

2004 Water Management Plan

Final – October 22, 2003

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1.0 Introduction

1.1 Preparation of Plans

This Water Management Plan for 2004 has been prepared as part of the implementation planning process outlined in the 2000 National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) Biological Opinions (BiOps) concerning operation of Federal Columbia River Power System (FCRPS) dams. This plan describes how the FCRPS dams and reservoirs will be operated for the 2004 water year (October 1, 2003, through September 30, 2004) to implement the BiOps' water management measures in a manner consistent with the actions called for in both BiOps and progress toward the performance standards specified in the NMFS 2000 BiOp, and non-BiOp related, requirements and purposes, such as flood control, hydropower, irrigation and recreation. The FCRPS hydrosystem performance standards are presented in section 12.

Per the BiOps, the action agencies will annually prepare a 1-year Water Management Plan that covers FCRPS hydro operations in the upcoming water year. These plans will generally be drafted in July and completed by the end of September. The plan will cover the upcoming water year, which begins on October 1 and ends on September 30 the following year. This 1-year plan will be written when very little information is known about the future year's water supply. Therefore, the annual Water Management Plan will generically describe how the FCRPS will be operated during the year. It will also include any special operations (such as any special tests, flood control procedures planned for the year, etc.) that are known at the time the plan is developed.

This plan contains several uncertainties that previous plans did not address. Firstly, the NMFS FCRPS BiOp is in remand per U.S. Federal District Courts ruling by Judge Redden. The assumption is the current provisions of the BiOp will remain in place until a new BiOp is developed. A second uncertainty is how the Northwest Power Planning Council's recommendations will be addressed. Many of their proposals called for studies. The extent these studies will impact operations are uncertain at this time. In addition, there are a number of project operations that may be revised based on research results that are not available at this time.

The action agencies will also develop more detailed in-season action plans to describe how the FCRPS projects will be operated under actual conditions with current water supply forecasts. The first action plan will be prepared in the fall to address the fall/winter operation of the FCRPS projects. A spring update will be drafted in January and finalized in the March/April time period to address the spring and summer operation of the FCRPS projects. These action plans will take into account changes in the BiOp adopted by NOAA in this time frame.

This year a 5-year Water Management Plan will also be developed. The 5-year Water Management Plan will mainly look at planned and expected fisheries research resulting in possible changes to FCRPS operations.

1.2 BiOp Strategies

This Water Management Plan addresses strategies to enhance juvenile and adult fish survival through a coordinated set of hydro project management actions to achieve performance standards, and to provide benefits to resident fish. The plan is structured to address water management actions associated with the following strategies and substrategies, as defined in the Endangered Species Act 2004/2004-2008 Implementation Plan for the Federal Columbia River Power System.

1.2.1 Hydro Strategies and Substrategies for Listed Species of Anadromous Fish

Hydro Strategy 2 – Manage water to improve juvenile and adult fish survival

Substrategy 2.1 – Reservoir operations to enhance fish survival: Actions under this substrategy are project operations that benefit fish at or near the project or its reservoir.

Substrategy 2.2 – System flow management to enhance fish survival: This substrategy includes coordinated system operations for mainstem flow management and redd protection.

Substrategy 2.3 – Spill operations for project passage: This substrategy includes spill operations at individual projects to provide a better project passage for juvenile fish while avoiding high dissolved gas levels or adult fallback problems.

Substrategy 2.5 – Other actions to enhance water management: This substrategy includes water management related actions that are being done to improve fish survival, such as studies, water quality actions, and water conservation improvements.

Hydro Strategy 3 – Operate and maintain fish passage facilities to improve fish survival

Substrategy 3.4 – Juvenile fish transport actions to enhance fish survival. This substrategy includes the transportation of juvenile fish around FCRPS dams.

1.2.2 Strategy and Substrategies for Listed Species of Resident Fish

Strategy 1 – Promote the reproduction and recruitment of Kootenai River white sturgeon (KRWS).

Substrategy 1.1 – Create conditions below Libby Dam that facilitate KRWS natural reproduction and juvenile survival. This substrategy includes operations at and below Libby Dam that aid in Kootenai River white sturgeon recovery.

Strategy 2 – Determine the impacts of the FCRPS on bull trout and mitigate for those impacts.

Substrategy 2.2 – Operate and modify FCRPS dams to protect, provide, and reconnect bull trout habitats. This substrategy includes actions to improve conditions for bull trout.

1.3 Non-BiOp Operations

Each year the action agencies implement water management actions that are not required by the BiOps, but are aimed at meeting other project requirements and purposes such as flood control, power generation, irrigation, navigation, recreation, and fish and wildlife not listed under the ESA. The table below includes some of the fish and wildlife related non-BiOp water management actions that may be implemented and the time of year such actions typically occur. These actions are further described in section 12.

Action	Time of Year
Keenlyside Dam (Arrow) - mountain whitefish actions	December - January
Keenlyside Dam (Arrow) - rainbow trout actions	April - June
Libby - burbot actions	December - February
Dworshak – flow increase for hatchery release	March
Grand Coulee – kokanee	September - October
Hanford Reach Protection Flows	March - June
Vernita Bar Protection Flows	November - April
McNary - waterfowl nesting	March - May
McNary - waterfowl hunting enhancement	October - January
John Day - goose nesting	March - May
John Day - waterfowl hunting enhancement	October - January
Bonneville - Tribal fishing	April - September
Bonneville - Spring Creek Hatchery release	March

1.4 Changes From Last Year's Plan

This is the third annual water management plan developed under the NMFS and USFWS 2000 BiOps.

The NMFS 2000 FCRPS BiOp calls for a 5-Year Water Management Plan to be developed, which will outline operational considerations out to the 5-year horizon. The 5-Year Plan is a separate document that identifies potential operational changes that may occur in future years. Developments such as the Bonneville corner collector, changes in spill operations, and consideration of the NWPPC Mainstem Amendments. Some of these changes may be implemented as early as 2004 after coordination in the regional forums and through the Action Agencies.

Another change is the addition of two new appendixes, number 5, Chum Spawning Considerations and number 6, Criteria to consider for providing spill or terminating spill at Lower Snake River below average runoff volume years.

2.0 Hydro System Operation

2.1 Priorities

The NMFS and USFWS BiOps list the following strategies for flow management:

- Limit the winter/spring drawdown of storage reservoirs to increase spring flows and the probability of reservoir refill.
- Draft from storage reservoirs in the summer to increase summer flows.
- Provide minimum flows in the fall and winter to support mainstem spawning and incubation flow below Bonneville Dam.

The Action Agencies have reviewed these strategies and other actions called for in the BiOps and developed the following priorities (in order) for flow management and individual reservoir operations:

1. Operate storage reservoirs (Hungry Horse, Libby, and Albeni Falls) to meet minimum flow and ramp rate criteria for resident fish.
2. Refill the storage projects by June 30 to provide summer flow augmentation. A late snowmelt runoff may delay refill in order to avoid excessive spill.
3. Operate storage projects to be at their April 10 flood control elevations to increase available flows for spring flow management.
4. Provide fall and winter flows for chum salmon spawning and incubation.

The Action Agencies implement several independent FCRPS project operations to benefit fish at or near each project or its reservoir. Reservoirs are to be operated to meet project minimum outflows, to reduce outflow fluctuations to avoid stranding resident fish and degrading fish habitat and productivity, to reduce cross sectional area to speed juvenile passage, and to make specific temperature releases to improve water temperatures for fish. These operations are generally the highest priority and not likely to change.

In an operating year that begins on October 1, the flow needs are not encountered in the same order as the BiOp priorities (e. g. the first decision to be made is for chum spawning flows which ultimately have a lower priority than summer flows), so chronologically, the Action Agencies will attempt to operate during the year as follows.

The initial objective is to operate the storage reservoirs (Dworshak, Hungry Horse, Libby, Albeni Falls, and Grand Coulee) to be at flood control levels by early April. This level varies by runoff forecast. Reaching early April flood control levels will be affected by how much water was released for flood control, power generation, and fishery flows to support both lower Columbia chum and Hanford reach fall Chinook spawning, and to meet Columbia Falls minimum flow requirements.

The next objective is to attempt to refill the storage reservoirs by about June 30 without causing excessive spill, to maximize available storage of water for the benefit of summer migrants. The June 30 refill in general has priority over spring flow (April, May, June) objectives, while attempting to meet the spring flow objectives and other fish needs.

The final objective is the management of available storage to augment summer (July and August) flows to achieve flow objectives and for water temperature moderation. The storage reservoirs will be drafted to their specified August 31 draft limits to augment summer flows and/or moderate river temperatures. Draft limits are a higher priority than the summer flow objectives in order to meet other project uses and reserve water in storage for the following year.

These objectives are intended as general guidelines in overall system operations. The BiOps also embrace the concept of adaptive management. Adaptive management is the concept that the operation of the system should be adjusted based on acquired knowledge about current conditions in the system and effects of our management actions on it, as opposed to following a rigid set of rules. Some items to be considered are current information on fish migration, stock status, biological requirements, biological effectiveness, and hydrologic and environmental conditions. System managers recognize that there is often insufficient water to meet all the actions specified in the BiOps and meet other system uses such as flood protection, power system reliability, irrigation, recreation, and navigation needs. The use of water for any one fish species or project purpose will most likely affect the amount of water available for other fish species or project purposes. Therefore, the Action Agencies, in coordination with regional parties through the TMT, endeavor to consider the multiple uses of the system, while providing, as a high priority, the measures to benefit listed species.

2.2 Conflicts

As stated above, there often is not enough water available in the Columbia River basin to meet every action item stated in the BiOps and provide for other project purposes. Below are some of the main conflicts that may occur.

2.2.1 Flood control draft versus project refill

One way to maximize flood control is to provide abundant storage space in the event a large flood occurs. Conversely, the BiOps require that the storage projects be as full as possible to increase the likelihood of refill and provide flows for spring flow management and summer flow augmentation.

Flood control procedures specify the amount of storage needed to provide flood protection. The space is provided to reduce the risk of forecast and runoff uncertainty. In an effort to reduce forecast error and to better anticipate the runoff timing or water supply for a given year, the BiOps call for the action agencies to study system flood control requirements and forecast procedures to determine if they can be improved.

2.2.2 The provision of spring flows versus project refill and summer flow augmentation

Again, because water supply and runoff forecasts are not 100 percent accurate, it is difficult to estimate how much water is available for spring flows and still assure refill at the storage projects by June 30. If too much water is allowed to flow through the storage reservoirs in the spring, there is an increased risk of not refilling the projects. This will reduce the water supply available for summer flow augmentation. On the other hand, if the reservoirs fill too early in the spring, late season rain or snowmelt may cause flood damage downstream, or cause excessive spill and produce higher dissolved gas levels.

2.2.3 Chum tailwater elevations versus refill/spring flows

Setting the Bonneville tailwater elevation level for chum spawning and incubation in recognition of the spring refill priority is one of the decisions that the Action Agencies, in consultation with the interagency Technical Management Team (TMT), have to make with the least amount of reliable information. Decisions about the tailwater elevation level for chum spawning and incubation are made in the October/November time period, long before the action agencies have reliable information on the coming year's expected water supply. The early season Southern Oscillation Index (SOI) provides an indication of the upcoming year's water supply. If the tailwater elevation level selected is too high (causing higher flows), there is a risk of refill failure. Choosing to refill runs the risk of reducing the tailwater elevation that can be supported through the spawning season and dewatering chum redds. A chum salvage plan will be in place for 2004 that will provide a reasonable level of assurance some level of chum salmon production will occur in the event chum flows cannot be provided. The area below Bonneville Dam is also utilized by fall chinook and coho spawning when water is provided to the spawning grounds.

2.2.4 Sturgeon pulse versus summer flow augmentation

Water released from Libby Dam for spring sturgeon flows (pulse) during April -through July may reduce the water available for summer flow augmentation from Libby, although VARQ has been implemented to minimize that possibility. If the pulsed water cannot be stored in Grand Coulee, spring flows will be provided, potentially at the expense of summer flows.

2.2.5 Fish operations versus other project uses

In addition to flood control operation, there are other project purposes that may conflict with operations carried out for the purpose of enhancing fish survival. For example, keeping the flow steady below a project for resident and anadromous fish needs conflicts with the ability to use a project to follow electrical load changes; spilling water for juvenile fish passage reduces the amount of power that can be generated to meet demand; and augmenting flows during fish migration periods may conflict with the shape of power demand. Additionally, irrigation demands and recreation elevations at headwater reservoirs may impact the amount of water

available for spring flows. The development of the Biological Opinion for the FCRPS included consultation with the federal operating agencies on the operations of the Hydrosystem, and the impact on listed stocks. These negotiations included consideration of the multiple uses of the Hydrosystem. These negotiations and the multiple uses of the Hydrosystem are part of the foundation of the Biological Opinion.

2.2.6 Conflicts and priorities

The conflicts described above pose many challenges to the Action Agencies in meeting the multiple uses of the Federal hydro system. Given these challenges, the priorities for flow management and individual reservoir operations outlined in section 2.1 will guide the Action Agencies in their operational decision-making when conflicts arise. Discussion of conflicts between operational requirements and alternatives for addressing such conflicts will occur in TMT with disputes taken to IT and at times to the Federal Executives.

2.3 Emergencies

The 2000 BiOps acknowledge that emergencies and other unexpected events occur and may cause deviations from fish operations. Such deviations may be short in duration, such as a deviation to respond to an unexpected unit outage or power line failure, or longer in duration, such as experienced in 2001 in response to the low water conditions and unprecedented power market conditions. The TMT has developed Emergency Protocols to be followed to respond to short-term emergencies. (See Appendix 1 or see TMT homepage at <http://www.nwd-wc.usace.army.mil/TMT> for current version of protocols.)

2.4 Research

Research studies sometimes require special operations that differ from routine operations otherwise described in the Biological Opinions. These studies are generally developed through technical workgroups of the Regional Forum (e.g., System Configuration Team (SCT) and the USACE's Anadromous Fish Evaluation Program Fish Facilities Design Review Work Group (FFDRWG) and Studies Review Work Group (SRWG) and further described in 1- and 5-Year Implementation Plans. In most cases, operations associated with research entail relatively minor changes from routine operations and are coordinated in technical forums (e.g., TMT, FPOM). In some cases, the nature or magnitude of operational changes for research may require further coordination and review in policy forums (e.g., Implementation team (IT)). Generally, research planning and coordination occurs throughout the late fall and winter, with final research plans established by late winter/early spring. In extraordinary events such as extreme low runoff conditions or an emergency, planned research may be modified prior to spring to accommodate anticipated unique circumstances and/or to reallocate resources to obtain the greatest value given the circumstances. The Council's recommended changes in mainstem hydro operations will require the development of specific experimental designs that may be implemented next spring and summer. These experiments are under development and may be incorporated into the experimental protocols for next year as soon as they become available.

3.0 Decision Points and Water Supply Forecasts

3.1 Decision Points

Table 1 below lists the key water management decisions/actions and when they need to be made. Some decision points, such as setting flow objectives, are clearly articulated in the BiOps. Other decision points, such as setting weekly flow augmentation levels, require much discussion and coordination. Some of the decision points given below are spelled out in the BiOps and some are based on experience. These decisions are made by the action agencies in consideration of actions called for in the BiOps and input received through the Regional Forum (TMT, IT, Regional Executives).

Table 1. Water Management Decision Points/Actions

	Early October	November	Winter (December – March)	Early April	Early May	June	Early July
<i>Operations</i>	<ul style="list-style-type: none"> Assess potential of providing tailwater elevations/flows for chinook populations below Bonneville Dam (<i>Non-BiOp Action</i>) Assess potential tailwater elevations / flow levels to support chum spawning below Bonneville Dam Preliminary discussions of flood control/ project refill strategy Albeni Falls fall/winter 	<ul style="list-style-type: none"> Early season forecast using SOI Evaluate VARQ rule curves Evaluate likely tier for sturgeon water volume Consider Kootenai burbot operations 	<ul style="list-style-type: none"> Determine winter/spring chum flow levels below Bonneville Dam Determine flood control and refill strategies, including any available flood control shifts Minimum flows from Hungry Horse Dam and minimum Columbia Falls flows are set by April-August forecast Begin discussing spring operations Spring Creek Hatchery release –March (<i>Non-BiOp Action</i>) Begin spring transport discussions Hanford Reach Operations Discussed (<i>Non-BiOp Action</i>) Outlook for meeting flow objectives prepared 	<ul style="list-style-type: none"> Spring flow objectives are set by the April final volume forecasts Determine spring flow management strategy including priority for refill Determine start dates and levels by project for spring spill Determine start date for MOP at Lower Snake River projects Determine John Day forebay elevations 	<ul style="list-style-type: none"> Use May final forecast to calculate the appropriate volume of the sturgeon tiered flow release from Libby using new, coordinated formula Determine required outflow from Libby for bull trout. 	<ul style="list-style-type: none"> Summer flow objective at Lower Granite determined by June final volume forecast Determine summer flow augmentation strategy (early June) Complete Dworshak temperature modeling and determine release strategy Decision on McNary juvenile fish transportation (late June) 	<ul style="list-style-type: none"> Grand Coulee summer reservoir draft limit determined by July final April – August volume forecast

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	Early October	November	Winter (December – March)	Early April	Early May	June	Early July
	drawdown strategy discussion <ul style="list-style-type: none"> Hanford Reach /Vernita Bar flows set (<i>Non-BiOp Action</i>) 						
<i>Plans</i>	Develop fall/winter update to the annual water management plan		Preliminary work on spring/summer update to the annual water management plan	Start operational plans for Libby and Hungry Horse Dams	Libby and Hungry Horse operational plans due		
<i>Forecasts</i>			January, February, and March volume forecasts released by the RFC	April final forecast released by RFC	May final forecast released by RFC	June final forecast released by RFC	

3.2 *Water Supply Forecasts*

Water supply forecasts serve as a guide to how much water is available for fish and other operations.

During the flow management season (April 3 - August 31) weekly flow projections are provided to the TMT.

The National Weather Service's Northwest River Forecast Center, USACE Northwest Division Hydrologic Engineering Branch, Reclamation, and others prepare water supply forecasts to manage the Columbia River. Table 2 below lists the forecasts that are referenced by the NMFS 2000 BiOp and the USFWS 2000 BiOp.

Table 2. Water Supply Forecasts Used to Determine BiOp Actions

Forecast Point	Forecast period	Forecast	What does it control	BiOp reference	RPA Action Item
Lower Granite	April – July	April Final	Spring flow objective at Lower Granite	NMFS BiOp at Section 9.6.1.2.1 Page 9-57	NMFS Action 14
Lower Granite	April – July	June Final	Summer flow objective at Lower Granite	NMFS BiOp at Section 9.6.1.2.1 Page 9-57	NMFS Action 14
The Dalles	April – August	April Final	Spring flow objective at McNary Dam	NMFS BiOp at Section 9.6.1.2.1 Page 9-57	NMFS Action 14
Hungry Horse	April – August	March Final provided by Reclamation	Hungry Horse minimum flows	NMFS BiOp at Section 9.6.1.2.3 Page 9-63 USFWS BiOp at Section 3.A.1 Page 6	NMFS Action 19
Hungry Horse	April – August	March Final provided by Reclamation	Columbia Falls minimum flow	NMFS BiOp at Section 9.6.1.2.3 Page 9-63 USFWS BiOp at Section 3.A.1 Page 7	NMFS Action 19
The Dalles	April – August	July final	Grand Coulee summer draft limit	NMFS BiOp at Section 9.6.1.2.3 Page 9-64	NMFS Action 19
Libby	April – August	May Final	Volume of water for sturgeon flow at Bonners Ferry and minimum bull trout flows between sturgeon and salmon flows	USFWS BiOp at Section 8.1 Page 74 and USFWS BiOp at Section 3.A.2 Page 15	USFWS Action 8.1.c NMFS Action 19

Table 3 summarizes the major fish-related reservoir and flow operations by project. More detailed descriptions of each of these operations follow.

Table 3. Major Fish-Related Reservoir and Flow Operations

Project	Flood Control & Refill	Sturgeon	Bull Trout	Spring Anadromous	Summer Anadromous	Chum
Libby	<p><u>Winter:</u> Operate to VARQ flood control rule curve and achieve appropriate elevation by April 10</p> <p><u>Spring:</u> Refill by June 30 and operate to meet flow objectives</p>	<p><u>April – July</u> Augment flows at Bonners Ferry for sturgeon pulse</p>	<p><u>Year Round:</u> Operate to minimum flows and project ramping rates to minimize adverse affects of flow fluctuations</p>	<p>Operate to meet flow objectives and June 30 refill if possible without excessive spill</p>	<p><u>July/August:</u> Draft for summer flow augmentation, not to exceed reservoir draft limit of 2,439 feet</p>	<p>Fall/winter storage may be used to support chum flows</p>
Hungry Horse	<p><u>Winter:</u> Operate to VARQ flood control by April 10</p> <p><u>Spring:</u> Refill by June 30 if possible without excessive spill and operate to meet flow objectives</p>		<p><u>Year Round:</u> Operate to Columbia Falls minimum flows and project ramping rates to minimize adverse affects of flow fluctuations</p>		<p><u>July/August:</u> Draft for summer flow augmentation, not to exceed reservoir draft limit of 3,540 feet</p>	<p>Fall/winter storage may be used to support chum flows</p>
Albeni Falls	<p><u>Winter:</u> Operate to flood control rule curve by April 10</p> <p><u>Spring:</u> Refill by June 30 and operate to meet flow objectives</p>		<p><u>Fall/Winter:</u> Maintain the recommended elevation until kokanee fry emergence (approximately end of April)</p> <p>The USFWS recommended elevation is expected to be provided by September</p>			<p>Fall/winter storage may be used to support chum flows</p>

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Project	Flood Control & Refill	Sturgeon	Bull Trout	Spring Anadromous	Summer Anadromous	Chum
Grand Coulee	<p><u>Winter:</u> Operate to 85% confidence of meeting April 10 flood control elevation</p> <p><u>Spring:</u> Refill by June 30 and operate to meet flow objectives</p>				<p><u>July-August:</u> Draft for summer flow augmentation, not to exceed reservoir draft limit of 1,280 feet (\geq 92 maf forecast at The Dalles) or 1,278 feet ($<$ 92 maf forecast at The Dalles)</p>	Fall/winter storage may be used to support chum flows
Grand Coulee (continued)					<p><u>July/August:</u> Operate Banks Lake at elevation 5 feet less than full to provide more water for summer flow augmentation</p>	
Dworshak	<p><u>Winter:</u> Operate to flood control rule curve by April 10</p> <p><u>Spring:</u> Refill by June 30 and operate to meet flow objectives</p>				<p>Draft for summer flow augmentation and water temperature reduction, not to exceed reservoir draft limit of 1,520 feet</p>	Fall/winter storage may be used to support chum flows
Lower Granite				<p>Flow objective of 85-100 kcfs</p> <p>Operate within 1 foot of MOP to reduce juvenile travel time</p> <p><u>Mar 15-Nov 30</u> Operate to 1% peak efficiency</p>	<p>Flow objective of 50-55 kcfs</p> <p>Operate within 1 foot of MOP to reduce juvenile travel time</p> <p><u>Mar 15-Nov 30</u> Operate to 1% peak efficiency</p>	
Little Goose				<p>Operate within 1 foot of MOP to reduce juvenile travel time</p> <p><u>Mar 15-Nov 30</u> Operate to 1% peak efficiency</p>	<p>Operate within 1 foot of MOP to reduce juvenile travel time</p> <p><u>Mar 15-Nov 30</u> Operate to 1% peak efficiency</p>	

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Project	Flood Control & Refill	Sturgeon	Bull Trout	Spring Anadromous	Summer Anadromous	Chum
Lower Monumental				Operate within 1 foot of MOP to reduce juvenile travel time <u>Mar 15-Nov 30</u> Operate to 1% peak efficiency	Operate within 1 foot of MOP to reduce juvenile travel time <u>Mar 15-Nov 30</u> Operate to 1% peak efficiency	
Ice Harbor				Operate within 1 foot of MOP to reduce juvenile travel time <u>Mar 15-Nov 30</u> Operate to 1% peak efficiency	Operate within 1 foot of MOP to reduce juvenile travel time <u>Mar 15-Nov 30</u> Operate to 1% peak efficiency	
McNary				Flow objective of 220-260 kcfs <u>Mar 15-Oct 31</u> Operate to 1% peak efficiency	Flow objective of 200 kcfs <u>Mar 15- Oct 31</u> Operate to 1% peak efficiency	
John Day				<u>Apr 10-Sep 30</u> Operate within 1.5 feet of MIP to reduce juvenile travel time <u>Mar 15-Oct 31</u> Operate to 1% peak efficiency	<u>Mar 15-Oct 31</u> Operate to 1% peak efficiency Operate within 1.5 feet of level that will allow irrigation to reduce juvenile travel time	
The Dalles				<u>Mar 15-Oct 31</u> Operate to 1% peak efficiency	<u>Mar 15-Oct 31</u> Operate to 1% peak efficiency	

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Project	Flood Control & Refill	Sturgeon	Bull Trout	Spring Anadromous	Summer Anadromous	Chum
Bonneville				<u>Mar 15-Oct 31</u> Operate to 1% peak efficiency	<u>Mar 15-Oct 31</u> Operate to 1% peak efficiency	If hydrologic conditions indicate system can likely maintain minimum flow below BON of 125 kcfs Nov 1 - April, implement mainstem chum flows. If not, provide flows below BON to enable access to creeks for spawning.

4.0 Sub-Strategies: Hydrosystem Substrategy 2.1: Reservoir operations to improve fish survival

4.1 Lower Snake Projects (*Lower Granite, Little Goose, Lower Monumental, and Ice Harbor*)

4.1.1 Reservoir Passage

All Lower Snake projects will operate within 1 foot of MOP (Minimum Operating Pool) from approximately April 3 until small numbers of juvenile migrants are present. (This normally occurs in late August.)¹ Lower Granite Dam shall not return to normal operating pool until enough natural cooling has occurred in the fall, generally after October 1. The purpose of this action is to provide a smaller reservoir cross section to reduce juvenile salmon travel time. Elevations may be modified to maintain the minimum navigation channel requirements.

4.1.2 Juvenile Fish Survival

To enhance juvenile passage survival, turbines at all Lower Snake projects will be operated within 1% of peak efficiency during the juvenile and adult migration seasons (March 15 through November 30).²

4.2 Lower Columbia Projects (*McNary, John Day, The Dalles, Bonneville*)

To enhance juvenile passage survival, turbines at all the Lower Columbia projects will be operated within 1% of peak efficiency during the juvenile and adult migration seasons (March 15 through October 31).³ A test of operating above the 1% peak operating efficiency is scheduled to be conducted at McNary Dam during the 2004 juvenile migration.

4.2.1 John Day

4.2.1.1 Pool level

John Day pool shall operate within a 1½-foot range of the minimum level that provides irrigation pumping from April 10 to September 30.⁴ The purpose of this action is to provide a smaller reservoir cross section to reduce juvenile salmon travel time.

¹ NMFS BiOp at Section 9.6.1.2.3 Page 9-65, Action 20 Note page numbers for the NMFS BiOp refers to the PDF version.

² NMFS BiOp at Section 9.6.1.4.4 Page 9-93, Action 58

³ NMFS BiOp at Section 9.6.1.4.4 Page 9-93, Action 58

⁴ NMFS BiOp at Section 9.6.1.2.3 Page 9-65, Action 20

5.0 Hydrosystem Substrategy 2.2: System flow management to improve fish survival

5.1 Flow Objectives

The purpose of the flow objectives is to aid in achieving the hydro system biological performance standards by providing better instream flow to aid in juvenile salmon and steelhead migration and enhance water quality. However, as recognized in the BiOps, it is not possible to achieve the flow objectives in many water years because there is limited water and reservoir storage. This Water Management Plan strives to achieve the best possible mainstem passage conditions, recognizing the priorities established in this document and the need to balance the limited water and storage resources available in the region.

Weekend flows are often lower than weekday flows due to less electrical demand in the region. During the spring and summer migration period (April through August), the action agencies strive to maintain flows during the weekend at a level which is at least 80% of the previous weekday average.

5.1.1 Lower Granite

5.1.1.1 Spring anadromous fish

The April final runoff volume forecast at Lower Granite Dam for April to July determines the spring flow objective at Lower Granite Dam.⁵ When the forecast is less than 16 million acre-feet (maf) the flow objective will be 85 kcfs. If the forecast is between 16 maf and 20 maf the flow objective will be linearly interpolated between 85 kcfs and 100 kcfs. If the forecast is greater than 20 maf the flow objective will be 100 kcfs. The planning dates for the flow objective are from April 3 to June 20.

5.1.1.2 Summer anadromous fish

The June final runoff volume forecast at Lower Granite Dam for April to July determines the summer flow objective at Lower Granite Dam.⁶ When the forecast is less than 16 maf the flow objective will be 50 kcfs. If the forecast is between 16 maf and 28 maf the flow objective will be linearly interpolated between 50 kcfs and 55 kcfs. If the forecast is greater than 28 maf the flow objective will be 55 kcfs. The planning dates for the flow objective will be from June 21 to August 31.

5.1.2 Priest Rapids—Spring anadromous fish

The spring flow objective at Priest Rapids dam is 135 kcfs.⁷ The planning dates are from April 10 to June 30.

⁵ NMFS BiOp at Section 9.6.1.2.1 Page 9-57, Action 14

⁶ NMFS BiOp at Section 9.6.1.2.1 Page 9-57, Action 14

⁷ NMFS BiOp at Section 9.6.1.2.1 Page 9-57, Action 14

5.1.3 McNary

5.1.3.1 Spring anadromous fish

The spring flow objective at McNary Dam is set according to the April final runoff volume forecast at The Dalles Dam for April to August.⁸ When the forecast is less than 80 maf the flow objective will be 220 kcfs. If the forecast is between 80 maf and 92 maf the flow objective will be linearly interpolated between 220 kcfs and 260 kcfs. If the forecast is greater than 92 maf the flow objective will be 260 kcfs. The planning dates for the flow objective will be from April 10 to June 30.

5.1.3.2 Summer anadromous fish

The summer flow objective at McNary Dam is 200 kcfs.⁹ The planning dates for the flow objective will be from July 1 to August 31.

5.2 All Storage Projects

The purpose of the following actions is to refill FCRPS storage projects as much as possible for spring flows, summer flow augmentation and to cool water temperatures.

The FCRPS dams will be operated during the winter season in order to achieve a high probability of water surface elevations within 0.5 foot of the flood control rule curve by April 10, and to refill by June 30, except as specifically provided by the TMT.¹⁰ The Action Agencies, in consideration of recommendations of the Technical Management Team, will determine the availability and amount of any additional FCRPS storage draft beyond the flood control rule curve for the purpose of flow augmentation, consistent with refill by June 30 for summer flow augmentation.

During the spring, the Action Agencies shall operate the FCRPS to meet the flow objectives and refill the storage reservoirs (Albeni Falls, Dworshak, Grand Coulee, Hungry Horse, and Libby) by approximately June 30.¹¹ If both these objectives cannot be achieved, the TMT will make an in-season recommendation, weighing considerations unique to each particular year. Because research results indicate that increased flows have more direct survival benefits for summer migrants than for spring migrants, modest reductions in spring flows to facilitate reservoir refill would generally be preferable to refill failure.

During the summer, the Action Agencies draft mainstem storage reservoirs (Libby, Hungry Horse, Dworshak, Grand Coulee, Banks Lake) within the NMFS BiOp's specified draft limits, based on flow recommendations provided by TMT. TMT considers a number of factors when developing its flow recommendations, such as: the status of the migration, attainment of flow objectives, water quality, and the effects that reservoir operations will have on other listed and resident fish populations.

⁸ NMFS BiOp at Section 9.6.1.2.1 Page 9-57, Action 14

⁹ NMFS BiOp at Section 9.6.1.2.1 Page 9-58, Action 14

¹⁰ NMFS BiOp at Section 9.6.1.2.1 Page 9-56, Action 14 and NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

¹¹ NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

5.3 Libby

5.3.1 Flood Control

The Corps plans to use the new SOI forecast procedure in November and December to determine the December 31 flood control elevation. In below average water years the end of December draft elevation may be higher than 2411 feet.

Libby will be operated during the winter season in order to achieve a high probability of water surface elevations within 0.5 foot of the VARQ flood control elevation by April 10 and to refill by June 30 and avoid the risk of filling too quickly and having to spill, except as specifically provided by the TMT.¹²

During the spring, the Action Agencies shall operate Libby to refill by approximately June 30 while contributing to meeting the flow objectives and the pulse for sturgeon.¹³

5.3.2 Summer anadromous fish

During the summer (July and August) the Action Agencies shall operate Libby to help meet the flow objectives for juvenile salmon out-migration in the lower Columbia. Retention of July/August water in Lake Koocanusa is possible under a Libby-Canadian storage water exchange, but is not guaranteed. This exchange agreement also reduces the second flow peak created by July/August salmon flow through Kootenay Lake July and August. The purpose of this action is to reduce or eliminate the second peak in the Kootenai River, thus protecting bull trout and sturgeon. Additionally, the exchange agreement reduces the draft of Lake Koocanusa and increases upstream benefits (Note: This type of exchange is allowed under the current Libby Coordination Agreement, which was signed February 16, 2000. Because the operation must have mutual benefit and the magnitude of the water year is not known earlier, the operation, if any, for a given water year is not finalized until June or July of that year.)

The summer reservoir draft limit is 2,439 feet,¹⁴ which determines the maximum draft available for summer flow augmentation from Libby. The Northwest Power Planning and Conservation Council mainstem amendments call for an evaluation of the relative risks posed to resident fish versus the benefits provided to anadromous fish by drafting the reservoir to 2439' by August 31.

5.4 Hungry Horse

5.4.1 Flood Control

Hungry Horse began operating using VARQ starting January 1, 2001.¹⁵ The purpose of this action is to provide more water for flow augmentation.

Hungry Horse will be operated during the winter season to achieve a high probability¹⁶ of water surface elevations within 0.5 foot of the flood control rule curve by April 10 and to refill by June 30, except as specifically provided by the TMT.¹⁷

¹² NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

¹³ NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

¹⁴ NMFS BiOp at Section 9.6.1.2.3 Page 9-63, Action 19

¹⁵ NMFS BiOp at Section 9.6.1.2.3 Page 9-62 Action 19

5.4.2 Refill

During the spring, the Action Agencies shall operate Hungry Horse to contribute to meeting the flow objectives and refill by approximately June 30.¹⁸

5.4.3 Summer anadromous fish

During the summer (July and August) the Action Agencies shall operate Hungry Horse to help meet the flow objectives. The summer reservoir draft limit is 3,540 feet.¹⁹ This limit determines the maximum draft available for summer flow augmentation from Hungry Horse. The Northwest Power Planning and Conservation Council mainstem amendments call for an evaluation of the relative risks posed to downstream resident fish versus the benefits provided to anadromous fish by drafting the reservoir to 3,540 feet by August 31.

5.5 Albeni Falls

5.5.1 Flood Control

Albeni Falls will be operated during the winter season in order to achieve a high probability²⁰ of water surface elevations within 0.5 foot of the flood control rule curve by April 10 and to refill by June 30, except as specifically provided by the TMT.²¹

5.5.2 Refill

During the spring, the Action Agencies shall operate Albeni Falls to meet the flow objectives and refill by approximately June 30.²²

5.6 Upper Snake River Reservoir Operation for Flow Augmentation

The purpose of this action is to provide water from the upper Snake Reservoirs for flow augmentation.

Reclamation will attempt to provide 427 kaf of flow augmentation from the Reclamation projects in the upper Snake River basin consistent with the NMFS 2002 Supplemental Biological Opinion and Idaho state law.²³

5.7 Brownlee, Dworshak, and Grand Coulee Flood Control

Opportunities to shift flood control requirements from Brownlee and Dworshak to Grand Coulee shall be considered.²⁴ These shifts may be implemented after coordination with TMT. The purpose of this action is to provide more water for flow augmentation in the lower Snake River.

¹⁶ No specific probability of refill is specified in the BiOps. According to the BiOps (NMFS 9-62) the probability of being at April 10 flood control is 60% when operating using VARQ.

¹⁷ NMFS BiOp at Section 9.6.1.2.1 Page 9-56, Action 14 and NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

¹⁸ NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

¹⁹ NMFS BiOp at Section 9.6.1.2.3 Page 9-63, Action 19

²⁰ No specific probability of refill is specified in the BiOps

²¹ NMFS BiOp at Section 9.6.1.2.1 Page 9-56, Action 14 and NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

²² NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

²³ NMFS BiOp at Section 9.6.1.2.6 Page 9-70, Action 32

²⁴ NMFS BiOp at Section 9.6.1.2.3 Page 9-65, Action 21

This will occur when the shifts will not compromise flood control and they have been coordinated.

5.8 Dworshak

5.8.1 Flood Control

Dworshak will be operated during the winter season in order to achieve a high probability²⁵ of water surface elevations within 0.5 foot of the flood control rule curve by April 10 and to refill by June 30, except as specifically provided by the TMT.²⁶

5.8.2 Refill

During the spring, the Action Agencies shall operate Dworshak to meet the flow objectives and refill by approximately June 30.²⁷

After summer fish operations, flows from Dworshak shall be limited to minimum one turbine operation (approximately 1,500 cfs) unless higher flows are required for flood control.²⁸ The purpose of this action is to assist in the filling of Dworshak reservoir.

5.8.3 Summer anadromous fish

During the summer (July and August) the Action Agencies shall operate Dworshak to help meet the flow objectives. The summer reservoir draft limit is 1,520 feet.²⁹ This limit determines the maximum draft available for summer flow augmentation from Dworshak. As was the case in 2002 and 2003, water may be held above 1,520 feet and discharged in early September in some water years.

5.8.4 Water quality

During the summer, releases shall be made from Dworshak to attempt to maintain water temperatures at the Lower Granite forebay water quality station at or below 68 F.³⁰ The purpose of this action is to improve water quality (by lowering water temperature) in the Lower Snake River. This fishery action also assists in cooling the downstream lower Snake River closer to the state water temperature standards.

²⁵ No specific probability of refill is specified in the BiOps

²⁶ NMFS BiOp at Section 9.6.1.2.1 Page 9-56, Action 14 and NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

²⁷ NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

²⁸ NMFS BiOp at Section 9.6.1.2.3 Page 9-65, Action 19

²⁹ NMFS BiOp at Section 9.6.1.2.3 Page 9-65, Action 19

³⁰ NMFS BiOp at Section 9.6.1.2.3 Page 9-65, Action 19

5.9 Grand Coulee

5.9.1 Flood Control

Grand Coulee will be operated during the winter season in order to achieve an 85% probability of water surface elevations within 0.5 foot of the flood control rule curve by April 10. It will be operated to refill by July 4 if summer flow objectives are being met. The TMT may provide other specific operations.³¹

5.9.2 Refill

During the spring, the Action Agencies shall operate Grand Coulee to meet the flow objectives and refill by approximately July 4.³²

5.9.3 Summer anadromous fish

During the summer (July and August) the Action Agencies shall operate Grand Coulee to help meet the flow objectives for juvenile salmon out migration. The final forecast produced by RFC in July determines the summer reservoir draft limit. The draft limit is 1,280 feet in years when the April through August forecast for The Dalles is equal to or exceeds 92 maf. If the forecast is less than 92 maf the draft limit will be 1,278 feet.³³ This limit determines the maximum draft available for summer flow augmentation from Grand Coulee.

5.10 Banks Lake Summer Draft

Banks Lake will be drafted to elevation 1,565 feet by the end of August.³⁴ The purpose of this action is to provide more water for summer flow augmentation.

5.11 Bonneville Dam Chum Tailwater Elevations

The purpose of the following actions is to provide spawning areas and protect redds of chum salmon.

Tailwater elevations will be regulated below Bonneville Dam to support spawning of chum salmon if the best hydrologic data available by early October indicate that precipitation, runoff, and reservoir storage are likely to support the operation from the start of spawning (late October or early November) until the end of emergence (generally through the start of the spring flow management season in April). The SOI has been given consideration in previous years as a method to get a relative gage as to what the coming year's precipitation may be. The chum spawning operation cannot adversely affect implementation of NMFS's 2000 FCRPS higher priority RPA actions (see section 2.1) or the parties' ability to comply with the Vernita Bar agreement. If these conditions cannot be met, the Action Agencies will work with NMFS and the regional salmon managers to identify operations that would benefit salmon while maintaining these other fish protection measures. Such operations may include intentionally managing flows below what is necessary for mainstem spawning to discourage redds from being established in the area or shaping flows in a manner that would discourage redd development (reverse load

³¹ NMFS BiOp at Section 9.6.1.2.1 Page 9-56, Action 14 and NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

³² NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

³³ NMFS BiOp at Section 9.6.1.2.3 Page 9-64, Action 19

³⁴ NMFS BiOp at Section 9.6.1.2.4 Page 9-67, Action 23

factoring). In the BiOp, the chum spawning operation calls for the FCRPS projects to provide a minimum flow below Bonneville Dam of 125 kcfs (or more as coordinated) from when chum salmon are found in the area around Ives and Pierce islands (but no later than November 1) through December 31. The NMFS BiOp recommends flows from Bonneville Dam be maintained within 5 kcfs of the established minimum.³⁵ However, in recent years, operating to the Bonneville tailwater gage during daylight hours was found to be an effective management tool. During nighttime hours, discharges more the 5 kcfs over the daytime discharge level may occur. Operations with discharges more than 75 kcfs over the daytime discharge level have occurred without impacting where chum redds were placed. The tailwater gage better reflects the effects of tides, tributary inflow, and groundwater influence below Bonneville Dam. The Action Agencies intend to operate to a minimum Bonneville tailwater elevation of approximately 11.4 feet in operating year 2004.

If water supply conditions indicate that it is not possible to maintain this minimum tailwater elevation at Bonneville Dam, flow will be provided at times during the chum-spawning season to allow access to Hamilton and Hardy Creeks if the creeks are flowing. Details will be set through coordination in TMT.³⁶

From January 1 to the start of spring flows April 10, if the chum operation is possible, the minimum tailwater elevation at Bonneville Dam will be the daily minimum water surface elevation established by coordination in the TMT.³⁷

Chum salmon will be captured and used as broodstock to initiate/bolster a spawning population in the recently restored habitat of Duncan Creek. The NPPC Duncan Creek project outlines the logistics for a brood movement and fry-rearing program. The salvage operation would expand the numbers of fish captured and reared in this newly established brood collection program to make up for the lack of tributary or mainstem spawning

The Implementation Team sought criteria that NOAA Fisheries uses to make decisions regarding the provision of water for chum spawning. A memo responding to this request is attached in Appendix 5.

6.0 Hydrosystem Substrategy 2.3: Spill operations for project passage

This substrategy addresses spill at certain FCRPS projects to provide improved survival and better project passage for juvenile fish while avoiding adult fallback problems and creating greater than 120% saturation levels of total dissolved gas in the tail race and 115 % at the designated downstream monitoring stations at the forebay of the next dam downstream.

The planning dates for spring spill for juvenile fish migration are April 3 to June 20 in the Snake River, and April 10 to June 30 in the lower Columbia River.³⁸ Spill levels and times are

³⁵ NMFS BiOp at Section 9.6.1.2.1 Page 9-58, Action 15

³⁶ NMFS BiOp at Section 9.6.1.2.1 Page 9-60, Action 16

³⁷ NMFS BiOp at Section 9.6.1.2.1 Page 9-59, Action 15

indicated below.³⁹ No spill for juvenile fish passage at the three Snake River collector projects shall occur when seasonal average flows are projected to be below 85 kcfs.⁴⁰ The specificity of the 85 kcfs criteria was debated in TMT and IT during the 2003 flow season. NOAA fisheries provided criteria regarding the provision of spill when flows are forecasted to be close to the 85 kcfs threshold. These criteria are attached in Appendix 6.

Planning dates for summer spill for juvenile fish migration are June 21 to August 31 in the Snake River, and July 1 to August 31 in the lower Columbia River.⁴¹ There will be no summer spill at the four collector projects (Lower Granite, Little Goose, Lower Monumental, and McNary).⁴²

The concept of how to apply planning dates to spill decisions is being considered by the IT. Any guidance they may provide on this issue will be included in the spring/summer update of the 2004 WMP.

Spill for the various projects are shown in the table below:

Changes in spill levels or spill operations are being considered for the following projects in 2004: Bonneville Dam, John Day, Ice Harbor, and Lower Granite. These changes will be informed by the results of research results that are not currently available.

³⁸ NMFS BiOp at Section 9.6.1.4.3 Page 9-88, Action 54

³⁹ NMFS BiOp at Section 9.6.1.4.4 Page 9-88, Action 54 and NMFS BiOp at Section 9.6.1.3.4 Page 9-76, Action 41

⁴⁰ NMFS BiOp at Section 9.6.1.3.2 Page 9-76, Action 40

⁴¹ NMFS BiOp at Section 9.6.1.4.3 Page 9-88, Action 54

⁴² NMFS BiOp at Section 9.6.1.3.2 Page 9-76, Action 42

Table 4. Spill at run-of-river projects to aid out migration of juvenile anadromous fish.

Project	Planning Dates	Time	Spring Spill	Summer Spill	Amount	Minimum Generation Requirements kcfs
Lower Granite	April 3– June 20	1800-0600	Yes	No	120/115 gas cap	11.5 ^a
Little Goose	April 3– June 20	1800-0600	Yes	No	120/115 gas cap	11.5 ^a
Lower Monumental	April 3– June 20	24 hours a day	Yes	No	45% or 50% of outflow	11.5 ^a
Ice Harbor	April 3– August 31	24 hours a day	Yes	Yes	120/115 gas cap 1800-0500 45 Kcfs 0500-1800	7.5 – 9.5 ^a
McNary	April 10– June 30 ^b	1800-0600	Yes	No	120/115 gas cap	50
John Day	April 10– August 31	1800-0600 1900-0600 May 15– July 31	Yes	Yes	60% of outflow Min spill 30%	50
The Dalles	April 10– August 31	24 hours a day	Yes	Yes	40% of outflow	50
Bonneville	April 10– August 31	24 hours a day	Yes	Yes	120/115 gas cap nighttime 75 kcfs daytime ^c 50 min flow	30

a – Minimum generation requirements at the Lower Snake River Projects may not be needed all the time.

b – Collection of subyearling fall chinook for transportation at McNary Dam shall not be initiated until in-river migratory conditions are deteriorating (i.e., no longer spring-like).⁴³ In general, the switch from spring to summer operation will occur on or about June 20. Spring-like is defined as favorable flow and water temperature conditions; i.e., river flows are at or above the spring flow target (220 to 260 kcfs) at McNary Dam, and ambient water temperatures are below 62°F (17°C). Actual dates shall be set by TMT coordination.

c – Day and nighttime vary during the spill season and are set in the Fish Passage Plan.

Note: Spill for juvenile fish passage may be reduced or turned off for short periods of time because of navigation problems at the projects or to allow for juvenile fish barges to dock and undock. Also research at projects that spill may change the details of spill at the project.

⁴³ NMFS BiOp at Section 9.6.1.3.4 Page 9-77, Action 43

7.0 Hydrosystem Substrategy 2.5: Other actions to enhance water management

This substrategy includes water management related actions that are being done to improve fish survival, such as studies, water quality actions, and water conservation improvements.

7.1 Libby

7.1.1 TDG and Water temperature monitoring

Water temperature profiles in the south end (near-dam, or forebay area) of Lake Kooconusa during May and June will be monitored to provide information necessary for timing of sturgeon spawning/rearing flow augmentation.⁴⁴ Also, water temperature profiles in the forebay are used to determine whether warmer temperatures may be provided to assist sturgeon spawning

During the summer of 2003, the Seattle District installed a TDG monitoring sensor at a fixed monitoring station below Libby Dam on the spillway side of the river (left bank, looking downstream) directly across the river from the USGS stage gage.

7.1.2 Libby VARQ

The purpose of VARQ is to better ensure reservoir refill and to provide more (and more reliable) water for spring flows and summer flow augmentation without reducing flood control protection.

An Environmental Impact Statement (called the Upper Columbia Alternative Flood Control and Fish Operations EIS) is being prepared and additional public and Canadian (including Columbia River Treaty) coordination will be conducted before VARQ can be implemented at Libby, Hungry Horse, and Grand Coulee for the long term. VARQ will continue to be implemented on an interim basis until a final decision is made regarding long-term implementation. This decision will be made in 2005 upon completion of the EIS.⁴⁵

7.1.3 Libby Storage Reservation Diagram and Runoff Volume Forecast Procedure

The purpose of the Libby storage reservation diagram study and investigation of a new forecast procedure and the investigation into a variable 31 December draft point is to see if more water can be made available for spring flows without reducing flood control protection.

⁴⁴ USFWS BiOp at Section 8.3.h Page 82 Note page numbers in USFWS BiOp may vary depending on how it is printed.

⁴⁵ NMFS BiOp Section 9.6.1.2.3 Page 63, Action 19; NMFS BiOp Section 9.6.1.2.3 Page 9-66, Action 22; and USFWS BiOp Section 8.1.b page 73

The investigation of the forecast procedure will be completed this year. Forecasts will be done in water year 2004 using the new method. Work on a new Libby storage reservation diagram and 31 December draft point will be completed in December 2003. A decision has not been made concerning implementation of a variable 31 December draft point.⁴⁶

7.1.4 Coordination

An annual operational schedule to be supplemented on a monthly basis will be provided to the USFWS annually on or about May 1 but not later than May 10. The annual schedule shall include month-end estimates of water surface elevation at Koocanusa Reservoir and estimates of monthly discharge from Libby Dam. The monthly supplement shall include a report of actual operations over the previous month and shall include daily water surface elevation at Koocanusa Reservoir and hourly spill and releases at Libby Dam.⁴⁷ The purpose of this action is to provide for better coordination. The Action agencies plan to do this required coordination at TMT meetings.

7.1.5 Increased Flow Capacity at Libby

The purpose of the following actions is to provide for a higher flow during the sturgeon pulse.

The USACE has initiated evaluation of channel capacity in the Libby/Troy area below Libby Dam for purposes of determining possible impacts and limitations of increasing flow capacity from Libby Dam.⁴⁸ This study is expected to be completed by the end of calendar year 2003 and will be used in the Upper Columbia Alternative Flood Control (VARQ) and Fish Operations EIS.. Pending funding approval, the USACE will begin an evaluation of flood control levels and public safety concerns along the banks of the Kootenai River below Libby Dam in the Bonners Ferry area, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means.⁴⁹ NEPA documentation will be required for this action and will be addressed for the flows themselves (but not the means by which additional capacity would be achieved) through the Upper Columbia Alternative Flood Control (VARQ) and Fish Operations EIS.

Limited flow over the Libby spillway is being considered starting in 2004 to enhance sturgeon flow capability. Maximum spill levels will be based in part on final analysis of data from the spill test and spill for flood control that took place in June-July 2002 at Libby. Preliminary information indicates maximum spill may be 2,000 cfs or less in order to not exceed the state standard of 110% TDG assuming a measurement point at the cross-section of the USGS gage below the dam. However, no method other than voluntary spill is available to achieve the required 5,000 cfs additional capacity from Libby Dam by 2004.⁵⁰ Therefore, the allowable dissolved gas limit and the exact location for measuring it are being developed in coordination with the state of Montana Departments of Environmental Quality, and Fish, Wildlife, and Parks.

⁴⁶ NMFS BiOp Section 9.6.1.2.6 Page 33, Action 36; USFWS BiOp at Section 8.1.h Page 76; and USFWS BiOp at Section 8.1.i Page 76

⁴⁷ USFWS BiOp at Section 11.A.1.1.c Page 93

⁴⁸ USFWS BiOp at Section 8.2a.5 Page 79 and Section, 8.2a.2 Page 78

⁴⁹ USFWS BiOp at Section 8.3.a Page 80

⁵⁰ USFWS BiOp at Section 8.2a.5 Page 79

Further NEPA documentation requirements for use of voluntary spill in 2004 are being determined.

7.1.6 Kootenai River Groundwater Investigation

The purpose of the following action is to provide for a higher flow level during the sturgeon pulse.

Groundwater seepage investigations⁵¹ are being conducted as part of the Upper Columbia Alternative Flood Control (VARQ) and Fish Operations EIS. These will allow better quantification of the relationship between river stage/duration and groundwater saturation in agricultural lands from the Bonners Ferry area downstream to the Canadian border. Further field investigations, modeling, and a report will be completed in 2003.⁵²

7.2 Hungry Horse Coordination

Reclamation will fulfill the USFWS recommendation for annual and monthly reporting by contributing to the annual water management plan and presenting weekly and biweekly reports of Hungry Horse operations through the TMT process.⁵³

Reclamation will also fulfill the USFWS recommendation for reporting actual operations by making available pertinent historic elevations and flows as related to Hungry Horse Dam through its current website at <http://mac1.pn.usbr.gov/pn6200/esatea.html>. These actions are described in accordance with the US Bureau of Reclamation, Pacific Northwest Region Findings and Commitments Implementing December 2000 Biological Opinions for the Federal Columbia River Power System and Other Related Actions, Section III, B, 2, paragraph 23.

Reclamation began operating under VARQ at Hungry Horse in 2001. The VARQ EIS is scheduled to be completed in the spring of 2005.

7.3 Water Quality Actions

7.3.1 Water Quality Plans

One- and five-year water quality plans are to improve fish passage and survival through water quality improvement measures. The intent of the water quality plans is to recommend FCRPS facility and operational improvements related to water quality, total dissolved gas (TDG) and water temperature monitoring, and related studies. The BiOp also includes RPAs 130 to 143, which are water quality actions.⁵⁴

Operationally oriented water quality RPAs 131 and 132 are addressed in the annual Water Management Plan. RPA 143 has long-term water management planning goals and is also addressed in the Water Management Plan. The other capital investment water quality RPAs

⁵¹ USFWS BiOp at Section 8.3.c Page 81

⁵² USFWS BiOp at Section 8.3.c Page 81

⁵³ USFWS BiOp at Section 11.A.1.2.A Page 93

⁵⁴ NMFS BiOp Section 9.4.2.4 Page 9-29, Action 5

related to facility improvements will be addressed in the 1-year and the 5-year Research, Monitoring, and Evaluation Plans.

7.3.2 Total Dissolved Gas Monitoring

Exposure to high levels of TDG over long periods of time can be harmful or lethal to fish. Environmental monitoring at the dams is necessary where voluntary spill is employed for juvenile fish passage to ensure that gas levels do not exceed TDG thresholds established in the NMFS (now called NOAA Fisheries) BiOp, and variance levels established by the state water quality agencies. According to RPA 131 of the BiOp, the physical monitoring program is to include QA/QC components; redundant and backup monitors at as many locations as the Water Quality Team determines necessary; calibration of monitoring equipment at least every 2 weeks; adequate funds for spot-checking monitoring equipment, error checking, correcting, and recording functions for CROHMS data; and daily reporting.

There are two purposes for the Corps to monitor total dissolved gas (TDG) and water temperature at 10 Columbia River Basin dams: 1) to monitor project performance in relation to water quality standards, and 2) to provide water quality data for anadromous fish passage at Columbia/Snake mainstem dams. The monitoring program is considered an integral part of the Corps' Reservoir Control Center water management activities.

TDG is the primary water quality parameter monitored. High saturation level TDG can cause physiological damage to fish. Water temperature is also measured because it affects TDG saturation levels, and because it influences the health of fish and other aquatic organisms. Both TDG and water temperature are closely linked to project water management operations (e.g., water released over the spillways, releases through the powerhouses and other facilities, and forebay and tailwater water surface elevations).

One component of the NMFS 2000 BiOp water quality strategy was for the Corps to take the actions necessary to implement the spill program at the dams called for in the BiOp, including obtaining variances from appropriate State water quality agencies. The Corps took the necessary actions to prepare for the 2002 and 2003 spill seasons. The Corps will follow a similar process prior to the 2004 season. The variance provides for a revision of the total dissolved gas standard from 110% to a revised standard of 115% in the forebays and 120% in the tailwaters of McNary, John Day, The Dalles, and Bonneville dams, and the Camas location, from April 1, 2003, to August 31, 2003. The 115% and 120% caps are based on the 12 highest hourly measurements per calendar day. Also, a cap of total dissolved gas of 125%, based on the two highest hours, is in effect.

In 1999, the State of Washington had issued a modified TDG water quality standard, which is in effect through the 2003 water year. Additional actions with the State of Washington were not required for the 2002 water year. The Corps will be meeting with the Washington Department of Ecology in late 2003 to discuss the possibility and process for developing a multiple year TDG rule modification starting in the 2004 spill season.

The State of Idaho was not approached in 2002 concerning a variance to water quality standards. The State, in conjunction with the Tribes, provided a set of conditions in 2001 to be met as part of the variance process. The Corps did not pursue obtaining a variance from the State of Idaho for 2002 or 2003 and does not plan to do so in 2004.

The Reservoir Control Center is responsible for monitoring the TDG and water temperature conditions in the forebays and the tailwaters of the lower Columbia River/lower Snake River dams, and selected river sites. The operational water management guidelines in Oregon are to change spill levels and, subsequently, spill patterns at the dams (daily if necessary) so that the forebays are as close to, but do not exceed, daily (12 highest hours) average of 115% TDG, and the tailwater levels are close to, but do not exceed, daily (12 highest hours) average of 120% TDG. Also, a cap of total dissolved gas of 125%, based on the two highest hours, is in effect.

The Corps prepares a Total Dissolved Gas Management Plan each year (see Appendix 4). It is a supporting document for the Water Management Plan. The Plan summarizes the roles and responsibilities of the Corps as they relate to dissolved gas monitoring. The Plan stipulates what to measure, how, where, and when to take the measurements, and how to analyze and interpret the resulting data. The Plan also provides for periodic review and alteration or redirection of efforts when monitoring results and/or new information from other sources justifies a change. The Plan identifies channels of communication with other cooperating agencies and interested parties.

The Corps will be monitoring similarly to what occurred since 2000.

See: <http://www.nwd-wc.usace.army.mil/TMT/>

The 2004 Plan of Action can be found listed under the TDG category of the Reservoir Control Center Water Quality Team page on the following web site:

<http://www.nwd-wc.usace.army.mil/TMT/wqwebpage/mainpage.htm>

7.3.3 Other Water Quality Actions

The following water quality topics are covered in Appendix 4: Total Dissolved Gas Model, Temperature Model and Temperature Monitoring Needs, Water Quality Database.

7.4 Canadian Storage for Flow Augmentation

The purpose of the actions below is to see if more water from Canadian storage projects can be obtained for flow augmentation.

One (1) maf of Treaty storage shall be requested and negotiated when available with BC Hydro to be provided and released during the migration season.⁵⁵

⁵⁵ NMFS BiOp at Section 9.6.1.2.5 Page 9-67, Action 24

BPA shall continue to request and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring, for subsequent release in July and August, for flow enhancement as long as operations forecasts indicate that water stored in the spring can be released in July and August.⁵⁶

A study regarding the shaping and release of water behind Canadian Treaty storage projects in July and August was completed in 2001.⁵⁷

7.5 Albeni Falls Coordination

The action agencies, the USFWS, and Idaho Department of Fish & Game shall meet annually to evaluate Lake Pend Oreille kokanee monitoring results and make necessary adjustments through subsequent in-season management.⁵⁸ The purpose of this action is to review IDFG monitoring results and to ensure winter lake operation protocol is addressing the needs of kokanee spawning and hence, threatened bull trout, which feed on kokanee.

7.6 Public Coordination

The purpose of the following actions is to provide for better regional coordination.

Actions in the Water Management Plan will be coordinated with NMFS, USFWS, and the states and tribes in preseason planning and in-season management of flow and spill operations. This coordination shall occur in the Technical Management Team process.⁵⁹

At all appropriate decision points, the action agencies shall routinely seek timely input and concurrence from the USFWS on all matters affecting USFWS listed fish through the Columbia River Treaty, International Joint Commission Orders, and all other decision making processes involving transboundary waters in the Columbia River basin. This shall include notification of all meetings and decision points and provision of opportunities to advise the action agencies during meetings and in writing, as appropriate.⁶⁰

7.7 System Flood Control Study

The purpose of the various flood control studies is to see if more water can be available for spring flow management without reducing flood control protection.

The plans for the Columbia River Fish Mitigation System Flood Control Review for 2004 include the completion of the planning reconnaissance phase. This includes completing for the 905(b) Analysis and the Project Management Plan.⁶¹

⁵⁶ NMFS BiOp at Section 9.6.1.2.5 Page 9-67, Action 25

⁵⁷ NMFS BiOp at Section 9.6.1.2.5 Page 9-67, Action 26

⁵⁸ USFWS BiOp at Section 11.A.1.4.d Page 94

⁵⁹ NMFS BiOp at Section 9.4.2.2 Page 9-27, Action 3 and NMFS BiOp at Section 9.4.2.2 Page 9-60, Action 17

⁶⁰ USFWS BiOp at Section 8.1.g Page 76

⁶¹ NMFS BiOp Section 9.6.1.2.6 Page 72, Action 35

7.8 Banks Lake Flow Augmentation

The purpose of the proposed operation at Banks Lake is to enhance and attempt to help flow objectives in the Columbia River during the juvenile out-migration of ESA listed salmonid stocks. This would be accomplished by altering the August draft limit of Banks Lake from elevation 1,565 feet down to 1,560 feet.⁶²

Reclamation is preparing an analysis to determine if this action will be implemented.

7.9 Dworshak Draft to 1,500 Feet Adult Evaluation

The NMFS BiOp calls for drafting Dworshak to 1,500 feet in order to evaluate whether releasing approximately 200 kaf of water during September provides a benefit to adult migrants.⁶³ The ongoing temperature monitoring and field evaluations will continue in 2004 to provide data for the study.

Water conditions at the end of 2002 *and a TMT decision in 2003* allowed approximately 200 KAF of storage from Dworshak to be released in September for the purpose of this study. The preliminary data from the 2002 test was presented to TMT in the fall of 2002. A final report on the 2002 operation is anticipated in 2004.

7.10 Other Reclamation Water Management Actions

The following actions from the NMFS BiOp are intended to provide additional benefits to listed fish.

Reclamation will consult with NMFS before committing any of its uncontracted storage space or entering into new contracts. No contracts are scheduled for review in 2004.⁶⁴

Reclamation shall pursue water conservation improvements at its projects. Reclamation annually receives numerous proposals for conservation projects from its irrigation districts and others. FY 2002 project selection criteria have been developed with a new ESA emphasis and will be applied to proposals considered for Reclamation projects.⁶⁵

Reclamation provided NOAA Fisheries with a report on unauthorized use of Reclamation project water in March 2003.⁶⁶

Reclamation shall complete ESA consultations on its tributary projects below Chief Joseph Dam. Consultations are in progress for the Crooked River, Deschutes, Arnold, Umatilla, Yakima, Upper Snake and Tualatin Projects.⁶⁷

⁶² NMFS BiOp at Section 9.6.1.2.6 Page 9-70, Action 31

⁶³ NMFS BiOp at Section 9.6.1.2.6 Page 9-71, Action 34

⁶⁴ NMFS BiOp Section 9.6.1.2.6 Page 68, Action 27

⁶⁵ NMFS BiOp Section 9.6.1.2.6 Page 68, Action 28

⁶⁶ NMFS BiOp Section 9.6.1.2.6 Page 69, Action 29

⁶⁷ NMFS BiOp Section 9.6.1.2.6 Page 69, Action 30

The Action Agencies shall acquire water for in-stream use from Reclamation's Upper Snake River Projects. Reclamation, NMFS, and others are participating in settlement discussions under the Snake River Basin Adjudication. Implementation of flow augmentation in 2004 will involve a settlement, another ESA consultation on the Upper Snake projects, and authorizing legislation from Idaho.⁶⁸

The study of salmon attraction problems in the wasteways and drains is complete. Water quality monitoring and evaluation of return flows has been initiated and will be ongoing in 2004.⁶⁹

8.0 Hydrosystem Substrategy 3.3: Juvenile fish transport actions to improve fish survival

This substrategy addresses actions to collect juvenile fish at some FCRPS projects while providing a balance between transported and in-river juvenile fish migration.

8.1 Snake River Collector Projects

All non-research juvenile salmonids collected at the Snake River collector projects will be transported (Lower Granite, Little Goose, and Lower Monumental dams).⁷⁰ A review of the information relative to when spring transport should be initiated will occur during the winter of 2003/2004. Current research information should be available to help inform this decision consistent with NOAA Fisheries' BiOp action 51.

8.2 McNary

Juvenile spring migrants collected at McNary Dam shall be bypassed.⁷¹

Collection of subyearling fall chinook for transportation at McNary Dam shall not be initiated until in-river migratory conditions are deteriorating (i.e., no longer spring-like).⁷² In general, the switch from spring to summer operation will occur on or about June 20. Spring-like is defined as favorable flow and water temperature conditions; i.e., river flows are at or above the spring flow target (220 to 260 kcfs) at McNary Dam, and ambient water temperatures are below 62°F (17°C). Actual dates shall be set through coordination with TMT.

⁶⁸ NMFS BiOp at Section 9.6.1.2.6 Page 9-70, Action 32

⁶⁹ NMFS BiOp Section 9.6.1.2.7, Page 74-75, Actions 37, 38, 39

⁷⁰ NMFS BiOp at Section 9.6.1.3.2 Page 9-76, Action 40

⁷¹ NMFS BiOp at Section 9.6.1.3.4 Page 9-76, Action 41

⁷² NMFS BiOp at Section 9.6.1.3.4 Page 9-77, Action 43

9.0 Resident Fish Substrategy 1.1: Create conditions below Libby Dam that facilitate Kootenai River white sturgeon (KRWS) natural reproduction and juvenile survival

9.1 Libby

9.1.1 Sturgeon

The purpose of the actions below is to provide water for sturgeon spawning.

Water shall be stored in Libby reservoir and supply, at a minimum, water volume during May and June, based upon water availability or the “tiered” approach as defined through coordinated reevaluation that took place in March 2002 among USACE, USFWS, and MDFWP, and summarized in the table below. This water shall be in addition to storage needs for listed bull trout, salmon, and the 4,000 cfs minimum releases from Libby Dam. Accounting on these total tiered volumes shall begin when the USFWS determines benefits to conservation of sturgeon are most likely to occur. This may include releases timed to enhance survival of eggs, yolk sac larvae, or larvae reared under the preservation stocking program and released into the Kootenai River. Releases may be timed to serve both wild fish and hatchery eggs/fish. Sturgeon flows will generally be initiated between mid-May and the end of June to augment lower basin runoff entering the Kootenai River below Libby Dam.⁷³

⁷³ USFWS BiOp at Section 8.1.c Page 73,

Table 5. “Tiered” volumes of water for sturgeon flow enhancement to be released from Libby Dam according to the April - August volume runoff forecast at Libby. Actual flow releases would be shaped according to seasonal requests from the USFWS and in-season management of water actually available.⁷⁴

Forecast runoff Volume (maf*) at Libby	Sturgeon flow volume (maf) from Libby Dam
0.00 < forecast < 4.80	Sturgeon flows not requested
4.8	0.8
5.4	0.8
6.35	1.12
7.4	1.2
8.5	1.2
8.9	1.6
Forecast > 8.9	1.6

Note: For forecasts between 4.8 and 8.9 maf interpolate from the values shown in the table above.

The purpose of the actions below is to provide for the annual sturgeon pulse.

Libby outflow will fulfill the operational guidelines provided by the USFWS annually prior to and during the sturgeon spawning/incubation period. During 2004, operational guidelines will include a request to deliver a high flow of water for 4 or 5 days at a time when both Kootenay Lake-Kootenai River stages are low and local runoff is high, to evaluate the potential of increased stream energy to scour sand from buried gravel within designated critical habitat. However, this would be done within established flood control criteria. Specific release recommendations will be developed in consultation with action agencies and submitted annually through the TMT or similar regional process.⁷⁵

Efforts will be coordinated to attempt to limit sturgeon-spawning flows so they do not exceed a river stage elevation of 1,764 feet at Bonners Ferry. (Note: This may not always be possible during periods of unusual local runoff that may be beyond the control of Libby Dam.)⁷⁶

⁷⁴ Letter from Michael White (USACE) to Anne Badgley (USFWS) dated August 23 2002

⁷⁵ USFWS BiOp at Section 8.2.c Page 80

⁷⁶ USFWS BiOp at Section 8.3.b Page 80

During sturgeon recruitment flow periods, local inflow will be allowed to supplement Libby Dam releases to the maximum extent feasible, while assuring public safety by monitoring water levels throughout relevant areas of the Kootenai River basin.

For 2004 there is a proposal to provide 2-5 days of scouring flows from Libby during April, May, or June. This volume would be incorporated in the tiered sturgeon flow enhancement volume.

9.1.2 Coordination

Libby Dam flows shall be regulated consistent with existing treaties, Libby Project authorization for public safety, other laws, and the 1938 International Joint Commission order to achieve water volumes, water velocities, water depths, and water temperature at a time to maximize the probability of allowing significant sturgeon recruitment.⁷⁷

10.0 Resident Fish Substrategy 2.2: Operate and modify FCRPS dams to protect, provide, and reconnect bull trout habitats

10.1 Libby

The following minimum flows to protect bull trout between the sturgeon and salmon flows will be provided based on the April to August volume runoff forecast at Libby.

If Kootenai Reservoir elevations are below salmon guidelines (2439 ft) on July 1, and salmon augmentation will not occur for that year, the action agencies shall provide 6,000 cfs for the bull trout minimum flow during July and August (lowest water years). If additional water is available, increases in minimum flows may be determined through the TMT process.⁷⁸

⁷⁷ USFWS BiOp at Section 8.1.a Page 73

⁷⁸ USFWS BiOp at Section 11.A.1.1.b Page 93

Table 6. Minimum bull trout releases in July from Libby Dam.

Forecast runoff Volume (maf*) at Libby	Min bull trout flows between sturgeon and salmon flows
0.00 < forecast < 4.80	6 kcfs
4.80 < forecast < 6.00	7 kcfs
6.00 < forecast < 6.70	8 kcfs
6.70 < forecast < 8.10	9 kcfs
8.10 < forecast < 8.90	9 kcfs
8.90 < forecast	9 kcfs

(USFWS BiOp at Section 3.A.2 Page 13)

**maf = million acre-feet*⁷⁹

10.1.1 Ramp Rates

The purpose of the following actions is to provide better conditions for resident fish by limiting the flow fluctuations and setting minimum flow levels.

Operational constraints will be implemented at Libby Dam intended to minimize adverse effects of rapid and severe river flow fluctuations on bull trout, including year-round minimum flows and ramping rates, seasonal water management, conducting studies to monitor the adequacy of the constraints, and providing for modification of the operational constraints depending on study results.⁸⁰ Exact operational constraints are shown in paragraphs below.

The following ramp rates will guide project operations to meet various purposes, including power production.

⁷⁹ USFWS BiOp at Section 8.3.g Page 81

⁸⁰ USFWS BiOp at Section 10.A.1 Page 87

Table 7. Prescribed ramp rates to protect resident fish and their food organisms, and to minimize levee erosion, in the Kootenai River.

Daily and Hourly Maximum Ramp Up Rates for Libby Dam (as measured by daily flows, not daily averages, restricted by hourly rates)			
Flow Range	Ramp Up Unit (Daily max)	Ramp Up (Hourly max) 1 Oct – 30 Apr	Ramp Up (Hourly max) 1 May – 30 Sep
4,000 - 6,000 cfs	Limit ramp up to one unit per day (approx. 5,000 cfs per day)	2,000 cfs/hr	1,000 cfs/hr
6,000 - 9,000 cfs	Limit ramp up to one unit per day (approx. 5,000 cfs per day)	2,000 cfs/hr	1,000 cfs/hr
> 9,000 - 17,000 cfs	Limit ramp up to two units per day (approx. 10,000 cfs per day)	3,500 cfs/hr	2,000 cfs/hr
> 17,000 cfs	No limit	7,000 cfs/hr	3,500 cfs/hr

(USFWS BiOp at Section 3.A.2 Page 13)

Daily and Hourly Maximum Ramp Down Rates for Libby Dam (as measured by daily flows, not daily averages, restricted by hourly rates)			
Flow Range	Ramp Down Unit (Daily Max)	Ramp Down(Hourly max) 1 Oct – 30 Apr	Ramp Down (Hourly max) 1 May – 30 Sep
4,000 - 6,000 cfs	Limit ramp down to 500 cfs per day	500 cfs/hr	500 cfs/hr
> 6,000 - 9,000 cfs	Limit ramp down to 1,000 cfs per day	500 cfs/hr	500 cfs/hr
> 9,000 - 17,000 cfs	Limit ramp down to 2,000 cfs per day	1,000 cfs/hr	1,000 cfs/hr
> 17,000 cfs	Limit ramp down to one unit per day (approx. 5,000 cfs per day)	5,000 cfs/hr	3,500 cfs/hr

(USFWS BiOp at Section 3.A.2 Page 14)

Daily and hourly ramping rates may be exceeded during flood emergencies to protect health and public safety and in association with power or transmission emergencies.⁸¹

Variations to ramping rates during years where runoff forecasting or shortage shortfalls occur, or variations are necessary to provide augmentation water for other listed species, will be negotiated through the TMT process. This is expected in only the lowest 20th percentile water years.⁸²

⁸¹ USFWS BiOp at Section 3.A.2 Page 14

⁸² USFWS BiOp at Section 3.A.2 Page 14

Note: The ramp rates will be followed except when they would cause a unit(s) to operate in the rough zone, a zone of chaotic flow in which all parts of a unit are subject to increased vibration and cavitation that could result in premature wear or failure of the units. In this case the project will utilize a ramp rate, which allows all units to operate outside the rough zone. The action agencies will provide additional information to the USFWS describing operations outside the “rough zone.”⁸³

10.2 Hungry Horse

10.2.1 Ramp Rates

The purpose of the following actions is to provide better conditions for resident fish by limiting the flow fluctuations and setting minimum flow levels.

Operational measures will be implemented at Hungry Horse Dam to minimize adverse effects of rapid and severe river flow fluctuations on bull trout, including year-round minimum flows and ramping rates, and seasonal water management; conduct studies to monitor the adequacy of the constraints; and provide for modification of the operational constraints depending on study results.⁸⁴ Exact operational measures are shown in paragraphs below.

The following ramp rates will guide project operations to meet various purposes, including power production.

⁸³ USFWS BiOp at Section 3.A.2 Page 13

⁸⁴ USFWS BiOp at Section 10.A.1.2 Page 88

Table 8. Ramp rates prescribed for Hungry Horse Dam releases to protect resident fish and their food organisms in the Flathead River.

Daily and Hourly Maximum Ramp Up Rates for Hungry Horse Dam (as measured by daily flows, not daily averages, restricted by hourly rates).		
Flow Range (measured at Columbia Falls)	Ramp Up Unit (Daily Max)	Ramp Up Unit (Hourly max)
3,200 - 6,000 cfs	Limit ramp up 1,800 cfs per day	1,000 cfs/hour
> 6,000 - 8,000 cfs	Limit ramp up 1,800 cfs per day	1,000 cfs/hour
> 8,000 - 10,000 cfs	Limit ramp up 3,600 cfs per day	1,800 cfs/hour
> 10,000 cfs	No limit	1,800 cfs/hour

(USFWS BiOp at Section 3.A.1 Page 8)

Daily and Hourly Maximum Ramp Down Rates for Hungry Horse Dam (as measured by daily flows, not daily averages, restricted by hourly rates)		
Flow Range (measured at Columbia Falls)	Ramp Down Unit (Daily max)	Ramp Down Unit (Hourly max)
3,200 - 6,000 cfs	Limit ramp down to 600 cfs per day	600 cfs/hour
> 6,000 - 8,000 cfs	Limit ramp down to 1,000 cfs per day	600 cfs/hour
> 8,000 - 12,000 cfs	Limit ramp down to 2,000 cfs per day	1,000 cfs/hour
> 12,000 cfs	Limit ramp down to 5,000 cfs per day	1,800 cfs/hour

(USFWS BiOp at Section 3.A.1 Page 8)

Daily and hourly ramping rates may be exceeded during flood emergencies to protect health and public safety and in association with power or transmission emergencies.⁸⁵

Variations to ramping rates during years where runoff forecasting or storage shortfalls occur, or variations are necessary to provide augmentation water for other listed species, will be coordinated through the TMT process. This is expected in only the lowest 20th percentile water years.⁸⁶

Note: The ramp rates will be followed except when they would cause a unit(s) to operate in a zone that could result in premature wear or failure of the units. In this case the project will utilize a ramp rate, which allows all units to operate outside the rough zone. The action agencies will provide additional information to the USFWS describing operations outside the “rough zone.”⁸⁷

⁸⁵ USFWS BiOp at Section 3.A.1 Page 8

⁸⁶ USFWS BiOp at Section 3.A.1 Page 8

⁸⁷ USFWS BiOp at Section 3.A.1 Page 7

The minimum outflow for Hungry Horse Dam will be determined monthly starting with the January forecast, with final flows based on the March final runoff forecast for Hungry Horse Reservoir for the period April 1 to August 31. These forecasts will be provided by Reclamation to the TMT. If the April to August forecast is greater than 1,790 kaf, the minimum flow shall be 900 cfs. If the forecast is less than 1,190 kaf, the minimum flow shall be 400 cfs. If the forecast is between 1,190 and 1,790 kaf, the minimum flow will be linearly interpolated between 400 and 900 cfs.⁸⁸ The minimum flow from Hungry Horse can be lowered to 145 cfs when the river at Columbia Falls reaches flood level (13 feet).

The minimum flow at Columbia Falls will be determined monthly starting with the January forecast, with the final flows based on the March final runoff forecast for Hungry Horse Reservoir for the period of April 1 to August 31. If the April to August forecast is greater than 1,790 kaf, the minimum flow shall be 3,500 cfs. If the forecast is less than 1,190 kaf, the minimum flow shall be 3,200 cfs. If the forecast is between 1,190 and 1,790 kaf, the minimum flow will be linearly interpolated between 3,200 and 3,500 cfs.⁸⁹

10.3 Albeni Falls

10.3.1 Lake winter elevation

A proposal has been made to draw down Lake Pend Oreille in the fall/winter to an elevation of 2,051 feet.

⁸⁸ NMFS BiOp at Section 9.6.1.2.3 Page 9-63, Action 19 and USFWS BiOp at Section 3.A.1 Page 6

⁸⁹ NMFS BiOp at Section 9.6.1.2.3 Page 9-63, Action 19 and USFWS BiOp at Section 3.A.1 Page 7

11.0 FCRPS Hydrosystem Performance Standards

Table 9. FCRPS hydrosystem survival performance rates (%) for affected life stages.

ESU	Adult Survival Rate		Juvenile Survival Rate		
	FCRPS System	Per FCRPS Project 1	FCRPS In-river Only		FCRPS Combined ² (Transport + In-river + Differential Mortality of Transported Fish)
			System	Per Project ¹	
Chinook Salmon					
SR spring/summer	85.5	98.1	49.6	91.6	57.6
SR fall	74.0	96.3	14.3	78.4	12.7
UCR spring	92.2	98.1	66.4	90.3	66.4
UWR	N/A	N/A	N/A	N/A	N/A
LCR	98.1	98.1	90.7	90.7	90.7
Steelhead					
SR	80.3	97.3	51.6	92.1	50.8
UCR	89.3	97.3	67.7	90.7	67.7
MCR	89.3	97.3	67.7	90.7	67.7
UWR	N/A	N/A	N/A	N/A	N/A
LCR	97.3	97.3	90.8	90.8	90.8
CR chum salmon	N/A	N/A	N/A	N/A	N/A
SR sockeye salmon	88.7	98.5	N/A	N/A	N/A

(NMFS BiOp Section 9.2.2.2.1, Page 9-12, Table 9.2-3)

Source: Adult standards taken from Table 9.7-2. Juvenile standards taken from Table 9.7-1.

¹ Per-project in-river survival rate calculated as the xth root of the system in-river survival rate (where x = number of FCRPS projects encountered). They are provided for illustrative purposes only. They are *NOT* intended to be interpreted as project-specific standards, or to be used in any way to support curtailment of survival improvement measures at an individual project.

² Values represent averages over the water years and D values in Table 9.7-1.

12.0 Fish and Wildlife Related Non-BiOp Actions

The following non-BiOp actions are typically options available to be addressed by TMT during the water management year.

12.1 Keenlyside Dam (Arrow)

12.1.1 Mountain Whitefish

Spawning flow levels are set the third week in December between 45 and 55 kcfs. Spawning continues through mid-January. Egg protection flows are set 5 to 15 kcfs lower than the spawning flow through the end of March.

12.1.2 Rainbow Trout

Rainbow trout spawning begins in April. Protection levels begin somewhere between 15 and 25 kcfs. The goal is to have stable flows or ever-increasing flows through June.

12.2 Libby

12.2.1 Burbot

Providing low flows from Libby Dam to aid upstream migration of burbot to spawning areas above Kootenay Lake on the Kootenai River in Idaho is considered each winter. These low flows may occur over several periods of time or may last for an extended period from December through February. The details of this operation for 2004 are being developed and may be included in the fall/winter update. Negotiations on a Conservation agreement are underway for this species. Use of VARQ may aid this operation in years with medium runoff forecasts, and a variable December draft may help as well if and when it is implemented.

12.3 Dworshak

12.3.1 Flow increase for Dworshak National Fish Hatchery release.

Release 4 – 6 kcfs from Dworshak in order to move juvenile fish into the mainstem Clearwater River.

12.4 Grand Coulee

12.4.1 Kokanee

Fill Grand Coulee to 1,283 feet by October 1. Maintain elevation 1,283 to 1,285 feet or greater through October for brood stock collection and access to tributaries.

12.5 Hanford Reach Protection Flows

Grant County PUD limits outflow from Priest Rapids Dam to minimize juvenile fish stranding.

12.6 Vernita Bar Protection Flows

Flow management occurs from Priest Rapids Dam in the fall to ensure that fall chinook salmon establish redds (spawn) at an elevation that enables the redds to have a high likelihood of not being dewatered prior to emergence of fry. Daytime flows are regulated to a range between 50 and 70 kcfs during October and November when redds are being established. Flow fluctuations are limited from the time of fish emergence in early April through early June. (Note: This is included pursuant to the Vernita Bar Settlement Agreement and the annual Hanford reach stranding agreement.)

12.7 McNary

12.7.1 Waterfowl nesting

To improve waterfowl nesting conditions in the McNary pool between March and May each year, we operate the pool in the top 1 foot of the pool range for several hours every 4 days.

12.7.2 Waterfowl hunting enhancement

In order to enhance Waterfowl hunting, we hold the McNary pool constant several times a week from October to January.

12.8 John Day

12.8.1 Goose nesting

To encourage geese to nest in areas that are not typically inundated by frequent fluctuations in the John Day pool between March and May each year, we operate the pool in the top 1 foot of the pool range for several hours every 4 days.

12.8.2 Waterfowl hunting enhancement

In order to enhance Waterfowl hunting, we hold the John Day pool constant several times a week from October to January.

12.9 Bonneville

12.9.1 Tribal Fishing

To support tribal fishing, the Bonneville pool is normally held between elevation 75 and 76.5 feet during tribal fishing seasons.

12.9.2 Spring Creek Hatchery Release

Special operations for Spring Creek hatchery release may include powerhouse 2 priority operation, bypass system in operation, screens installed, and water may be spilled, to aid the March release from Spring Creek hatchery.

13.0 Conclusion

This draft 2004 Water Management Plan will be coordinated with the Technical Management Team. Seasonal action plans will be developed as described in the introduction to this plan. Additionally, operations may be adjusted in-season based on recommendations from the TMT.