options that include breaching of the four Lower Snake River dams are most likely to recover listed Snake River populations, and are least risky across a broad range of uncertainties (Budy 2001; NMFS 2000). The Council's Program, as opposed to the BiOp, must continue to focus on timely evaluation and implementation of measures to improve mainstem survival to a level that is adequate for recovery of ESA listed fish as well as meet the mandates of the Power Act and CWA.

Power Supply Impacts

a) What are the appropriate operations for the hydrosystem to meet both the needs of fish and wildlife and the power supply needs of the region?

1. We detail changes to hydro system operations to meet fish and wildlife needs in other sections of these recommendations. These operations should be viewed as minimum environmental compliance standards for the hydropower system, just as air quality standards are minimums for fossil fuel power plants. We address the question of meeting both fish and power needs for long-term and for the interim problem we face now.

   In the long run, the generation, transmission, conservation and load-management components of the Northwest power supply system should be designed and operated to meet power needs while insuring that appropriate hydro system operations for fish and wildlife recovery are provided in all years. The regional power supply system should be robust enough to provide a high probability of meeting the reasonable power supply needs of the region while allowing the hydro system to operate in a way that meets the needs of fish and wildlife. To the extent that hydro operations for fish and wildlife modify the output of the hydropower system, those modifications should be viewed as changes in hydro system cost due to required environmental compliance. The Council must work to ensure that the full costs of hydropower

production are incorporated into power supply system decisions that are largely driven by market forces.

In the interim, until new power supplies are developed, the region faces power system deficits, and fish protection shortfalls under low-runoff conditions. With regard to balancing fish and power needs in the interim, the Council program should develop a strategy to share any shortfall of water between fish and power operations. The Fish and Wildlife Program should set forth principles for proportionate allocation of any curtailments of fish operations or reductions in power system reliability due to insufficient runoff. We suggest that proportionate reductions in probability of meeting minimum standards be the guiding principle. Such a scheme requires that the Council establish a common metric by which it can measure both fish and power benefits and costs. In principle, proportionate sacrifice should yield proportionate cost.

For example, the Council's recent reliability analysis estimated a winter power reliability of 17% loss of load probability (LOLP) assuming reservoirs start the winter at BiOp levels. That is a significant shortfall from the industry standard 5% LOLP. At the same time we also see a huge shortfall in meeting the flow and spill objectives set forth in the 2000 Biological Opinion this year. To date federal hydro projects have spilled only about tenth of the spill identified in the BiOp for spring migrants. The Council reliability analysis estimates that storing extra water this summer could reduce the winter-time LOLP. For every 500 MW-months of extra storage, LOLP is reduced about 2% up to about 1500 MW-months of extra storage. But storing extra water this summer means reducing flows or spill this summer for fish. A decrease of 500 MW-months of spring and summer flow or spill diverts us further from BiOp flow and spill objectives and increases the probability of species extinction. In this situation, neither the power nor the fish objectives are met by significant amounts. A proportionate sharing of the shortfall would allocate proportionate misses from the targets taking into account the costs of missing the targets.

Justification:

Fish recovery and power reliability obligations must be balanced under the law. Both fish operations and power operations should have established baselines for minimum system conditions. For fish, these minimum conditions are expressed as flow, spill and reservoir levels. For power, they are expressed as system reliability standards that call for a 5 percent loss of load probability. A similar probabilistic minimum standard should be developed for meeting hydro system operations required for fish and wildlife. To the extent low runoff jeopardizes either set of minimum conditions, any shortage should be

allocated proportionately between fish and power system obligations taking into account the costs of missing the standard.

2. The Council should lead an effort to review, and revise if necessary, definitions and procedures for declaration of power system emergencies that have significant impacts on hydro operations and consequent fish and wildlife impacts.

Justification:

Presently the declaration of power system emergencies allows the curtailment of hydro operations for fish under the BiOp. We believe application of the current system to declare power system emergencies has placed the brunt of the burden of dry years on fish recovery efforts. The current procedures and policy choices in declaring emergencies made by the federal agencies give total discretion to the action agencies to establish both power system reliability and fish recovery goals in times of scarcity. For example, the standards being used in the Federal Agencies' 2001 FCRPS Operations Plan include both short-term and longer-term generation insufficiency and BPA financial condition as criteria for declaring emergency conditions that allow hydro operations outside Biological Opinion specifications.

The Council should engage this review for several reasons. First, it is legally unclear whether BPA financial condition ought to trigger an emergency declaration that jeopardizes Biological Opinion operations. Second, the biological opinions only deal with listed species. We submit that hydro operations for non-listed species under the Council Program ought to be considered as well, when considering deviations from planned operations required because of emergency declarations. Third, even if BPA financial condition merits an emergency declaration, it is unclear whether the federal agencies have struck an appropriate balance between physical insufficiency and financial burden under the particular choices made this year.

We believe the Council program should express the appropriate conditions for declaring emergencies that result in curtailing fish operations for both listed and non-listed species. We propose that if the region is in rolling blackouts, fish operations could be curtailed. But short of blackouts, any curtailment should weigh the benefits and costs on both fish and power sides. Furthermore, the Council should incorporate goals for non-ESA-listed species when declaring power emergencies to assure appropriate balance among competing objectives.

b) What other actions should the Council consider recommending to resolve the region's power supply problems, as part of a larger review of the current power plan?

1. Investigate whether there are systematic barriers to market solutions for filling in an unpredictable and potentially large hydro shortfall due to run-off uncertainty. Make recommendations if necessary to address any systematic barriers identified.

Justification:

As long as we rely heavily on hydropower, we will be subject to potential large shortfalls of hydropower due to low run-off. It appears that curtailment of fish and wildlife obligations, price-sensitive load response, and temporary generation additions can respond rapidly to fill system shortfalls like we are experiencing now. But these responses come at economic and environmental costs. The power plan should investigate whether other short-term responses or alternative strategies to deal with hydro variability would provide suitable system reliability at less economic and environmental cost.

2. Investigate and make recommendations on what specific, or localized, transmission expansion, generation addition or load reduction actions would allow for increased flexibility in the hydropower system.

Justification:

Several times, over the past two years, localized system reliability issues required curtailment of fish operations. The Council plan should assure that we find least-cost solutions to these problems.

3. Identify fuel switching opportunities at end uses that would provide lower system costs for the combined electricity and natural energy systems. Investigate whether markets are adequately resolving the fuel choice issue, or if market intervention is required.

Justification:

Natural gas supplies the fuel for much of the new electric generation being developed. Alternatively, natural gas can also be burned directly at end uses. System-wide efficiencies could be achieved by switching fuels at some end uses depending on the efficiency of electric power generation and transmission, and the efficiencies of the direct use of natural gas and its delivery system. The study should incorporate environmental impacts of fuel switching in its analysis including air emissions of each system.

4. Identify cost-effective energy conservation potential. Identify systematic areas where conservation potential is untapped by market forces or market intervention. Recommend solutions to maximize cost-effective energy conservation.

Justification:

Until retail power prices reflect marginal power costs, the Council plan must continue to assess whether market forces are taping sufficient amounts of energy conservation.

c) How should the Council evaluate the power supply impacts of proposed operations and on what basis will the Council be able to reach the necessary conclusion that it is adopting a fish and wildlife program that truly does protect, mitigate and enhance fish and wildlife while continuing to assure the region an adequate, efficient, economical and reliable power supply?

1. The power supply impacts of proposed fish and wildlife impacts should be identified and quantified by the Council. The Council should assess the extent that these operations change the cost of hydropower production by modifying the amount or time pattern of power generated. Any changes should be viewed as changes to the cost and availability of hydropower production due to required environmental compliance. Experiences over the past year clearly indicate that energy markets respond rapidly, on both the supply and demand sides, to fill hydro system gaps. The key element the Council should focus on is the question of whether the market response to fill any gaps is providing cost-effective new resources and load response. The Council power plan should evaluate whether there are systematic barriers that preclude the market from responding to hydro system operational changes in an efficient and economical way. Where barriers to efficient market response are identified, the plan should recommend solutions.

Justification:

Since the adoption of the national Energy Policy Act we have been relying primarily on the wholesale marketplace and the obligation-to-serve requirements on utilities to deliver new generation and load management actions to meet power supply requirements. In contrast, we rely on non-market mechanisms, like planning and regulation to provide river conditions for fish and wildlife. Consequently, hydro system operations required to meet our fish and wildlife recovery obligations should be considered costs of hydropower production and thereby fully incorporated into the market-based system we have adopted for power system development.

Proposed Hydrosystem Objectives and Strategies

Our recommended primary short-term objective is to significantly improve mainstem survival and production of anadromous and resident fish and wildlife by enhancing in-river migration, habitat, and water quality conditions in the Columbia Basin to meet ESA requirements of the opinions, short-term Power Act mitigation requirements for listed and unlisted anadromous and resident fish and wildlife established in the 2000 Program, and water quality requirements of the CWA.

I. Anadromous Fish

Objective: Significantly improve mainstem survival and production of anadromous fish by enhancing in-river migration, habitat, and water quality conditions to meet ESA requirements of NMFS' 2000 FCRPS Biological Opinion and short-term mitigation requirements of the 2000 Program and make progress in complying with water quality requirements of the CWA.

Oregon also recommends that the Council adopt smolt-to-adult survival rates (SAR) survival objectives for the mainstem plan sufficient to recover ESA listed populations and meet short-term mitigation objectives of the 2000 Program. For Snake River spring/summer chinook, PATH (Plan for Analyzing and Testing Hypotheses) estimated that SARs of a minimum 2% (2-6% range) is needed to meet ESA recovery goals (Marmorek et al. 1998; IDFG 1998;). Recent SARs have been only a fraction of those needed for recovery (Marmorek et al. 1998; Sandford and Smith, unpublished) resulting in sharp population declines over most generations (Idaho 2000).

The Program needs to explicitly recognize the importance of the mainstem and out-of-subbasin influences as primary limiting factors for upriver anadromous salmonids. The comparison of upstream to downstream stocks has shown that declines in Snake River spring/summer chinook occurred with hydrosystem development specifically with construction of Snake River dams (Schaller et al. 1999), and that survival declines occurred primarily in the smolt-to-adult stage, rather than in the spawner-to-smolt stage (Petrosky et al., in press). The overall survival decline is consistent primarily with hydrosystem impacts and poorer ocean (out-of-subbasin factors) rather than large-scale impacts within the subbasins between the 1960s and present. These findings are consistent with the Council's Program and NMFS' 2000 BiOp that recognize the importance of improving survival of anadromous fish in the mainstem.

Strategy: Improve inriver survival and production by augmenting flows.

Measure 1. Implement Biological Opinion and other operations to meet flow targets in the Snake and Columbia Rivers.

1. Operate FCRPS dams and reservoirs to meet the following modified Biological Opinion flow objectives on both a weekly and seasonal basis.

The Biological Opinion flow objectives are modified to include higher spring (changed from 85-100 kcfs to 100 kcfs for runoff forecasts >16-20 maf) and summer (changed from 50-55 kcfs to 50-100 kcfs for runoff forecasts 16-28 maf) flow objectives for juvenile migration in the Snake River and a higher flow objective for chum and chinook spawning below Bonneville Dam (changed from 125 kcfs instantaneous flow to 125-160 kcfs flow target and initiation of operations that are not conditioned on runoff forecast). The flow objectives should be minimum flow requirements and hard constraints and require the Action Agencies to exceed the objectives utilizing system flexibility and when there is adequate water supply.

Table 1. Modified 2000 Biological Opinion seasonal flow objectives and planning dates for the mainstem Columbia and Snake Rivers. Modified objectives are bolded with Biological Opinion objectives in parentheses.

Location	Spring Dates	Spring Flow Objective (kcfs)	Summer Dates	Summer Flow Objective (kcfs)
Snake River at Lower Granite Dam	April 3-June 20	<16 maf =85[a] 16-20 maf=**100[ac]** (85-100[ab]) >20 maf =100[a]	June 21-August 31	<16 maf =50[d] 16-28 maf=**50-100[df]** (50-55[de]) >28 maf =**100[d]**(55[d])
Columbia River at McNary Dam	April 10-June 30	<80 maf =220[g] 80-92 maf=220-260[gh] >92 maf =260 [g]	July 1-August 31	200
Columbia River at Priest Rapids Dam	April 10-June 30	135	NA	NA

Table 1. Modified 2000 Biological Opinion seasonal flow objectives and planning dates for the mainstem Columbia and Snake Rivers. Modified objectives are bolded with Biological Opinion objectives in parentheses.

	Fall/Winter Dates	**Fall/Winter Flow Objective (kcfs)**		
Columbia River at Bonneville Dam	Oct 15-31 Nov 1-14 Nov 15-30 Dec 1-31 Jan 1 thru emergence	**125**(125) **140**(125) **150**(125) **160**(125) **150**(125)		

[a] Sliding scale based on April final runoff forecast at Lower Granite Dam for April-July.
[b] Linear interpolation between 85 and 100 kcfs.
[c] Modified flow objective is 100 kcfs for runoff forecasts >16 maf.
[d] Sliding scale based on June final runoff forecast at Lower Granite Dam for April-July.
[e] Linear interpolation between 50 and 55 kcfs.
[f] Linear interpolation between 50 and 100 kcfs.
[g] Sliding scale based on April final runoff forecast at The Dalles Dam for April-August.
[h] Linear interpolation between 220 and 260 kcfs.

Justification:

Flow objectives- The flow objectives in the Biological Opinion should be modified in two ways for the Council's Program. First, the language in the Biological Opinion should be changed that requires the Action Agencies to operate FCRPS dams and reservoirs to meet the flow objectives on a seasonal and weekly basis. The Biological Opinion as stated only requires the Action Agencies to "consider" meeting the flow objectives, which is not binding and allows considerable discretion by the Action Agencies. The Action Agencies have done a poor job in implementing operational measures to meet the flow objectives under the 1995 FCRPS Biological Opinion. For example, in four of five years during 1995-99, Hungry Horse Reservoir was not drafted to the interim draft elevation required by the 1995 BiOp leaving up to 332 kaf of water that could have been used to meet flow targets on a weekly basis. Similarly, Dworshak Reservoir was not drafted to the interim draft elevation in two of five years leaving up to 146 kaf that could have been used to meet flow targets.

Second, the flow objectives should be incorporated into the Program as minimum flows and as hard constraints and require the Action Agencies to use available water volume and system flexibility to meet and if possible exceed these minimum flows especially if there is adequate water supplies. As discussed in Appendix B of the 1995 Biological Opinion, the flow objectives are defined as those flow levels that are "low estimates of

the flows that reduce the likelihood of high mortality" of the listed ESU's and that flows need to be managed at higher levels to avoid this high mortality. Meeting the flow objectives in the Biological Opinion has been limited in part by water supplies in the RPA emphasizing the need to improve water volumes and operations (as discussed below) while utilizing system flexibility to meet the objectives.

Oregon adheres to the view that water acquisitions for flow augmentation be done on a willing seller/willing lessor basis consistent the states' regulatory mechanisms. The Program should include enforcement principles of the states' regulatory laws to protect flows to benefit fish.

Snake River spring flow objective- Available scientific data and analyses indicate extinction risks are high for ESA listed Snake River spring/summer chinook at low and average spring flows under the current hydrosystem configuration (Oregon 2000; Oregon 2000a; Idaho 2000). Prior to FCRPS completion, Snake River spring/summer chinook populations were productive under a range of natural runoff and environmental conditions even after completion of lower Columbia River dams (Schaller et al. 1999; Oregon 2000). Since completion of Snake River dams, Snake River spring/summer chinook have been above replacement (>1.0 positive population growth) only when Snake River spring flows have exceeded an average 100 kcfs due to high natural runoff conditions (Idaho 2000). In contrast, these stocks have been below replacement (0.9) for average spring flows of 85-100 kcfs (the BiOp spring flow objective) and well below replacement (0.4) for flows <85 kcfs. Based on this analysis, we conclude that the BiOp's spring flow objective of 85-100 kcfs is on the average inadequate to sustain Snake River spring/summer chinook populations and that the Council should adopt a minimum flow objective of 100 kcfs to avoid jeopardizing these stocks. Additionally, the Council should adopt measures to provide flows higher than 100 kcfs especially during years of high runoff to promote population growth and recovery of these stocks.

Snake River summer flow objective- The Snake River summer flow objective of 50-55 kcfs should be revised based on recent flow-survival data suggesting that survival of summer migrants can be greatly improved at flows of 80-100 kcfs. The Biological Opinion states that NMFS is not revising the Snake River summer flow objective because "such flows could seldom be achieved." We disagree that this upper range in flows as a target should be excluded on the basis of whether it is frequently attainable under current conditions that are limited in part by inadequate operational measures identified in the opinion. Instead, flow targets should be based on scientific data that demonstrate the survival benefitto Snake River summer migrants. Flow-survival data from PIT tag research conducted by NMFS (over a wider range of flows than earlier studies used to establish the 1995 Biological Opinion flow targets) have shown that survival of juvenile fall chinook can be increased six-fold as Snake River flows are increased from 40 to 100

kcfs and temperature reduced from 20 to 15C (NMFS 2000a). Based on this new information, the Council's mainstem plan should include these higher flows (50-100 kcfs) as the Snake River flow target on a sliding scale that recognizes that it will not be achievable under current operations and normal runoff, but will serve as a goal to improve survival under higher runoff conditions (as occurred in 1997) and provide the basis for pursuing additional flow augmentation in future years.

Below Bonneville fall/winter flow objective- Bright stock fall chinook, tule fall chinook, and chum salmon have been observed spawning in the mainstem Columbia below Bonneville Dam since 1994 and protection of these stocks is important to rebuilding salmonid runs in the Columbia Basin (WDFW and ODFW 1998). ESA listed tule fall chinook and chum occur in small numbers, however over 5,000 bright fall chinook have been counted in recent surveys. The Biological Opinion's flow objective for chum and chinook spawning below Bonneville needs to be revised several ways to meet the spawning, incubation, and emergence needs for both listed and unlisted adults under the Council's Program. First, the opinion's condition of not initiating spawning flow operations unless flow projections indicate that flow objectives can be met throughout spawning and incubation should not be included in the Program. The Biological Opinion does not provide spawning flows for adult spawning below Bonneville unless runoff projections in mid-October indicate that the specified operations from the start of spawning until emergence will be adequate to meet the 125 kcfs flow objective. Since the operations in the Biological Opinion are inadequate to meet the flow objectives, initiation of spawning flow operations are certain to not occur except during high flow years. Additionally, fall and winter flow projections in mid-October are highly unreliable.

Second, the Program needs to provide more adequate flows for spawning of each of the species below Bonneville and access of adults into tributaries. The Biological Opinion 125 kcfs instantaneous flow objective does not provide adequate spawning flows for both listed (Columbia River chum and lower Columbia tule fall chinook) and unlisted (lower Columbia bright fall chinook) species below Bonneville Dam. Flows of 125 kcfs would allow utilization of only 50% of available spawning habitat in the Ives Island area and restrict entry of chum into Hardy and Hamilton creeks. Depending on the tide and Willamette River backwater effect, the Ives Island spawning area has been dewatered at flows of 125 kcfs. The recommended flows supported by ODFW of 125-160 kcfs submitted to the Action Agencies (System Operational Request 99-28 dated September 3, 1999-Attachment 7) would provide full utilization of available chum and chinook spawning habitat and would protect adult spawners and established redds. The recommended flows also include earlier (October 15 vs November 1) spawning flows for lower Columbia tule and fall chinook that spawn earlier than chum. By restricting flow over the control point until November 1, there will be no water available to attract

chinook into the area where they stage prior to spawning. Restricting flows will force lower Columbia tule and bright chinook to spawn on the outside (main channel) of Ives and Pierce islands where spawning conditions are less favorable and where juveniles will not have good access to the island complex for rearing. This will result in decreased abundance and production of a self sustaining, naturally spawning bright chinook population and will limit recovery of the ESA listed tule stock.

Third, the Program needs to include protection measures to reduce the possibility of juvenile stranding in the area around Ives and Pierce islands when spring flows are in the range of 250-260 kcfs (ODFW 2000). Restrictions on hourly flow fluctuations as a result of load following need to be established. The Program should recommend that when flows are between 250 kcfs and 260 kcfs fluctuations be limited to no more than 10 kcfs in a 3-hour period.

2. Implement the following modified Biological Opinion operations to meet flow objectives.

The Program should include operations that modify those in the Biological Opinions to provide additional water to meet flow objectives. Table 2 provides Oregon's recommended modified Biological Opinion operations to meet flow objectives in the Columbia and Snake rivers. Justifications for each proposed modification to operations follow.

Additional Discussion of Measures and Justification:

Need for additional water to meet flow objectives- The Program needs to identify operations that are more likely than the NMFS and USFWS Biological Opinions to meet minimum flow objectives for all anadromous and resident fish species under a wider range of runoff conditions. Oregon acknowledges that under the current configuration of the Federal Columbia River Power System the biological requirements of many fish species, as represented by the minimum flow objectives, are not met during years of low runoff. Oregon's recommendations are a start to improve water supply to meet flow objectives, but further progress needs to be made in the Program. Based on Bonneville Power Administration's (BPA) modeling, NMFS's Biological Opinion operations will meet spring and summer flow objectives in the Columbia River only under average to above average runoff conditions and will never meet summer flow objectives in the Snake River. As an example of the magnitude of water volume that would be required to meet the flow objectives above and beyond that supplied by the opinion, we calculated the deficit volume for meeting the Snake (50-55 kcfs) and Columbia (200 kcfs) summer flow objectives for the 50 year flow record using data provided by BPA (Table 3). On the average, the Snake River deficit is 1020 kaf and 2260 kaf for the Columbia.

Table 2. **Modified (in bold) 2000 FCPS Biological Opinion operations to meet flow objectives in the Columbia and Snake Rivers.**

BiOp Action No.	**Purpose of BiOp Action**	**Project(s)**	**Biological Opinion Operation**	**Recommended Modified Operation**	**Benefit**	**Risks**
18	Meet spring and summer flow objectives on the Columbia and Snake Rivers.	Albeni Falls Dworshak Grand Coulee Hungry Horse Libby	Operate to meet April 10 flood control elevations; operate to meet spring flow objectives; refill by June 30.	**Operate Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby to meet both spring and summer flow objectives. Do not prioritize operations to meet summer objectives over operations to meet spring objectives.**	**Equitable probability of meeting spring and summer flow objectives. This, in turn, increases survival of spring and summer migrating juvenile salmonids through the federal hydropower system.**	**Under low runoff conditions, water elevations in some reservoirs may be lower in the spring. This may decrease probability of refilling these reservoirs by June 30 and may impact certain recreational opportunities in these reservoirs.**
19	Provide greater winter power draft. Meet Columbia River summer flow objective while providing protection for bull trout.	Hungry Horse	By January 1, 2001, implement VARQ flood control; provide minimum flows for bull trout and at Columbia Falls; limit summer draft to elevation 3540 ft by August 31.	**Implement VARQ for Hungry Horse only when water supply is sufficient to ensure VARQ does not reduce probabilities of meeting April 10 flood control elevations, refill by June 30, and chum and chinook spawning flows. If studies show no biological risk to resident fish, enhance water supply for meeting salmon flow objectives by drafting Hungry Horse below elevation 3540 ft by August 31.**	**Increased probability of meeting spring, summer, and fall flow objectives. This, in turn increases (a) survival of spring and summer migrating juvenile salmonids through the federal hydropower system and (b) production of chum and chinook salmon downstream from Bonneville Dam.**	**Water elevations in Hungry Horse may be lower in the summer, fall and winter. This may impact certain recreational opportunities in the reservoir and may reduce the amount of water available for meeting winter power needs.**

Table 2. **Modified (in bold) 2000 FCPS Biological Opinion operations to meet flow objectives in the Columbia and Snake Rivers.**

BiOp Action No.	**Purpose of BiOp Action**	**Project(s)**	**Biological Opinion Operation**	**Recommended Modified Operation**	**Benefit**	**Risks**
19	Meet Columbia River summer flow objective while providing protection for bull trout.	Libby	By October 1, 2001, implement VARQ flood control; provide minimum flows for bull trout; limit summer draft to elevation 2439 by August 31.	**Implement VARQ for Libby only when water supply is sufficient to ensure VARQ does not reduce probabilities of meeting April 10 flood control elevations, refill by June 30, and chum and chinook spawning flows. If studies show no biological risk to resident fish, enhance water supply for meeting salmon flow objectives by drafting Libby below elevation 2439 ft by August 31.**	**Increased probability of meeting spring, summer, and fall flow objectives. This, in turn increases (a) survival of spring and summer migrating juvenile salmonids through the federal hydropower system and (b) production of chum and chinook salmon downstream from Bonneville Dam.**	**Water elevations in Libby may be lower in the summer, fall and winter. This may impact certain recreational opportunities in the reservoir and may reduce the amount of water available for meeting winter power needs.**
19	Determine if operation improves spawning success for kokanee, an important bull trout forage fish.	Albeni Falls	Draft to elevation 2051 ft by August 31; refill to and maintain elevation 2055 ft during fall/winter for kokanee spawning study. Beginning in 2004, implement operation recommended by USFWS and NMFS.	**Refill to and maintain elevation 2055 ft at Albeni Falls during the fall/winter only when water supply is sufficient to ensure the operation does not reduce probabilities of meeting salmon spawning flow objectives.**	**Increased probability of meeting fall spawning flow objectives. This, in turn increases production of chum and chinook salmon downstream from Bonneville Dam.**	**Under low runoff conditions, water elevations in Albeni Falls may be lower in fall and winter. This may or may not not provide ideal conditions for kokanee spawning and forage for bull trout.**
19	Meet Columbia River summer flow objective.	Grand Coulee	Operate to achieve 85% probability of meeting April 10 rule curve and refill by July 4 if a draft is not required to meet flow objectives; limit August 31 draft to elevation 1280 ft when runoff forecast = or >92 maf and to elevation 1278 ft when forecast <92 maf.	**If studies show no biological risk to resident fish, enhance water supply for meeting salmon flow objectives by drafting Grand Coulee below 1280 ft (>92 maf) and 1278 ft (<92 maf) by August 31.**	**Increased probability of meeting Columbia River summer flow objectives. This, in turn increases survival of summer migrating juvenile salmonids through the federal hydropower system.**	**Water elevations in Grand Coulee may be lower in the summer, fall and winter. This may impact certain recreational opportunities and other uses in the reservoir and may reduce the amount of water available for meeting winter power needs.**

Table 2. **Modified (in bold) 2000 FCPS Biological Opinion operations to meet flow objectives in the Columbia and Snake Rivers.**

BiOp Action No.	**Purpose of BiOp Action**	**Project(s)**	**Biological Opinion Operation**	**Recommended Modified Operation**	**Benefit**	**Risks**
19	Meet Snake River summer flow objective and 68F temperature criteria.	Dworshak	Attempt to refill by June 30 while coordinating with TMT to meet spring flow objectives; limit draft to elevation 1520 ft by August 31; manage discharge to achieve 68F at Lower Granite.	**If studies show no biological risk to resident fish, enhance water supply for meeting Snake River summer flow objectives by drafting Dworshak below elevation 1520 ft by August 31.**	**Increased probability of meeting Snake River summer flow objectives. This, in turn increases survival of summer migrating juvenile salmonids through the federal hydropower system.**	**Water elevations in Dworshak may be lower in the summer, fall and winter. This may impact certain recreational opportunities in the reservoir and may reduce the amount of water available for meeting winter power needs.**
20	Increase water velocity to provide faster juvenile emigration and improve survival.	Snake River Projects John Day	Operate Snake River projects within 1 ft of MOP April 3 until small number of juveniles are present and John Day within 1.5 ft of MIP April 10-September 30.		**Reductions in travel time and corresponding increase in survival of spring and summer migrating juvenile salmonids through the federal hydropower system.**	
21	Improve meeting Snake River flow objectives while only slightly affecting mid-Columbia flow conditions.	Brownlee Dworshak Grand Coulee	If opportunity exists, shift flood control from Brownlee and Dworshak to Grand Coulee.		**Increased probability of meeting spring and summer flow objectives. This, in turn increases survival of spring and summer migrating juvenile salmonids through the federal hydropower system.**	

Table 2. **Modified (in bold) 2000 FCPS Biological Opinion operations to meet flow objectives in the Columbia and Snake Rivers.**

BiOp Action No.	**Purpose of BiOp Action**	**Project(s)**	**Biological Opinion Operation**	**Recommended Modified Operation**	**Benefit**	**Risks**
22	Improve meeting summer flows at McNary by 10 kcfs by relaxing flood control during average to below average water years.	Libby Hungry Horse	Implement VARQ at Libby by October 1, 2001 and at Hungry Horse by January 1, 2001. Corps complete NEPA compliance and Canadian coordination for Libby VARQ.	**Implement VARQ for Libby and Hungry Horse only when water supply is sufficient to ensure VARQ does not reduce probabilities of meeting April 10 flood control elevations, refill by June 30, and chum and chinook spawning flows**.	**Increased probability of meeting Columbia River spring, summer, and fall flow objectives. This, in turn increases (a) survival of spring and summer migrating juvenile salmonids through the federal hydropower system and (b) production of chum and chinook salmon downstream from Bonneville Dam.**	**Water elevations in Libby and Hungry Horse may be lower in the summer, fall and winter. This may impact certain recreational opportunities in the reservoirs and may reduce the amount of water available for meeting winter power needs.**
23	Improve summer flows by 130 kaf.	Banks Lake	Operate Banks Lake at 5 ft from full during August by reducing 130 kaf water pumped from Lake Roosevelt.		**Increased probability of meeting Columbia River summer flow objectives. This, in turn increases survival of summer migrating juvenile salmonids through the federal hydropower system.**	
24	Meet summer flow objective at McNary Dam.	Canada Treaty storage	BPA and Corps negotiate agreements to provide 1 maf Treaty storage January-April 15 for release during summer.		**Increased probability of meeting Columbia River summer flow objectives. This, in turn increases survival of summer migrating juvenile salmonids through the federal hydropower system.**	

Table 2. **Modified (in bold) 2000 FCPS Biological Opinion operations to meet flow objectives in the Columbia and Snake Rivers.**

BiOp Action No.	**Purpose of BiOp Action**	**Project(s)**	**Biological Opinion Operation**	**Recommended Modified Operation**	**Benefit**	**Risks**
25	Meet summer flow objective at McNary Dam.	Canada non-Treaty storage	BPA and Corps request from BC Hydro storage of non-Treaty water during spring for release in July and August if forecasts indicate that stored water can be released.		**Increased probability of meeting Columbia River summer flow objectives. This, in turn increases survival of summer migrating juvenile salmonids through the federal hydropower system.**	
26	Meet summer flow objective at McNary Dam.	Additional Canada Treaty storage	BPA and Corps negotiate with BC Hydro additional storage of Treaty water for release in July and August.	**Increase water supply available to meet salmon flow objectives by 3.5 maf by implementing 1995 BiOp Sections 1C (reallocate 1.5 maf of flood control from Arrow to Mica) and 1D (expand storage above 1 maf realized in current operational agreements). Increase water supply available to meet salmon flow objectives by an additional 1-2 maf by requiring installation of two turbines at Mica and Revelstoke dams.**	**Increased probability of meeting Columbia River summer flow objectives. This, in turn increases survival of summer migrating juvenile salmonids through the federal hydropower system.**	**Water elevations in Canadian reservoirs may be lower in the summer, fall and winter. This may impact certain recreational and other opportunities in the reservoirs and may reduce the amount of water available for meeting winter power needs.**

Table 2. **Modified (in bold) 2000 FCPS Biological Opinion operations to meet flow objectives in the Columbia and Snake Rivers.**

BiOp Action No.	**Purpose of BiOp Action**	**Project(s)**	**Biological Opinion Operation**	**Recommended Modified Operation**	**Benefit**	**Risks**
32	Meet spring and summer flow objectives at Lower Granite Dam.	USBR Upper Snake projects Hells Canyon Complex	Action Agencies acquire water from USBR upper Snake projects and IPC Hells Canyon Complex for instream use during spring and summer.	**Provide 427 kaf from the upper Snake and 110 kaf spring and 337 kaf summer from Brownlee Reservoir. Provide all upper Snake water in July and August (no shaping operations in Brownlee). Consistent with 1994 Program Measure 5.2A.3, provide an additional 0.5-1.0 maf water from USBR projects including the upper Snake on a willing seller/willing lessor basis.**	**Increased probability of meeting Snake River spring and summer flow objectives. This, in turn increases survival of spring and summer migrating juvenile salmonids through the federal hydropower system.**	**Water elevations in USBR upper Snake reservoirs may be lower in the summer, fall and winter. This may impact certain recreational and other opportunities in the reservoirs and may reduce the amount of water available for meeting winter power needs.**
34	Evaluate potential benefits to adult fall chinook and steelhead passage.	Dworshak	Draft 20 ft from elevation 1520 to 1500 ft in September.	**Draft Dworshak 20 ft from elevation 1520 to 1500 ft in August, not September.**	**Increased probability of meeting Snake River summer flow objectives and lowering water temperatures. This, in turn increases survival of summer migrating juvenile and adult salmonids through the federal hydropower system.**	**Water elevations in Dworshak may be lower in the summer, fall and winter. This may impact certain recreational and other opportunities in the reservoir and may reduce the amount of water available for meeting winter power needs.**

Table 2. **Modified (in bold) 2000 FCPS Biological Opinion operations to meet flow objectives in the Columbia and Snake Rivers.**

BiOp Action No.	**Purpose of BiOp Action**	**Project(s)**	**Biological Opinion Operation**	**Recommended Modified Operation**	**Benefit**	**Risks**
35	Reduce effects on the spring freshet; minimize flow fluctuations during fall chinook emergence; and achieve higher refill probability while providing acceptable protection from floods.	Columbia River Flood Control Project	Conduct feasibility analysis of modifying flood control operations to benefit Columbia River ecosystem.	**Conduct feasibility analysis of modifying flood control operations to benefit Columbia River ecosystem. Implement modified operations beginning in 2007.**	**Increased probability of meeting spring, summer, and fall flow objectives. This, in turn increases (a) survival of spring and summer migrating juvenile salmonids through the federal hydropower system and (b) production of chum and chinook salmon downstream from Bonneville Dam.**	**Increased probability of flood events and increased mitigation and maintenance costs due to flooding.**

However, for the 8 lowest flow years (53.5-70.9 maf), the deficit is 1.68 maf for the Snake and 8.8 maf for the Columbia.

Table 3. Deficit water volume to meet the NMFS Biological Opinion's summer flow objectives in the Snake and Columbia rivers (Hydro Regulation data from BPA).

Run-off Volume (maf)	Snake River Deficit (kaf)	Columbia River Deficit (kaf)
50 yr average	1020	2260
53.5-70.9 maf (8 yr)	1680	8800
80.8-96.9 maf (12)	1080	3240
101.8-117.9 maf (20)	1080	1560
121.8-156.1 maf (10)	360	0

The federal agencies have failed to resolve a well-documented problem that further reduces available water for migrating juvenile salmon and, in fact, have placed less emphasis on resolving this issue in the recent opinions. Operations for spawning of Kootenay River sturgeon under the USFWS Biological Opinion reduces available water for migrating juvenile salmon by compromising refill of Libby Reservoir (as occurred this year) and water for summer flow augmentation. The VARQ operations discussed below reduces water for chum and chinook spawning below Bonneville Dam by reducing flood control drafts from Libby and Hungry Horse reservoirs. Available water supply under NMFS's opinions to meet flow objectives has remained relatively constant since 1995 despite the fact an additional eight salmon and steelhead ESU's have been added to the Endangered Species list. This has resulted in "trading off" protection measures for one fish species for another. Rather than trading off or spreading protection measures between fish species, the Program needs to identify additional water to meet the flow needs of all fish species.

As stated earlier, Oregon's recommended operations would greatly enhance water availability relative to NMFS and USFWS Biological Opinions and are more likely to meet the flow objectives under a wider range of runoff conditions. As discussed below, assuming a 10 ft deeper draft of Libby, an 8 ft deeper draft of Grand Coulee, a 3 ft draft of Albeni Falls, reallocation of 1.5 maf flood control from Arrow to Mica and a 20 ft draft of Arrow, and installation of turbines at Mica and Revelstoke dams to allow a 1.5 maf draft could provide over 6 maf that would greatly improve meeting Columbia River summer flow objectives. Similarily, a 10 ft draft of Dworshak in July-August rather than September, a draft of 100 kaf from Brownlee, and draft of an additional 1.0 maf from the upper Snake could provide over 1.3 maf that would significantly improve meeting Snake River summer flow objectives.

Spring vs summer priority- The Program should place equal priority on meeting flow needs of spring and summer migrants as well as other fish species under the Program to

meet flow requirements of each species. The Program should emphasize meeting flow needs of all species, not prioritizing one species over the other.

Draft limits on reservoirs- The Program should redefine biologically acceptable draft limits for major storage reservoirs to meet flow objectives. The Program should call for Re-evaluation of "interim draft limits" on storage elevations established by the 1995 Biological Opinion including a formal risk assessment that includes conservation requirements for listed and other native species in the Columbia Basin affected by storage reservoir operations. NMFS has had over 5 years to compile this information and design risk assessments necessary to evaluate the interim draft limits. Deeper drafts of each of the reservoirs including Hungry Horse, Libby, Albeni Falls, Grand Coulee, and Dworshak may be possible without jeopardizing other fish species or affect other project purposes. As an example, a 10 ft deeper draft of Libby (to elevation 2530 ft) and Dworshak (to elevation 1500 ft) would provide an additional 418 and 244 kaf, respectively. An 8 ft deeper draft of Grand Coulee (to elevation 1270 ft) would provide an additional 588 kaf for flow augmentation. And finally, a 3 ft draft of Albeni Falls (from 2062.5 to 2059.5 ft) would provide 280 kaf to augment summer flows.

VARQ operations- The Program should place restrictions on VARQ operations of NMFS' opinion to eliminate reduction in spawning flows for chum and chinook below Bonneville. VAR Q flood control operations are an action in the opinion to improve reservoir elevation in Libby and Hungry Horse to enhance reservoir productivity for resident fish and to improve spring flows for migrating juvenile salmonids in the mid- and lower Columbia rivers. Although reservoir elevations in Libby and Hungry Horse and spring flows have been improved, spawning flows for chum and chinook below Bonneville have been reduced by 868 kaf <u>compared to flows provided under the 1999 Supplemental Biological Opinion</u>. This reduction will seriously reduce the probability of meeting the flow target of 125-160 kcfs recommended by Oregon to protect ESA listed chum and tule chinook as well as unlisted bright chinook below Bonneville Dam.

Canadian operations- The Program needs to include and require the Action Agencies to re-initiate consultation of additional Canadian storage identified in the 1995 NMFS Biological Opinion Sections 1C and 1D. Section 1C of the 1995 opinion calls for "The COE shall implement for 1996 and beyond the 1.5 MAF reallocation of flood control from Arrow to Mica…" and Section 1D "The BPA and COE shall continue attempting to expand current arrangements for storage in Canadian Reservoirs to allow additional storage for fish flow enhancement, above the current approximate 1 MAF realized in current operational agreements." According to the opinion BiOp, these improved operations at Arrow, including a 20-ft summer draft could provide an additional 3.5 maf of flow augmentation.

The Program should include a requirement for the Action Agencies to negotiate with BC Hydro installation of 2 turbines at Mica and Revelstoke dams in Canada, which is estimated to provide 1-2 maf for summer flow augmentation. Summer drafts would have to be balanced with winter operations when this volume is returned to Canada to minimize impacts to flows for chum and chinook spawning below Bonneville.

Brownlee and upper Snake River operations- The Program should include measures for drafting 427 kaf from the upper Snake and 110 kaf during spring and 237 kaf during summer from Brownlee Reservoir as required by the 1995 BiOp. These measures were not included in the 2000 BiOp pending outcome of ongoing Section 7 consultations with FERC. The Program should also require that the Idaho Power Company (IPC) draft an additional 100 kaf from Brownlee Reservoir to meet Snake River summer flow objectives. This is the average draft that IPC has done in the past to deliver USBR water from the upper Snake that can't be provided by August 31. The Program should require that all water from the upper Snake be provided in July and August with no shaping operations in Brownlee. Shaping operations in the past have reduced up to 160 kaf of storage from Brownlee Reservoir that could have been used to meet flow objectives.

Consistent with the Council's 1994 Program Measure 5.2A.3, the Council's mainstem plan should call for an additional 0.5-1.0 maf water from U.S. Bureau of Reclamation (USBR) projects including the upper Snake to better meet flow targets. Basinwide, of the 13.5 maf diverted from 31 USBR projects for irrigation, about 6.5 maf is consumed and not returned to the river (NMFS 2000 BiOp). Irrigation depletions from USBR Columbia River projects are a "major impediment to meeting NMFS' flow objectives" and without these depletions, monthly flow targets could be met at a significantly higher rate. The Program should require USBR to seek through negotiations with stakeholders in Oregon, Washington, and Montana, as well as Idaho, to determine the regulatory mechanisms to secure 0.5-1.0 maf for flow augmentation on a willing seller/willing lessor basis. The Council's Program should include enforcement principles of the state regulatory laws to insure that water transferred to in-river rights to benefit fish would not be used by private water users.

Dworshak operations- The Program should provide discretion to the Technical Management Team (TMT) to draft Dworshak to elevation 1500 ft in August to evaluate potential benefits to adult Snake River steelhead and fall chinook passage. A conversion rate analysis conducted by ODFW (August 20, 1999 memo "Improving Adult Fall Chinook Conversion Rates in the Lower Snake River by Hydropower System Management") indicates that the greatest survival benefits to adult fall chinook is provided by cool water releases in August and less of a benefit in September. Releases in August would also have benefits to juvenile fall chinook

Flood control operations- The Program should incorporate the BiOp's requirement (Action 35) for expedited completion of a feasibility analysis of modifying system flood control operations to improve flows for anadromous while maintaining acceptable protection from floods. The Program should also require the Corps to seek authority to allow implementation of modified flood control operations in 2007 two years after completion of the feasibility analysis required in the BiOp. In addition to the elements of the feasibility analysis discussed in the BiOp, the analysis should determine how flood control operations could be managed so that releases coincide as closely as possible with fish migration (i.e., reserve as much of the flood control draft as possible until early April 3) and how flood control operations could be managed inseason to optimize benefits to migrating fish while meeting flood control responsibilities. An initial study done by the Corps (Corps 1997) has shown that relaxing flood control requirements at The Dalles (from 450 to 550 kcfs) could provide an additional 20 kcfs during May to benefit downsteam migrants while only increasing the probability of exceeding floods above 450 kcfs by 10%. The benefit from this operation could greatly exceed the $1-2 million additional cost estimated by the Corps to maintain levees in the Portland/Vancouver area. This study needs to be completed to determine the benefits and costs of modifying flood control operations basinwide to benefit fish and wildlife and the Columbia Basin ecosystem.

Strategy: Improve inriver survival by reducing predation-caused mortality.

Measure 2. As specified in the 2000 BiOp, continue program to harvest predator-sized pikeminnow in sport and dam angling fisheries to achieve an exploitation goal of 10-20% and evaluate biological effectiveness. Continue to explore different technologies and increase efficiency of current technologies to remove pikeminnow.

Justification:

Flow reductions resulting from the impoundment of the Columbia and Snake rivers act to delay the downstream migration of juvenile salmonids, prolonging their exposure to predators. Changes in flow regimes have also resulted in longer exposure during times of relatively high water temperatures, when predators are most active. The northern pikeminnow is the dominant predator of juvenile salmonids in the system, and may consume approximately 8% of the juvenile salmonids emigrating annually (Beamesderfer et al. 1996). Management fisheries have harvested an average of 12% of adult northern pikeminnow annually since 1991, which has decreased predation by an estimated 25% (Friesen and Ward 1999). The Northern Pikeminnow Management Program must be continued for these predation reductions to be sustained. Annual evaluation of the

exploitation rates and predation reductions should be continued, and the response of northern pikeminnow and other predators should be monitored periodically.

Measure 3. Reduce total predation by Caspian terns, cormorants, and gulls of juvenile salmonid spring and summer migrants arriving to the estuary to 5% by 2004; to 3% in 2006; to 2% in 2008; and to 1% in 2010.

Justification:

Caspian terns, double crested cormorants, and gulls consume significant numbers of juvenile salmonids in the Columbia River estuary (Bevan et al. 1994 and Corps 2001). In 2000, an estimated total of 7.3 million smolts (10.9% of spring migrants arriving to the estuary) including 1.1 million smolts listed under ESA (ODFW 2001) were lost to predation by terns. In 2000, an additional 4.5 million spring migrants (6.7% of fish arriving to the estuary) were estimated to have consumed by cormorants and an unknown but likely significant number was consumed by gulls (unpublished data from Dan Roby, Oregon State University). This predation loss by terns, cormorants, and gulls constitutes a major point source of human caused mortality of ESA listed juvenile salmon and steelhead in the Columbia Basin and is a major impediment to recovery efforts under ESA and the Power Act. Although considerable progress has been made by the Corps and the Caspian Tern Work Group (CTWG) to reduce predation losses by relocating terns from Rice to East Sand Island, the Northwest Governors (Northwest Governors 1999) and the Oregon Fish and Wildlife Commission have called for more aggressive action to reduce predation losses due to piscivorous birds in the Columbia estuary.

The 2000 BiOp (Reasonable and Prudent Alternative Action 102 Page 9-108) provides clear direction to the Corps that if studies indicate an unacceptable loss of ESA listed fish then "If warranted and after consultation with NMFS and USFWS, the Action Agencies shall develop and implement methods of control that may include reducing the populations of these [terns, cormorants, gulls] predators." Oregon strongly feels that efforts to reduce predation by these birds are warranted and has recommended that the Corps re-initiate Section 7 consultation with NMFS to identify alternative actions to significantly reduce predation beginning in 2003. The Corps should develop a management plan in conjunction with the Caspian Tern Working Group to meet the above benchmark goals. These benchmark goals are conservation measures and will not in themselves result in recovery of the listed fish species. When progress is made in recovering the listed fish, an appropriate balance between fish and bird populations can be established. These goals must include the following management and regulatory considerations for terns, cormorants, and gulls: 1) identification of alternative nesting sites that ensures avian population viability is not compromised; 2) consistency with migratory bird obligations; 3) availability of adequate funds; 4) process for effective

public involvement and education; 5) effective regional coordination and cooperation; and 6) restoration of ecological balance and processes in the lower Columbia.

Measure 4. Investigate predation by pinnipeds in the near-ocean, estuary, and lower Columbia River up to Bonneville Dam to determine extent of predation and to evaluate predation control measures. Coordinate study efforts with on-going efforts. Submit a study plan to NMFS by June 30, 2001, detailing the study objectives, methods, schedule, and budget.

1. Determine current abundance, population structure, and distribution patterns of harbor seals and California sea lions in the near-ocean, estuary, and Columbia River up to Bonneville Dam.

2. Determine areas and times of pinniped predation and identify physical/environmental factors that may contribute to predation success.

3. Determine annual prey and food requirements of pinnipeds occurring in the Columbia River.

4. Determine predation vulnerability of various salmonid runs and levels of mortality caused by pinniped predation.

5. Estimate direct and indirect mortality of salmon by pinnipeds in the Columbia River.

6. Identify and evaluate methods to reduce salmon mortality caused by pinnipeds in-river and in the Columbia River estuary.

Justification:

As recognized by the NMFS BiOp, the riverine ecosystems of the lower Snake and lower Columbia rivers have been altered dramatically by the development of the FCRPS. This development, and associated fish management practices, has created an environment that has benefited a variety of species that prey on juvenile and adult salmonids. Studies cited in the Predation White Paper (NMFS 1999) indicate that a relatively large number of juvenile salmonid migrants are eaten by a variety of piscivorus fish, birds, and marine mammals. From 1990 to 1993, marine mammal damage was observed on up to 19% of the adult spring/summer chinook and up to 14% of the steelhead passing Lower Granite Dam. NMFS speculates that many fish injured by marine mammals die before reaching this hydroproject. As noted by the Draft Recovery Plan for Snake River Salmon (NMFS 1995), pinniped numbers in the Columbia River have increased significantly over the past 20 years. These animals are regularly observed over 100 miles from the ocean up to

Bonneville Dam and Willamette Falls. On many occasions, California sea lions have been observed feeding on adult salmon near the fishway entrances below Bonneville Dam.

Reasonable and Prudent Alternative Action 106 (Page 9-109) in the NMFS 2000 BiOp calls for an investigation of marine mammal predation in the tailrace of Bonneville Dam. The study plan is to be submitted to NMFS by June 30, 2001, detailing the study objectives, methods, and schedule. Oregon agrees that this study is necessary, however, Oregon strongly believes that there is a need to adequately understand the current relationships between predation (as a source of mortality) and the viability of fish stocks in the entire Columbia River system below Bonneville Dam – an area that includes near-ocean, the Columbia River estuary, and the mainstem Columbia River up to Bonneville Dam. Once such an understanding is achieved, an evaluation of the effects of predation on fish stocks of special concern can be made. Included in this study effort should be determination of pinniped abundance and distribution, movements in the Columbia River system, predation levels, and the vulnerability of various salmonid runs to such mortality. Evaluation of this predator activity should also include development of remedial methods such as relocation or lethal removal. Efforts should be coordinated with on-going marine mammal research and control activities in the Columbia River, estuary and near-ocean.

Strategy: Maximize fish passage efficiency and survival at all projects in the Snake and Columbia Rivers. Protect biodiversity and favor fish passage methods that are consistent with natural fish migration and river processes.

Measure 5. Implement 2000 BiOp and additional spill at Snake and Columbia River dams.

1. Implement modified 2000 Biological Opinion spill.

Table 4 provides Oregon's recommended modified Biological Opinion spill levels for Columbia and Snake River Dams.

Table 4. Recommended spill levels and gas caps for FCRPS projects during spring[a] and summer[b]. Modified spill levels are bolded with Biological Opinion levels in parentheses.

Project	**Spring Spill Amount[c] and (Hours)**	**Summer Spill Amount and (Hours)**	**Limiting Factor**
Lower Granite	60 kcfs (6PM-6AM)	N/A	Gas cap
Little Goose	45 kcfs (6PM-6AM)	N/A	Gas cap
Lower Monumental	40 kcfs (24 hours)	N/A	Gas cap
Ice Harbor	100 kcfs night and 45 kcfs day (24 hours)	100 kcfs night and 45 kcfs day (24 hours)	Night- gas cap Day- adult passage
McNary	120-150 kcfs (6PM-6AM)	N/A	Gas cap
John Day	85-160 kcfs/60% instantaneous[d] (6PM-6AM)[e]	85-160 kcfs/60% instantaneous (6PM-6AM) [e]	Gas cap/tailrace juvenile passage
The Dalles	**64 %** (40%) instantaneous (24 hours)	**64 %** (40%) instantaneous (24 hours)	Tailrace juvenile passage
Bonneville	90-150 kcfs night and 75 kcfs day (24 hours)	90-150 kcfs night and 75 kcfs day (24 hours)	Night- gas cap Day- adult fallback

[a] Spring spill planning dates are April 3-June 20 for the Snake River and April 10-June 30 for the Columbia River.
[b] Summer spill planning dates are June 20-August 31 for the Snake River and July 1-August 31 for the Columbia River.
[c] Estimated spill levels have and will continue to increase for some projects as spillway optimization measures are implemented.
[d] At flows <300 kcfs, spill at John Day is limited by the TDG cap that is estimated at 85-160 kcfs. At flows>300 kcfs, spill is limited by tailrace hydraulics and is 60% of instantaneous flows.
[e] Spill at John Day will be 7PM-6AM (night) and 6AM-7PM (day) between May 15-July 31.

Justification:

Spillway passage is the preferred passage method for juveniles that are not collected and transported (NMFS 2000) since it has been shown to provide the highest survival of any passage route at mainstem Snake and Columbia River dams (NMFS 2000b). In a literature review of spillway survival studies, Whitney et al. (1997) concluded that

survival for fish passing through a standard spillbay is 98-100% compared to 90% for fish passing through a turbine (Iwamoto and Williams 1993). Similarly, Muir et al. (in preparation) found that yearling chinook salmon survival was highest for fish passing through spillways without deflectors (98.4-100%), followed by spillways with deflectors (92.7-100%), bypass systems (95.3-99.4%), and turbines (86.5-93.4%). Increasing spillway passage is consistent with hydrosystem strategies of the Council (2000), ISAB (ISAB 1999), NMFS (2000), and Oregon to significantly improve project and mainstem survival rates and promote recovery of anadromous fish through methods that protect life history diversity and closely approximates natural and physical conditions. Maximizing spillway passage using conventional spill is the best strategy to improving mainstem survival since it will be many years before engineering and biological issues with surface bypass/collection systems are resolved (see below). Increasing spillway passage at Snake and Columbia River dams will also reduce the proportion of fish transported nearer to a true "spread the risk" transport strategy advocated by Oregon (see below).

The Program should maintain 64% spill at The Dalles established by the 1995 Biological Opinion not the reduced 40% levelin the 2000 Biological Opinion. There is no sound scientific basis for decreasing spill to 40%. The reduction in spill at The Dalles by the 2000 opinion is contradictory to the Program's primary hydrosystem strategy to optimize spill operations to provide the greatest biological benefit. Providing 64% spill will increase spillway passage and provide greater project survival because of reduced passage of smolts through turbines and the sluiceway. NMFS' basis for reducing spill is survival studies conducted at The Dalles 1997-1999, but the results were equivocal with no statistically significant differences between the spill percentages tested (Attachment 8). The opinion calls for additional spill studies at The Dalles that are intended to resolve the question of spill level and relative survival through various passage routes. The Independent Scientific Advisory Board (ISAB 2000) recommended that future studies focus on spills between 30 and 50%. The Program should assume no increased spillway or project survival at The Dalles Dam until research resolves experimental design issues and provides statistically significant survival estimates.

2. Test 24 hr spill at Lower Granite, Little Goose, Lower Monumental, McNary, and John Day dams.

For spring and summer months, the Program should recommend an aggressive (2-3 year) schedule for testing 24 hr spill at Lower Granite (within constraints of surface bypass testing), Little Goose, Lower Monumental (summer only), McNary, and John Day dams to optimize spill levels to balance juvenile and adult passage needs within TDG gas cap limits. Under the Biological Opinion, spill is limited to 12 hr at Lower Granite, Little Goose, McNary, and John Day dams during spring months. During summer months, spill is limited to 12 hr at John Day and no spill is provided at transport collector dams.

High spillway effectiveness and high daytime passage were found during 24 hr spill tests at John Day in 1997 and 1999 (NMFS 2000c).

3. Implement 24 hr spill at Lower Granite, Little Goose, Lower Monumental, McNary, and John Day dams.

Based on the results of the above studies, an optimum 24 hr spill regime should be implemented at each project within TDG, tailrace, and adult passage constraints as soon as studies are completed and improvements to BPA's transmission system (NMFS Biological Opinion Actions 55-57) are made but not later than 2003 at John Day and McNary dams and 2005 at Lower Monumental, Little Goose, and Lower Granite dams.

Justification:

The NMFS Opinion in Section 9.6.1.4.2 calls for 24 hr spill tests at John Day (proceed with most promising option including 24 hr spill, RSW, and E-BS in 2002), Little Goose (implement RSW or 24 hr spill), and Lower Granite (implement RSW or 24 hr spill no date) but not at Lower Monumental (summer spill) or McNary dams. No firm date is established except for John Day (late 2002 decision date on 24 hr spill and/or removable spillway weir prototype). Daytime (24 hr) passage through bypass systems, sluiceways, and spillways has been demonstrated at every project studied on the lower Snake and mid- and lower Columbia rivers (NMFS 2000c). Higher daytime passage through spillways has been demonstrated at projects where 24 hr spill is provided (NMFS 2000b) indicating that forebay delay can be reduced by providing spill during daytime hours.

As discussed above, conventional spill is the only viable management option to improve juvenile project survival in the short-term and there is an urgent need to improve mainstem survival to avoid extinction of ESA listed fish. The abundance of many populations in the upper Columbia and Snake River ESU's has exhibited an accelerating level of decline over historic and recent periods. Smolt-to-adult survival for some populations under the 1995 BiOp remain below the 2-6% level required for recovery (Toole et al. 1996) with the prospect that many populations within ESU's will be extinct in less than 15 years if the survival rates of these fish are not improved (Mundy 1999; Oregon 2000a; Oosterhout and Mundy 2001).

4. Conduct risk assessment of increasing spill levels in the short-term above current 120% TDG waiver to benefit anadromous fish. Request a temporary waiver to the Clean Water Act standard to implement higher spill levels in the short-term if risk assessment indicates that ecological risks are low.

Justification:

The Program should call on the Corps, in consultation with NMFS and the states and tribes, to conduct a risk assessment of the biological risks of increasing spill at selected projects above the current gas cap (120% total dissolved gas) which is the maximum allowable TDG level allowed under state water quality rules. A risk assessment by NMFS (Appendix E of the BiOp) concluded (based on the 1995 Spill and Risk Management report prepared by the region's fishery agencies and tribes as well as research and monitoring since implementation of the 1995 BiOp) that TDG in the 120-125% range, coupled with depth compensation "would not cause juvenile or adult salmon mortalities exceeding the expected benefits of spillway passage." This risk assessment needs to be expanded to include risks to resident fish and other aquatic species. Comprehensive biological monitoring since 1995 required by the state water quality agencies has shown almost negligible impacts to anadromous fishfrom voluntary spill to 120% TDG and higher TDG under involuntary spill conditions. However, impacts to other fish and aquatic species have received only limited monitoring. This risk assessment should include evaluation of the potential survival benefits of increased spillway and reduced turbine passage to juvenile anadromous fish from spill at TDG's above 120% against the potential increase in mortality to juvenile and adult anadromous and resident fish and other aquatic species from gas supersaturation. Increasing spill at selected projects could provide significant survival benefits for all listed and unlisted fish under the Council's. Although Oregon supports gas abatement structural and operational measures to achieve the state and federal dissolved gas standard of 110% in the long-term, this risk assessment will evaluate the biological risk of the interim strategy to provide spill for fish in exceedances of the 110% gas standard. This effort should be coordinated with the 1- and 5-year Water Quality Improvement Plan described in Section 9.4.2.4 of the BiOp.

Oregon is currently in the process of developing a Total Maximum Daily Load (TMDL) for total dissolved gas for the mainstem Columbia River. This is required under the CWA because the mainstem is not meeting water quality standards for dissolved gas as a result of project spill. While the state has approved waivers to its standards to facilitate spill as required by the NMFS BiOp, the long-term aim of the TMDL is to attain the 110% TDG standard. The TMDL will specify for each of the lower Columbia River projects a spill quantity to comply with the standard. On the road to attaining these loads, fish passage needs of ESA fish need to be assured. Exceedances of the total dissolved gas standard beyond those experienced currently will contravene not only the CWA, but also the spirit of the TMDL standards attainment process.

Measure 6. In the short-term, modify projects to maximize spill and maximize spillway and project survival under temporary TDG waivers issued by the states.

1. **Consistent with the NMFS BiOp and schedules developed by the System Configuration Team, the Program should require the Corps to install end bay deflectors and improvements at John Day (by 2002), Lower Monumental (2004), and Little Goose (2005).**

2. **The Program should call for completion of spillway deflector optimization, spill pattern, and spillway and project studies outlined in the NMFS BiOp to maximize spill and maximize spillway and project survival under temporary TDG waivers.**

Justification:

The installation of spillway deflectors at Ice Harbor and John Day has resulted in significant increases in allowable spill at these projects under the temporary 120% TDG waivers issued by the states (NMFS 1998). Installation of end deflectors at John Day, Lower Monumental, and Little Goose will allow additional increases in spill and survival at these projects without increases in TDG. Testing and installation of spillway surface bypass/collection (RSW-raised spillway weirs) systems discussed below will also allow increases in spill and survival without increases in TDG.

Measure 7. In the long-term, modify projects to reduce dissolved gas levels under spill operations to meet the 110% TDG state and federal standard.

The Program needs to establish a requirement for the federal project operators to significantly reduce total dissolved gas (TDG) under voluntary and involuntary spill operations with the long-term goal of meeting the 110% TDG criteria established by EPA and the states. This effort was initiated in the Corps' Dissolved Gas Abatement Study (DGAS) program, but was abandoned to meet short-term ESA recovery goals and primarily focused on installation of deflectors and spill optimization testing. These efforts will reduce TDG and improve salmon survival, but will fall far short of complying with CWA standards to address ecological needs of all species. Load allocations for each of the lower Columbia River dams will be established as a part of a TMDL. The federal agencies (Corps and USBR) need to commit to accepting, and in the long term, meeting those allocations. As part of the TMDL, an implementation plan will be developed. The measures suggested and assessed through the Corps DGAS study will form the basis for this plan. The federal agencies will be asked to commit to seeking the required funding to carry out implementation of these measures.

Justification:

The CWA requires federal agencies, and other dischargers, to meet the requirements of the Act, including water quality standards. Currently, the mainstem Columbia is out of compliance for both temperature and dissolved gas. The remedy provided by the Act is development of a TMDL with loads being allocated to each discharger. The aggregate of loads will be such that water quality standards will be met. An implementation plan which may extend over a lengthy period of time will include measures designed to meet the load allocations. The objective of these measures will be to ensure the fish passage requirements required by the ESA, while meeting the TMDL load. The NMFS should determine the quantity of water required for spilling to meet maximized passage survival standard of the opinion. Either this quantity, or the amounts currently being spilled form the starting point for TMDL implementation. The state wishes to assure itself that money spent on gas abatement measures (either structural or operational) result in reductions in TDG concentration.

Measure 8. In the long-term, modify projects and implement actions to reduce temperature to meet the 68F state and federal standard.

Justification:

Appendix D of the opinion contains a number of measures designed to improve TDG and temperature in the Columbia mainstem. Collectively these measures will not meet CWA requirements. Both parameters exceed water quality standards and are subject to TMDL development and implementation plans with milestones for meeting CWA standards.

In addition to the measures contained in the A and B lists, the state expects the federal agencies to engage fully and actively in TMDL development and commits to development of implementation plans for both these parameters. Active engagement means supplying technical expertise to the states for the TMDL loading capacity and load allocation exercises, as well as assessments of uncertainty and seasonal variations. Commitment also to accepting the load allocations under a TMDL for the portion of pollution for which the FCRPS is responsible, and commitment to implementing measures that will lead to standards attainment.

Oregon acknowledges the cooperation shown by the Corps in development of the TDG TMDL to date and encourages similar cooperation to develop a temperature TMDL.

Measure 9. In the long-term, modify projects and implement actions to reduce toxic contaminants to meet state and federal standards.

Justification:

The Bi-State Study undertaken in the early 1990's, followed by recent U.S. Geological Survey lipid bag studies indicate the presence of toxics and metal in fish tissue and the water column. In addition, a number of toxics are listed on the State's list of water quality limited waterbodies for the Columbia River mainstem because they fail to meet water quality standards. These standards are set to protect both human health and aquatic life. Further, recent NMFS studies suggest that certain pesticides deleteriously impact salmonid homing to natal streams.

The Program should require that the federal agencies, to the extent they contribute to these exceedances either through hydropower operations or dredging should undertake cooperatively with the state studies to characterize the extent of toxic contamination, its sources, and help develop and implement a TMDL for the applicable toxics.

Measure 10. Continue to test and implement surface bypass/collection systems.

1. Consistent with the NMFS BiOp, the Program should call for expedited testing and installation of surface bypass/collection systems at Corps projects.

This includes continuing surface collector studies at Bonneville I, installation of a surface bypass corner collector at Bonneville II dependent on high flow outfall study results, continuing surface bypass efficiency improvements at The Dalles, testing surface bypass removable spillway weir (RSW) in 2002 as a surrogate for skeleton bay surface collection and continuing longer-term skeleton bay studies at John Day, testing RSW surface bypass at Lower Granite in 2002 in conjunction with 24 hr spill, and to test RSW surface bypass at McNary, Ice Harbor, Lower Monumental, and Little Goose pending results from studies at John Day and Lower Granite.

Justification:

As discussed in the NMFS BiOp (NMFS 2000), continued testing of surface bypass/collection systems (defined as surface-orientated route that provides appreciable attraction flow-field and discharges juvenile fish directly to tailwater or followed by lateral routing) is a high priority because of high potential to improve project survival and forebay delay while eliminating fish impacts associated with conventional powerhouse intake screen and bypass systems. Surface bypass/collection systems, similar to conventional spill, are a fish passage method that is consistent with the Council's Specific Planning Assumptions that favor methods that protect the biodiversity of all species and best fits natural migratory patterns and ecological river processes (Council 2000-19, p.13) and with the Council's recommended strategy for Juvenile Fish Passage

that the Corps continue developing and testing surface bypass systems. (Council 2000-19, p.26). However, the Program needs to acknowledge that maximizing spillway passage using conventional spill is currently the best strategy to improve mainstem survival since it will be many years before engineering and biological issues with surface bypass/collection systems are resolved. Results to date at Lower Granite and Bonneville I have not met fish guidance efficiency standards or bypass outfall criteria. Surface bypass/collection systems at Bonneville may meet guidance efficiency standards but it is unclear whether the systems can be designed with acceptable outfall locations (currently located in areas of high predator densities below the dams) and high-flow impact velocities (currently exceeds criteria) to meet bypass outfall fish survival criteria.

Measure 11. Evaluate and if necessary modify screen bypass/sampling systems and outfalls to improve survival of bypassed fish.

1. **Evaluate causes of low survival and identify ways to improve survival of bypassed fish.**

2. **Modify screen bypass/sampling systems and outfalls to improve survival.**

Justification:

It has been well documented that dewatering, separation, and sampling facilities increase stress (Congleton et al. 1999) and mortality (Ledgerwood et al. 1994; Muir et al. 1995, 1996, 1998) in juvenile salmonids. Evidence from recent survival studies demonstrate that survival of juvenile chinook and steelhead is substantially reduced from passage through bypass systems and returned (bypassed) to the river compared to other routes of passage. Sandford and Smith (in press) found that bypassed Snake River hatchery and wild chinook and steelhead smolt-to-adult survivals (SAR) that migrated during 1993-96 were consistently lower than transported or undetected (fish passing through spillways and turbines) especially fish for passing through multiple bypass systems. Similar finding were reported by Keifer et al. (in press) for Snake River wild spring/summer chinook that migrated 1994-96. NMFS (2000b) further found that survival of hatchery and wild chinook can be reduced 67% from passage through multiple bypass systems as occurred for fish that migrated in 1995, but this finding was not found for fish that migrated in 1997 (no difference in survival for fish that had been bypassed 1-4 times) which could have been a result of the higher flows and lower predation of bypassed fish.

The Program should emphasize expedited completion of ongoing studies to identify causes of low bypass survival and identify ways to improve survival. Solutions may include modification of bypass systems including relocation of bypass outfalls or retrofitting bypass and sampling systems to allow full-flow bypass and off-line sampling.

Until bypass survival is improved, information from survival studies indicate that once a juvenile fish is entrained in a bypass system at collector projects, survival would be higher if the fish is transported rather than bypassed (Sandford and Smith in press). As discussed below, this [transporting fish] is not a good long-term alternative to improving inriver passage and migration conditions given the high uncertainty of transport benefits.

Measure 12. Improve juvenile and adult survival through turbines.

1. **Operate all turbine units at FCRPS dams for optimum fish passage survival.**

2. **Continue investigation and installation of minimum gap runners.**

3. **Implement BiOp Actions 88-93 to develop new turbine design and technologies to improve juvenile and adult turbine survival.**

Justification:

Significant numbers of salmonid juveniles and adults pass through turbines which results in the highest mortality of any passage route (NMFS 2000b). Mortalities are associated not only with physical contact with turbine blades but also sudden pressure reductions and sheer velocities. Operating turbines at 1% of peak efficiency has been shown to improve survival (Bell et al. 1981 and Eicher 1987). Alternative designs such as minimum gap runners (MGR) should be further investigated and installed to reduce juvenile mortalities from the estimated 7-14% of current turbine designs (NMFS 2000b). The Program should also require the federal operators to incorporate all state-of-the-art turbine design technology to improve fish survival during turbine rehabilitation programs.

Strategy: Reduce proportion of juveniles transported.

Measure 13. Implement "spread-the-risk" transport policy where no more than 50% of juvenile migrants are transported.

1. **Improve in-river conditions by increasing flow, providing spill, and improve bypass survival as recommended above.**

2. **Bypass fish as needed to allow transportation of no more than 50% of the populations during spring and summer.**

Justification:

The overall strategy of the NMFS BiOp is to transport all non-research fish collected at collector projects (Lower Granite, Little Goose, Lower Monumental, and McNary dams) with the exception of McNary where collected fish are bypassed during spring months.

Table 5 provides NMFS BiOp and Oregon's recommended fish transportation and operational requirements at Snake River collectors projects and McNary Dam.

Table 5. NMFS BiOp and recommended (bolded) juvenile fish transportation and operational requirements at Lower Granite, Little Goose, Lower Monumental, and McNary dams.

Action No.	Project(s)	NMFS BiOp Spring[a] Transport/ Operation Requirement	NMFS BiOp Summer[b] Transport/ Operation Requirement	Recommended Spring Transport/ Operation	Recommended Summer Transport/ Operation
40, 42	Lower Granite, Little Goose, Lower Monumental	Transport all fish collected. Implement voluntary spill when flows >85 kcfs.	Transport all fish collected[c]. No voluntary spill.	**Transport no more than 50% of fish. Meet minimum flow objectives (Table 1) and spill requirements (Table 4).**	**Transport no more than 50% of fish. Meet minimum flow objectives (Table 1) and spill requirements (Table 4).**
41, 42, 43	McNary	No transport[d]. Bypass all fish collected. Implement spill consistent with Action 54.	Transport all fish collected[c]. No voluntary spill.	No transport. Bypass all fish collected. **Meet minimum flow objectives (Table 1) and spill requirements (Table 4).**	**Transport no more than 50% of fish. Meet minimum flow objectives (Table 1) and spill requirements (Table 4).**
44	Lower Granite, Little Goose, Lower Monumental, McNary	N/A	Extend[e] barge transportation to further reduce reliance on trucking.	N/A	Extend[e] barge transportation to further reduce reliance on trucking.

[a] Same as spring flow dates (April 3 Snake River and April 10 Columbia River).
[b] McNary summer transport not initiated until TMT determines that inriver conditions are deteriorating (i.e., no longer spring-like).
[c] Except for research (PIT tagged) fish.
[d] Transport of spring migrants was suspended in the 1995 BiOp because review of the data indicated that the benefit from transportation was uncertain. The moratorium on spring transport at McNary was continued in the 1998 BiOp because data indicated an unexpected problem with the bypass system which needs to be resolved before initiating McNary transport study (Action 45) scheduled for 2002.
[e] Barge transport will be extended 5 weeks (to end of July) with a further extension to be phased in future years.

Oregon's "spread the risk" transport strategy has the following basis. Transportation continues to be one of the most controversial issues on the Columbia, subject to several independent reviews (Mundy et al. 1994; ISG 1996; Ward et al. 1997; ISAB 1999; and

ISG 1999) that raise great concerns on the use of transportation as a fishery mitigation strategy. Studies conducted over the last 30 years have shown that transportation has failed as a mitigation tool in not reversing the declining trends of Snake River salmon (Nemeth and Keifer 1999) and will not meet minimum survival requirements for recovery of Snake River salmon and steelhead (Toole et al. 1996 and Marmorek et al. 1998). There is considerable uncertainty whether transporting fish will provide greater survival than allowing fish to migrate inriver which is in part due to experimental design issues of the studies and lack of assessment of the effects of transportation on straying (ODFW 1999). Recent PIT tag studies (Keifer et al. unpublished and Sandford and Smith unpublished) have resolved experimental design problems, but adult returns generally have been inadequate for statistical evaluation.

The Council endorses the strategy of "spread the risk" which, "depending on water and environmental conditions, divides migrating juvenile salmon and steelhead between inriver passage and transportation." (Council document 2000-19, Basinwide Provisions Section D.6 Inriver Migration and Transportation, p.27). The NMFS BiOp also embraces a "spread the risk" transport strategy, while although an improvement over previous opinions in reducing the proportion of juvenile fish transported still results in too many fish transported. The estimated proportion transported still exceeds the level advocated by Oregon, which is no more than 50%. NMFS (NMFS 2000) calculates the proportion transported under the BiOp at 57% for spring/summer chinook (range of 44-89% depending on water year) and 55% for fall chinook (range of 36-66%). The estimates for spring/summer and especially fall chinook are underestimated since they include reach mortality in the total "destined" to be transported. Excluding reach mortality from the total and calculated as a percentage of fish collected, the estimated proportion of fish transported during 1997-2000 which were average to above average flow years is 50-80% for spring/summer chinook, 57-86% for steelhead, and 87-90% for fall chinook (Fish Passage Center 2000). The Program should adopt a modified transport strategy to reduce the proportion of fish transported to no more than 50% on a seasonal basis by improving inriver passage conditions by meeting minimum flow objectives, providing 24-hr spill at each project, and if necessary bypassing fish at collector projects.

Strategy: Continue to plan for alternative actions for recovery of the Snake River ESUs if non-breach options do not meet ESA standards.

Measure 14. Conduct necessary planning and evaluations to ensure that alternative actions including dam breaching can be implemented on a timely basis if non-breach options fail to meet performance standards.

1. Include a more aggressive mid-point evaluation point (3 years vs 5-8 years) than the BiOp because extinction risks are high. Be ready to implement alternative actions after 3-5 years.
2. Assess the liklihood of survival and recovery under alternative actions including dam breaching, assess the lead time for implementing alternative actions, and prescribe steps that must be taken now to have alternative actions ready to go in the near term.
3. Evaluate the merits of alternative actions using criteria developed and endorsed by a collaborate team that includes the states and tribes.

Justification:

The NMFS has deferred a decision on breaching of the Snake River dams as an action to recover the four Snake River ESUs a minimum of eight years while non-breach alternatives are evaluated (NMFS 2000) despite that a wealth of scientific evidence that strongly suggests that dam breaching is the most risk adverse management action to recover Snake River salmon and steelhead (Oregon 2000; Oregon 2000a). Extinction risks of Snake River ESUs are high with some populations declining at an alarming rate of 24% or more in the last five years (Oregon 2000). The BiOp does not anticipate and have ready alternative actions if the proposed Reasonable and Prudent Alternative (RPA) does not meet ESA recovery standards in 5-8 years including completion of assessments of alternative actions (e.g., dam breaching), completion of necessary planning (e.g. NEPA requirements, congressional authorization, mitigation planning, etc.), resolution of uncertainty of dam breaching (e.g. "D" and extra hydrosystem mortality). The Program currently calls for the Council to facilitate a long-term planning study to include consideration of reconfiguration and other operational alternatives. (Council 2000-19, p.29). The Program should require that planning and assessment activities be initiated immediately since they could take 5-8 years to complete. The Program needs to include more aggressive mid-point evaluations (3 and 5 years vs 5 and 8 years) to identify needed emergency alternative actions to avert extinction of the most threatened stocks. Finally, the Program needs to describe an experimental management approach for resolution of uncertainties of recovery strategies and require that consistent evaluation criteria be developed and endorsed by a collaborative team that includes the states and tribes.

Strategy: Improve day to day hydrosystem operations decision-making.

Measure 15: Construct a hydro operations decision-making forum that includes state, tribal and federal management expertise in both biological and power system issues.

Justification:

The Program's hydrosystem primary strategy highlights the need for a mainstem operations decisionmaking forum that is capable of first *understanding* the biological requirements of the listed and unlisted anadromous and resident fish species and wildlife and power issues in a *timely* manner, and then making *coordinated decisions* as to how to operate the hydrosystem to optimize both salmon and power system requirements, and to meet the requirement of the Clean Water Act. We believe that such a decision making and implementation body needs to possess the following attributes:

- Policy level representation from states, the Council, tribes, the hydrosystem "action agencies" the National Marine Fisheries Service,the United States Fish and Wildlife Service, and the Environmental Protection Agency.

- A rule of participation that requires decision-makers to seek to reach agreement on issues with their full breadth of discretion available; representatives should not rule out options within the agency or caucuses that fall within their jurisdiction and authority prior to discussions.

- Technical capability to objectively analyze and present power supply forecasts, hydrosystem operational alternatives, and other power related issues. It is anticipated that the Council will play a significant role in this.

- Technical capability to objectively analyze differing hydrosystem operational proposals relative to impacts on salmon, sturgeon, and resident fish migration, survival, and spawning and rearing and impacts of wildlife.

- Regularly scheduled meetings, occurring as often as is required to deal with short-term real-time decisions (e.g. weekly in-migration season) as well as middle and long-term issues (e.g. addressing longer-term reliability issues in a way that removes risk to providing operations to meet requirements of salmon).

- Operate with a defined set of decision-making criteria and hold participants accountable for the decisions they make according to the established criteria. At this time, Oregon reserves the opportunity to provide further input into the Council's rulemaking process on the definition and scope of the decision-making criteria

At present, we do not believe that the TMT/IT process integrates the fish and power considerations in a timely, objective, and effective way. It does not possess the above listed attributes, primarily the ability to objectively analyze power supply issues and forecasts and consider fish requirements in that context. The TMT/IT process focuses on

ESA listed fish, with little consideration for unlisted anadromous and resident fish species and wildlife. It is also apparent that representatives come to those meetings often having already narrowed the breadth of discretion on issues. In fact, the entity that has come closest to this is perhaps the Regional Executives body that has gathered on an ad hoc basis to meet with states and tribes to discuss operational matters during the 2001 salmon migration season.

Therefore, Oregon recommends that the Council adopt provisions in its mainstem operations plan to provide for a decision making body as described above, to be an implementation vehicle for the execution of the hydrosystem strategies adopted in the 2000 Fish and Wildlife program, and those proposed by Oregon in these recommendations.

II. Resident Fish

Objective: Significantly improve mainstem survival and production of resident fish by enhancing in-river migration, habitat, and water quality conditions to meet ESA requirements of USFWS's 2000 FCRPS Biological Opinion and short-term mitigation requirements of the 2000 Program and make progress in complying with water quality requirements of the CWA.

White Sturgeon Objective: Mitigate for lost production by restoring abundance and productivity of naturally-produced white sturgeon so that reservoir populations can sustain annual harvest or the harvestable equivalent of 5 kg/ha.

Strategy: Configure and operate the hydropower system consistent with salmonid recovery to maximize spawning and rearing success of white sturgeon in reservoirs.

Measure 1. Optimize spawning conditions by maintaining minimum discharge of 250 kcfs at McNary Dam during the time period when river temperatures are between 13 and 15 ^{o}C.

Justification:

Flow objectives of the NMFS Biological Opinion will meet discharge recommendations for optimal spawning conditions for white sturgeon. Because spawning habitat is potentially restorable through flow augmentation, the Program calls for the habitat strategy to be focused on restoration. Potential yield of white sturgeon from impounded populations has been reduced by dam construction (Beamesderfer et al. 1995), and operation of the hydropower system can have large effects on spawning habitat of white sturgeon (Parsley and Beckman 1994). During years of low discharge in spring and

summer, the lack of high quality spawning habitat in impounded reaches may preclude successful reproduction. Recruitment to young of the year is poor during these years of low discharge.

Strategy: Supplement depleted populations of white sturgeon in reservoirs until changes in configuration and operation of the hydropower system have resulted in restored populations.

Measure 2. Transplant naturally-produced juvenile white sturgeon from below Bonneville Dam into reservoirs.

1. **Transplant up to 10,000 juvenile white sturgeon from below Bonneville Dam to The Dalles and John Day reservoirs.**

Justification:

Interim and limited supplementation are called for by the Program when habitat is potentially restorable. Recruitment to white sturgeon populations in The Dalles and John Day reservoirs has been low since development of the hydropower system. Viable alternatives for restoration of reservoir populations include transplants from productive populations (Beamesderfer et al. 1995). Though development of the hydropower system has reduced availability of habitat for spawning white sturgeon in these reservoirs, it has increased the area suitable for young of the year and juvenile fish (Parsley and Beckman 1994).

Measure 3. Supplement populations with artificially-produced fish where risks to naturally spawning populations are minimal.

Justification:

When ecological function or habitat structure are substantially diminished, the Program calls for supplementation to restore populations. White sturgeon populations between Priest Rapids and Grand Coulee dams have little or no natural recruitment under the current hydropower system configuration (DeVore et al. 1999), and there is little potential for providing flows that allow spawning and recruitment. Initiating hatchery release programs in areas of the Columbia and Snake rivers where production has been severely reduced or lost will allow establishment or re-establishment of white sturgeon fisheries.

Strategy: Monitor status of white sturgeon populations to evaluate effectiveness of and ensure success of restoration efforts.

Measure 4. Monitor and regulate harvest of white sturgeon in reservoirs based on estimated abundance and exploitation rates that provide optimum sustainable yields.

Justification:

The Program calls for harvest to be managed consistent with the protection and recovery of naturally spawning populations. Reduced productivity of white sturgeon populations in reservoirs (Beamesderfer et al. 1995) has complicated fishery management. Sustainable harvest levels have been reduced by low productivity caused by poor recruitment and slow growth. Recruitment and growth have been reduced by altered flow regimes and degraded spawning and rearing habitat (Parsley and Beckman 1994). Both limited fisheries and population recovery can be provided through intensive fisheries management.

Measure 5. Conduct periodic assessments of white sturgeon abundance, growth, recruitment, and age distribution in reservoirs.

Justification:

Periodic updates of population status will provide evidence of the success or failure of actions designed to restore white sturgeon populations. Information collected during assessments can be used to modify management approaches if necessary.

Bull Trout Objective: Restore abundance and productivity of bull trout populations using the Columbia River to move between tributary streams.

Strategy: Determine the extent of bull trout use of the lower Columbia River affected by the FCRPS.

Measure 1. Include bull trout in the species counted and recorded at mainstem Columbia River dams.

Measure 2. Determine the movements of bull trout from tributary streams into lower Columbia and Snake River reservoirs, and estimate the annual population size of bull trout migrating to and from these reservoirs.

Justification:

Information regarding bull trout use of the lower Columbia and Snake rivers is limited; however, bull trout are present in some reservoirs and in tributaries to these reservoirs (USFWS 2000). Bull trout use is documented in the Snake River downstream of Hells Canyon to near Asotin at the head of lower Granite Reservoir (unpublished data, Colden Baxter, Department of Fish and Wildlife, Oregon State University). Upstream movement of bull trout have been observed at Three Mile Dam on the Umatilla River. Bull trout have also been found in Hells Canyon and Oxbow reservoirs in the Snake Basin and in Bonneville Reservoir and its tributaries in both Washington and Oregon. Actions proposed or underway to improve habitat and passage conditions in tributaries and the mainstem Columbia and Snake rivers are anticipated to increase bull trout populations, and increase migrations within and among tributary and mainstem reaches. Improvements in mainstem dam operations (optimizing flow and spill regimes to reduce entrainment and losses due to gas supersaturation) and fish passage facilities will also help increase populations and improve migration conditions.

Strategy: Develop performance standards and measures to ensure that upstream and downstream passage for bull trout are not impeded at FCRPS dams.

Measure 3. Develop information regarding passage needs for bull trout.

Justification:

If it is determined that there is a significant bull trout population in the lower Columbia River that is affected by the FCRPS, then performance standards and appropriate measures should be developed to ensure that passage is not impeded (USFWS 2000). Information regarding passage needs for bull trout should be applied to bull trout passage measures throughout the FCRPS.

III. Wildlife

Objective:. Significantly improve survival and production of wildlife species associated with riparian /riverine habitats by achieving and sustaining levels of habitat replacement and species identified in the 1995 Fish and Wildlife Program as a means of fully mitigating wildlife losses caused by the development and operation of the hydrosystem and to meet short-term mitigation requirements of the 2000 Program.

Strategy: Improve riparian/riverine habitat conditions in the mainstem hydrosystem to mitigate for measured construction and inundation wildlife losses.

Measure 1. Protect key habitats through fee-title acquisition, perpetual conservation easement, and/or long-term cooperative management agreement.

1. Protect priority remaining riparian/riverine habitats including floodplain and side channel areas.
2. Focus on protection of existing wildlife populations and habitats that are healthy and productive.
3. Implement habitat improvement initiatives (e.g., shrub steppe initiative, riparian habitat initiative).

Measure 2. Implement habitat restoration activities on protected lands to benefit targeted species.

1. Restore native vegetation to protected lands through control of non-native invasive species and planting/seeding of native vegetation.
2. Restore riparian/riverine systems to more natural hydrologic conditions.
3. Use land management practices to achieve desired wildlife objectives.
4. Manage human use/activity.
5. Focus improvement efforts on restoration of existing populations and habitats that are at risk of extinction.
6. Secure BPA funding for O&M over the life of the project or in-perpetuity, or obtain some other Council-approved long-term funding arrangement.
7. Mitigate all construction/inundation losses on a 3:1 basis (i.e., 3 Habitat Units or acres for every 1 Habitat Unit or acre lost) to account for baseline protection credit and unannualization of losses.

Justification:

Construction /inundation of the FCRPS impacted wildlife and their habitats throughout the Columbia River Basin, including the mainstem areas of the Columbia and Snake rivers. In order to fulfill the mandates of the Northwest Power Act of 1980, these measured losses must be mitigated. Section 4(h)(10)(A) of the Northwest Power Act states "the Administrator shall use the Bonneville Power Administration fund and the authorities available to the Administrator under this Act and other laws administered by the Administrator to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project on the Columbia River and its tributaries in a manner consistent with the plan." The wildlife habitat loss

assessments conducted in the mid 1980s estimated hydropower system construction/inundation impacts to wildlife. Impacts to wildlife were estimated using the Habitat Evaluation Procedures (HEP) methodology and are expressed as Habitat Units lost or gained for each hydropower facility. These unannualized construction/inundation losses and gains are amended into the Council's 2000 Program (see Appendix C). Although significant progress has been made towards mitigating for these estimated losses, there are remaining HUs to be mitigated. Mitigation should be implemented within the subbasin where losses occurred and mitigated in-place and in-kind when feasible. The HEP Relative Value Index methodology should be used for out-of-kind wildlife mitigation. This obligation is satisfied only when these effects are fully addressed, that is, when mitigation actually offsets the loss caused by a hydropower facility and when the operator provides funding for O&M adequate to sustain the mitigation in perpetuity. The above strategy is consistent with the basinwide policies, planning provisions, and biological objectives of the Council's 2000 Program. Implementation of this strategy supports the Council's habitat-based program by focusing on protecting, mitigating, and restoring habitats and the biological systems within the mainstem area. Implementation of this strategy provides fish and wildlife mitigation where habitat has been lost permanently due to hydroelectric development.

Strategy: Improve riparian/riverine habitat conditions in the mainstem hydrosystem to mitigate for direct operational impacts.

Measure 1. Conduct an assessment of direct operational impacts to wildlife using the HEP methodology.

1. Define direct operational impacts as the changes to biological, hydrological, and geomorphic features and resources caused by the operation of the federal hydrosystem including, but not limited to, hydropower, irrigation, slackwater, recreation, navigation, and flood control that result in the loss or alteration of wildlife resources. Operational impacts begin the moment a hydroelectric facility becomes operational and occur until the effects of the hydropower operation are no longer measurable.
2. Finalize the assessment methodology as outlined in the Council's 1995 Draft Wildlife Plan.
3. Conduct an independent audit of the assessment results.
4. Adopt the direct operational losses into the Council's Program.
5. Establish priorities for target species and habitat types once the assessment of direct operational losses is complete.
6. Use the subbasin planning process as the vehicle to provide mitigation for direct operational losses.

Measure 2. Protect key habitats through fee-title acquisition, perpetual conservation easement, and/or long-term cooperative management agreement.

1. Protect priority remaining riparian/riverine habitats including floodplain and side channel areas.
2. Focus on protection of existing wildlife populations and habitats that are healthy and productive.
3. Implement habitat improvement initiatives (e.g., shrub steppe initiative, riparian habitat initiative).

Measure 3. Implement habitat restoration activities on protected lands to benefit targeted species.

1. Restore native vegetation to protected lands through control of non-native invasive species and planting/seeding of native vegetation.
2. Restore riparian/riverine systems to more natural hydrologic conditions.
3. Use land management practices to achieve desired wildlife objectives.
4. Manage human use/activity.
5. Focus improvement efforts on restoration of existing populations and habitats that are at risk of extinction.
6. Secure BPA funding for O&M over the life of the project or in perpetuity, or some other Council-approved long-term funding arrangement.
7. Mitigate all direct operational losses on a 3:1 basis (i.e., 3 Habitat Units or acres for every 1 Habitat Unit or acre lost) to account for baseline protection credit and unannualization of losses.

Justification:

Operation of the federal hydropower system impacted wildlife and their habitats throughout the Columbia River Basin, including the mainstem areas of the Columbia and Snake rivers. In order to fulfill the mandates of the Northwest Power Act of 1980, these measured losses must be mitigated. Section 4(h)(10)(A) of the Northwest Power Act states "the Administrator shall use the Bonneville Power Administration fund and the authorities available to the Administrator under this Act and other laws administered by the Administrator to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project on the Columbia River and its tributaries in a manner consistent with the plan." Operational impacts have not been quantified to date. The Council's 2000 program calls for the quantification of wildlife losses caused by operation of the hydropower system. The program includes a commitment to mitigate for these losses and states that the subbasin plans will serve as the vehicle to provide mitigation for the direct operational losses. Mitigation should be

implemented within the subbasin where losses occurred and mitigated in-place and in-kind when feasible. The HEP Relative Value Index methodology should be used for out-of-kind wildlife mitigation. This obligation is satisfied only when these affects are fully addressed, that is, when mitigation actually offsets the loss caused by a hydropower facility and when the operator provides funding for O&M adequate to sustain the mitigation in perpetuity. The above strategy is consistent with the basinwide policies, planning provisions, and biological objectives of the Council's 2000 Program. Implementation of this strategy supports the Council's habitat-based program by focusing on protecting, mitigating, and restoring habitats and the biological systems within the mainstem area. Implementation of this strategy provides fish and wildlife mitigation where habitat has been lost permanently due hydroelectric development.

Strategy: Improve riparian/riverine habitat conditions in the mainstem hydrosystem to mitigate for indirect operational (secondary) impacts.

Measure 1. Address indirect operational impacts to wildlife through subbasin planning.

1. Define indirect operational impacts as the impacts to wildlife and wildlife habitat that occur due to the loss of anadromous and resident fish from the development and operation of the hydropower system.
2. Develop a methodology to assess and mitigate indirect operational impacts through subbasin planning.
3. Assess indirect operational impacts to wildlife.
4. Implement projects to mitigate for indirect operational losses.
5. Secure BPA funding for O&M over the life of the project or in perpetuity, or some other Council-approved long-term funding arrangement.
6. Credit projects not specifically designed to mitigate for defined wildlife construction/inundation or direct operational impacts against indirect operational losses.

Justification:

Operation of the federal hydropower system impacted wildlife and their habitats throughout the Columbia River Basin, including the mainstem areas of the Columbia and Snake rivers. In order to fulfill the mandates of the Northwest Power Act of 1980, these measured losses must be mitigated. Section 4(h)(10)(A) of the Northwest Power Act states "the Administrator shall use the Bonneville Power Administration fund and the authorities available to the Administrator under this Act and other laws administered by the Administrator to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project on the Columbia River

and its tributaries in a manner consistent with the plan." Indirect operational impacts, or secondary impacts, have not been quantified to date. The Council's 2000 program calls for the quantification of wildlife losses caused by operation of the hydropower system. The program includes a commitment to mitigate for these losses and states that the subbasin plans will serve as the vehicle to provide mitigation for the secondary losses. Mitigation should be implemented within the subbasin where losses occurred and mitigated in-place and in-kind when feasible. The HEP Relative Value Index methodology should be used for out-of-kind wildlife mitigation. This obligation is satisfied only when these affects are fully addressed, that is, when mitigation actually offsets the loss caused by a hydropower facility and when the operator provides funding for O&M adequate to sustain the mitigation in perpetuity. The above strategy is consistent with the basinwide policies, planning provisions, and biological objectives of the Council's 2000 Program. Implementation of this strategy supports the Council's habitat-based program by focusing on protecting, mitigating, and restoring habitats and the biological systems within the mainstem area. Implementation of this strategy provides fish and wildlife mitigation where species have been lost permanently due hydroelectric development. There are systemwide impacts that result from the loss of salmon and other key species from the ecosystem. For example, the loss of salmon reduced the prey base for predators such as eagles and bears. This in turn greatly reduced the infusion of ocean-derived nutrients to both aquatic and terrestrial ecosystems.

Strategy: Reduce limiting factors to wildlife in the mainstem hydrosystem.

Measure 1. Identify limiting factors, needs and opportunities.

1. Compile existing information on mainstem conditions, habitat conditions and needs.
2. Conduct additional inventories as necessary.
3. Identify priority wildlife needs and develop an implementation plan.

Measure 2. Implement specific actions to address needs and opportunities.

1. Minimize artificial water level fluctuations within the mainstem system caused by the FCRPS.
2. Install underpasses for wildlife movement corridors.
3. Create natural and artificial island habitat for nesting and resting waterfowl.
4. Install osprey and eagle roosting and perching structures and nesting platforms.

Justification:

The riparian/riverine habitat areas along the mainstem Columbia and Snake rivers have

been included in the Council's subbasin summary review process to date. Thus, there are some limiting factors that have been identified and that can be addressed as recommended. The development and operation of the hydrosystem has had numerous effects on wildlife and wildlife habitat along the mainstem area. Impacts to habitat in the mainstem include habitat lost through inundation, declines in habitat values through habitat fragmentation, and declines in habitat quality through habitat conversion. Specific impacts to wildlife species in the riparian/riverine mainstem system include species/population distribution, movement, fragmentation, connectivity, population displacements, extirpations, and behavioral modifications.

Attachments

The attachments referenced in this document and listed below are available upon request from the staff of the Columbia River Coordination Program in the Interjurisdictional Fisheries Management Program, Fish Division:

Oregon Department of Fish and Wildlife
2501 SW First Avenue
PO Box 59
Portland, OR 97207
(503) 872-5252
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Attachment 1- Oregon Department of Fish and Wildlife's proposed amendments to the Northwest Power Planning Council's 1994 Columbia Basin Fish and Wildlife Program submitted to Mr. R. Applegate, Northwest Power Planning Council on August 15, 1994.

Attachment 2- State of Oregon's recommended amendments to the Northwest Power Planning Council's 2000 Columbia Basin Fish and Wildlife Program submitted to on September 19, 2000.

Attachment 3- State of Oregon's comments on NMFS' Draft Biological Opinion on "Operations of the federal Columbia River power system including the juvenile fish transportation program and the Bureau of Reclamation's 31 projects, including the entire Columbia Basin Project" submitted by P. Burgess, Govemor's Natural Resources Office to Mr. B. Brown, National Marine Fisheries Service on September 2, 2000.

Attachment 4- Comments of the ODFW on "Conservation of Columbia Basin Fish, Draft Basin-wide Salmon Recovery Strategy (Update of the All-H Paper), July 27, 2000"

submitted to Ms. L. Bodi (Bonneville Power Administration) and Mr. R. Ilgenfritz (National Marine Fisheries Service) on September 29, 2000.

Attachment 5- State of Oregon's comments on NMFS's proposed recovery plan for Snake River salmon submitted to Mr. W. Stelle (National Marine Fisheries Service) on December 1, 1995.

Attachment 6- Oregon Department of Fish and Wildlife's comments on NMFS' Section 7 consultation white papers on flow, transportation, dam passage, and predation submitted to Mr. J. Ferguson (NMFS) on November 10, 1999.

Attachment 7- System Operational Request # 99-28 relating to flows at Bonneville Dam, September 3, 1999.

Attachment 8- Oregon Department of Fish and Wildlife's comments on The Dalles Spillway Survival Study submitted to the System Configuration Team February 8, 1999.

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