

# 2003 Water Management Plan

*Draft - August 21, 2002*

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## **1.0 Introduction**

### **1.1 Preparation of Plans**

This Water Management Plan for 2003 has been prepared as part of the implementation planning process outlined in the 2000 Biological Opinions (BiOps). This plan describes how the Federal Columbia River Power System (FCRPS) reservoirs will be operated for the 2003 water year (October 1, 2002 through September 30, 2003) to implement the water management measures in the BiOps. In addition to implementing the RPAs indicated in the BiOps the goal is to meet the performance standards specified in the NMFS 2000 BiOp. The FCRPS hydrosystem performance standards are presented in section 12. This plan will also describe any special operations or water management activities planned for the 2003 water year.

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 one-year plan will be written when very little information is known about the future year's water supply. Therefore, the annual water management portion of the 1-year implementation 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.

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.

### **1.2 Strategy**

The overall strategy for the water management plan is to enhance juvenile and adult fish survival through a coordinated set of hydro project management actions to achieve performance standards, and also 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 2003-2007 draft implementation plan.

#### **1.2.1 Hydro Strategies and Substrategies**

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 generally specific 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 Resident Fish Strategy and Substrategies**

Strategy 1 – Promote the Reproduction and Recruitment of Kootenai River White Sturgeon (KWS).

Substrategy 1.1 - Create conditions below Libby Dam that facilitate KWS 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 purposes such as navigation and recreation. These actions are listed in the table below, and further described in section 12.0.

<b>Action</b>	<b>Time of Year</b>
Keenlyside Dam (Arrow) - Mountain Whitefish actions	December – January
Keenlyside Dam (Arrow) - Rainbow Trout actions	April - June
Libby – Burbot Actions	January - February
Grand Coulee - Kokanee	October
Hanford Reach Protection Flows	
Vernita Bar Protection Flows	
McNary – Reactor Barges	
McNary - Waterfowl nesting	March - May
McNary - Waterfowl hunting enhancement	October - January
McNary - Hydroplane races	July
John Day - Goose nesting	March - May
John Day - Waterfowl hunting enhancement	October - January
Bonneville - Tribal Fishing	
Bonneville - Spill for Spring Creek Hatchery Release	

## **1.4 Changes From Last Year's Plan**

This is the second water management plan developed under the 2000 BiOps.

The first major change this year is adding appendices to the plan. This year there are four appendices. Appendix 1 is the TMT emergency protocols. This document outlines the procedures to be followed during system emergencies. Appendix 2 is a table giving some project data for the FCRPS projects. Appendix 3 is a time line of water management actions. Appendix 4 is the TDG Monitoring plan and the Spill Priority Plan.

The second major change from last year's plan is some changes in the organization of the strategies and substrategies in the BiOp Implementation Plan. Some of the actions that were listed in last year's plan as being under the hydro strategy have been moved to the resident fish strategy. Also there has been a slight reorganization of the hydro substrategies.

A third change in this year's plan is the inclusion of more actions that are not called for in the BiOp's but are part of normal water management.

## **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:

- Operate storage reservoirs (Hungry Horse, Libby and Albeni Falls) to meet criteria for bull trout and sturgeon.
- Refill the storage projects by June 30 to provide summer flow augmentation.
- Operate storage projects to be at their April 10 Base –CRT63 flood control elevation or VARQ elevation (which ever is in effect) to increase available flows for spring flow management.
- Provide fall and winter flows for chum spawning.



The Action Agencies implement several independent FCRPS project operations to benefit fish at or near the project or its reservoir. Reservoirs are to be operated to meet project minimum outflows, to reduce outflow fluctuations to avoid stranding resident fish, 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, i.e., 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 Base –CRT63 flood control levels or VARQ elevation (which ever is in effect) will be affected by how much water was released for flood control, power generation, and fishery flows to support both chum and Hanford reach spawning. There may be years when chum and Hanford Reach flows may need to be reduced in order to be at the early April flood control levels.

The next objective is to attempt to refill the storage reservoirs by about June 30 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. These limits are a higher priority than the summer flow targets 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 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 fills too early in the spring, late season rain or snowmelt may cause flood damage downstream and potentially produce higher dissolved gas levels.

### **2.2.3 Chum flows versus refill/Spring flows**

Setting the flow 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 TMT have to make with the least amount of reliable information. Decisions about the flow 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. If the flow level selected is too high there is a risk of refill failure. Choosing to refill runs the risk of reducing the flow level and dewatering chum redds. [Need to check on this A chum salvage plan is now being prepared to ensure that some level of chum salmon production will occur in the event chum flows cannot be provided.]

### **2.2.4 Sturgeon pulse versus summer flow augmentation**

Water released from Libby Dam for the spring sturgeon pulse during May through June may reduce the water available for summer flow augmentation from Libby. If the pulsed water cannot be stored in Grand Coulee, spring flows will be provided, potentially at the expense of summer flows. [Need to check on this The Action Agencies are currently working with the state of Montana and the USFWS on the sturgeon tiered flows.]

### **2.2.5 Fish operations versus other project uses**

In addition to flood control operation, there are operations carried out for the purpose of enhancing fish survival that may conflict with other project purposes. 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.

### **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 operations and alternatives for addressing such conflicts will occur in TMT.

## **2.3 Emergencies**

The 2000 BiOps acknowledge that unexpected events/emergencies 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 Opinion's. These studies are generally developed through technical workgroups of the Regional Forum (e.g., SCT) and the USACE' Anadromous Fish Evaluation Program (FFDRWG and 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., 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.

## **3.0 Decision Points and Water Supply Forecasts**

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	Winter (December - March)	Early April	Early May	June	Early July
<b>Operations</b>	<ul style="list-style-type: none"> <li>Assess potential of providing flows for chinook populations below Bonneville Dam (<i>Non-BiOp Action</i>)</li> <li>Assess potential flow levels to support chum spawning below Bonneville Dam</li> <li>Preliminary discussions of flood control/project refill strategy</li> <li>Albeni Falls fall/winter drawdown strategy discussion</li> <li>Hanford Reach /Vernita Bar flows set (<i>Non-BiOp Action</i>)</li> <li>Calculate Integrated Rule Curves at Hungry Horse and Libby</li> </ul>	<ul style="list-style-type: none"> <li>Determine winter/spring chum flow levels below Bonneville Dam</li> <li>Determine flood control and refill strategies, including any available flood control shifts</li> <li>Minimum flows from Hungry Horse Dam and minimum Columbia Falls flows are set by April-August forecast</li> <li>Begin discussing spring operations</li> <li>Spring Creek Hatchery release -March (<i>Non-BiOp Action</i>)</li> <li>Begin spring transport discussions</li> <li>Hanford Reach Operations Discussed (<i>Non-BiOp Action</i>)</li> <li>Outlook for meeting flow objectives prepared</li> </ul>	<ul style="list-style-type: none"> <li>Spring flow objectives are set by the April final volume forecasts</li> <li>Determine spring flow management strategy including priority for refill</li> <li>Determine start dates and levels by project for spring spill</li> <li>Determine start date for MOP at Lower Snake River projects</li> <li>Determine John Day forebay elevations</li> </ul>	<ul style="list-style-type: none"> <li>Use May final forecast to calculate the appropriate volume of the sturgeon tiered flow release from Libby using new, coordinated formula</li> </ul>	<ul style="list-style-type: none"> <li>Summer flow objective at Lower Granite determined by June final volume forecast</li> <li>Determine summer flow augmentation strategy (early June)</li> <li>Complete Dworshak temperature modeling and determine release strategy</li> <li>Decision on McNary juvenile fish transportation (late June)</li> </ul>	<ul style="list-style-type: none"> <li>Grand Coulee summer reservoir draft limit determined by July final volume forecast</li> </ul>
<b>Plans</b>	Develop fall/winter update to the	Preliminary work on spring/summer update to the annual water	Start operational plans for	Libby and Hungry Horse		

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	annual water management plan	management plan	Libby and Hungry Horse Dams	operational plans due		
<b>Forecast s</b>		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	

***Water supply forecasts***

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

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

<b>Forecast Point</b>	<b>Forecast period</b>	<b>Forecast</b>	<b>What does it control</b>	<b>BiOp reference</b>	<b>RPA Action Item</b>
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		Volume of Water for Sturgeon Flow at Bonners Ferry and Minimum bull trout flows between	USFWS BiOp at Section 8.1 Page 74 and USFWS BiOp at Section 3.A.2 Page 15	USFWS Action 8.1.c

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

**Table 3.** Major Fish Related Reservoir and Flow Operations

Project	Flood Control & Refill	Sturgeon	Bull Trout	Spring Anadromous	Summer Anadromous	Chum
<b>Libby</b>	<p><u>Winter:</u> Operate to 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>May-June:</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</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>
<b>Hungry Horse</b>	<p><u>Winter:</u> Operate to flood control</p> <p><u>Spring:</u> Refill by June 30 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>
<b>Albeni Falls</b>	<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 elevation 2,051 feet until kokanee fry emergence (approximately end of April)</p>			<p>Fall / winter storage may be used to support chum flows</p>
<b>Grand Coulee</b>	<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>July-August:</u> Draft for summer flow augmentation, not to exceed reservoir draft limit of 1,280 feet (&gt;= 92 maf fcast at The Dalles) or 1,278 feet (&lt; 92 maf fcast at The Dalles)</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 (continued)					July/August: Operate Banks Lake at elevation 5 feet less than full to provide more water for summer flow augmentation	
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>				Draft for summer flow augmentation and water temperature reduction, not to exceed reservoir draft limit of 1,520 feet	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>	
Lower Monumental				<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
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 foot 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	
The Dalles				<u>Mar 15-Oct 31</u> Operate to 1% peak efficiency	<u>Mar 15-Oct 31</u> Operate to 1% peak efficiency	
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.<sup>1</sup> 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.

#### **4.1.2 Juvenile Fish Survival**

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

### **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 percent of peak efficiency during the juvenile and adult migration seasons (March 15 through October 31).<sup>3</sup>

### **4.3 John Day**

#### **4.3.1 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.<sup>4</sup> The purpose of this action is to provide a smaller reservoir cross section to reduce juvenile salmon travel time.

## **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 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

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<sup>1</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-65, Action 20

<sup>2</sup> NMFS BiOp at Section 9.6.1.4.4 Page 9-93, Action 58

<sup>3</sup> NMFS BiOp at Section 9.6.1.4.4 Page 9-93, Action 58

<sup>4</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-65, Action 20

Management Plan strives to achieve the best possible conditions recognizing the priorities established in this document and the need to balance the limited water and storage resources available in the region.

### **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.<sup>5</sup> When the forecast is less than 16 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 summer flow objective at Lower Granite Dam is determined by the June final runoff volume forecast at Lower Granite Dam for April to July.<sup>1</sup> 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.<sup>1</sup> The planning dates are from April 10 to June 30.

### **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.<sup>1</sup> 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.<sup>6</sup> 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 and summer flow augmentation.

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<sup>5</sup> NMFS BiOp at Section 9.6.1.2.1 Page 9-57, Action 14

<sup>6</sup> NMFS BiOp at Section 9.6.1.2.1 Page 9-58, Action 14

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.<sup>7</sup>

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.<sup>8</sup> 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 within the 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.

### **5.3 Libby**

#### **5.3.1 Flood Control**

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 Base –CRT63 flood control elevation or VARQ elevation (whichever is in effect) by April 10 and to refill by June 30, except as specifically provided by the TMT.<sup>3</sup>

[Insert statement about VARQ at Libby]

During the spring, the Action Agencies shall operate Libby to contribute to meeting the flow objectives and refill by approximately June 30.<sup>4</sup>

#### **5.3.2 Summer anadromous fish**

During the summer (July–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-Arrow 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. An agreement will be sought by October 2001.<sup>9</sup> The purpose of this action is to reduce or eliminate the second peak. (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 for a given water year is not finalized until June or July of that year.)

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<sup>7</sup> 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

<sup>8</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

<sup>9</sup> USFWS BiOp at Section 8.1.e Page 75

The summer reservoir draft limit is 2,439 feet.<sup>10</sup> This limit determines the maximum draft available for summer flow augmentation from Libby.

## **5.4 Hungry Horse**

### **5.4.1 Flood Control**

Hungry Horse will operate using VARQ starting January 1, 2001.<sup>11</sup> The purpose of this action is to provide more water for flow augmentation.

Hungry Horse 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.<sup>12</sup>

### **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.<sup>13</sup>

### **5.4.3 Summer anadromous fish**

During the summer (July – August) the Action Agencies shall operate Hungry Horse to help meet the flow objectives. The summer reservoir draft limit is 3,540 feet.<sup>14</sup> This limit determines the maximum draft available for summer flow augmentation from Hungry Horse.

## **5.5 Albeni Falls**

### **5.5.1 Flood Control**

Albeni Falls 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.<sup>15</sup>

### **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.<sup>16</sup>

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<sup>10</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-63, Action 19

<sup>11</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-62 Action 19

<sup>12</sup> 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

<sup>13</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

<sup>14</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-63, Action 19

<sup>15</sup> 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

<sup>16</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

## **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.<sup>17</sup>

## **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.<sup>18</sup> 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. 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 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.<sup>19</sup>

### **5.8.2 Refill**

During the spring, the Action Agencies shall operate Dworshak to meet the flow objectives and refill by approximately June 30.<sup>20</sup>

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.<sup>21</sup> The purpose of this action is to assist in the filling of Dworshak reservoir.

### **5.8.3 Summer anadromous fish**

During the summer (July–August) the Action Agencies shall operate Dworshak to help meet the flow objectives. The summer reservoir draft limit is 1,520 feet.<sup>33</sup> This limit determines the maximum draft available for summer flow augmentation from Dworshak.

### **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.<sup>33</sup> The purpose of this action is to improve water quality (by lowering water temperature) in the Lower Snake River.

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<sup>17</sup> NMFS BiOp at Section 9.6.1.2.6 Page 9-70, Action 32

<sup>18</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-65, Action 21

<sup>19</sup> 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

<sup>20</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

<sup>21</sup> 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 percent 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 flow augmentation to meet summer flow objectives is not needed before July 4. The TMT may provide other specific operations.<sup>22</sup>

### **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.<sup>23</sup>

### **5.9.3 Summer anadromous fish**

During the summer (July–August) the Action Agencies shall operate Grand Coulee to help meet the flow objectives for juvenile salmon out migration. The summer reservoir draft limit is 1,280 feet in years where 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.<sup>24</sup> 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.<sup>25</sup> The purpose of this action is to provide more water for summer flow augmentation.

## **5.11 Bonneville Dam Chum Flows**

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

Flows 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 chum spawning operation cannot adversely affect implementation of NMFS' 2000 FCRPS RPA 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 factoring). 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

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<sup>22</sup> 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

<sup>23</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-61, Action 18

<sup>24</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-64, Action 19

<sup>25</sup> NMFS BiOp at Section 9.6.1.2.4 Page 9-67, Action 23

area around Ives and Pierce islands (but no later than November 1) through December 31. The flows from Bonneville Dam will be maintained within 5 kcfs of the established minimum.<sup>26</sup> Operating to the Bonneville tailwater gauge was found to be an effective management tool during the 2001-operating year. The tailwater gauge better reflects the effects of tides, tributary inflow and groundwater influence below Bonneville Dam.

If water supply conditions indicate that it is not possible to provide a minimum flow of 125 kcfs from Bonneville Dam, flow will be provided during the chum-spawning season at times to allow access to Hamilton and Hardy Creeks. Details will be set through coordination in TMT.<sup>27</sup>

From January 1 to the start of spring flows April 10, if the chum operation is possible, the flow from Bonneville dam will be the daily minimum flow or minimum water surface elevation established by coordination in the TMT.<sup>42</sup>

If the minimum flow established for the fall chum operation is 125 kcfs the minimum flow shall be 125 kcfs or the equivalent tailwater gauge elevation. If the minimum flow for the fall chum operation is 135 kcfs or greater, the minimum flow for the winter chum operation will be 10 kcfs lower than the fall minimum chum flow. The minimum flow in no case will be greater than 150 kcfs.

A salvage operation for the chum population residing below Bonneville Dam is being considered for the 2001 spawning season. This operation is being considered because of the record low stream flows being experienced going into the fall of 2001. Also, chum salmon will be captured this year and used as broodstock to initiate a spawning population in the recently restored habitat of Duncan Creek. The Duncan Creek project established the logistics for a brood capture 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 salvage program is a safety net program and is not viewed as the preferred alternative to providing access to and sustenance of rearing habitat for the chum salmon.

## **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 percent saturation levels of total dissolved gas at the designated downstream monitoring stations.

Spring spill for juvenile fish migration shall occur from (planning dates) April 3 to June 20 in the Snake River, and April 10 to June 30 in the lower Columbia River.<sup>28</sup> Spill levels and times are

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<sup>26</sup> NMFS BiOp at Section 9.6.1.2.1 Page 9-58, Action 15

<sup>27</sup> NMFS BiOp at Section 9.6.1.2.1 Page 9-60, Action 16

indicated below.<sup>29</sup> Voluntary spill at all three Snake River collector projects shall occur when seasonal average flows are projected to meet or exceed 85 kcfs.<sup>30</sup>

Summer spill for juvenile fish migration shall occur from (planning dates) June 21 to August 31 in the Snake River, and July 1 to August 31 in the lower Columbia River.<sup>31</sup> There will be no summer spill at the four collector projects (Lower Granite, Little Goose, Lower Monumental, and McNary).<sup>32</sup>

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

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

Project	Spill Dates (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 <sup>a</sup>
Little Goose	April 3- June 20	1800-0600	Yes	No	120/115 gas cap	11.5 <sup>a</sup>
Lower Monumental	April 3- June 20	24 hours a day	Yes	No	120/115 gas cap	11.5 <sup>a</sup>
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 <sup>a</sup>
McNary	April 10- June 30 <sup>b</sup>	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 25%	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 <sup>c</sup> 50 min flow	30

<sup>28</sup> NMFS BiOp at Section 9.6.1.4.3 Page 9-88, Action 54

<sup>29</sup> 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

<sup>30</sup> NMFS BiOp at Section 9.6.1.3.2 Page 9-76, Action 40

<sup>31</sup> NMFS BiOp at Section 9.6.1.4.3 Page 9-88, Action 54

<sup>32</sup> NMFS BiOp at Section 9.6.1.3.2 Page 9-76, Action 42

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 inriver migratory conditions are deteriorating (i.e., no longer spring-like).<sup>33</sup> 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 navigate problem at the projects or to allow for juvenile fish barges to dock and undock.

## **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 Water temperature monitoring**

Water temperature profiles in the south end (near-dam area) of Lake Kooncanusa during May and June will be monitored to provide information necessary for timing of sturgeon spawning/rearing flow augmentation.<sup>34</sup> The purpose of this action is to provide better information of the timing of the sturgeon pulse.

#### **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 without reducing flood control protection.

An Environmental Impact Statement (EIS) is being prepared and additional public and Canadian (Columbia River Treaty) coordination will be conducted before implementation of VARQ can be implemented at Libby, Hungry Horse and Grand Coulee for the long term. EIS activities scheduled for 2002 include hydrologic study, and initial work on drafting of the EIS. Consequently, VARQ at Libby will not be implemented in 2002.<sup>35</sup>

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<sup>33</sup> NMFS BiOp at Section 9.6.1.3.4 Page 9-77, Action 43

<sup>34</sup> USFWS BiOp at Section 8.3.h Page 82

<sup>35</sup> 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

Reclamation intends to operate under VARQ at Hungry Horse in 2002. The draft EIS for long-term operation is scheduled to be completed in late 2003, following completion of studies, and a final EIS is scheduled for spring or summer 2004. The preferred alternative would be implemented in 2005 under that schedule.

To better address schedule requirements in the USFWS BiOp for VARQ implementation, the Action Agencies have also coordinated with the USFWS and NMFS on a process to decide in December 2002 whether it is feasible to implement VARQ at Libby and Hungry Horse on a one-year interim basis in 2003. That decision will use available hydrologic study information; the results of the Libby spill test, and public and Canadian coordination to prepare an Environmental Assessment and decision document.

### **7.1.3 Libby Storage Reservation Diagram and Forecast Procedure**

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

The investigation of a new forecast procedure should be completed. Forecasts will be done this water year using the new method. Work on a new Libby storage reservation diagram will begin this water year.<sup>36</sup>

### **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.<sup>37</sup> The purpose of this action is to provide for better coordination.

### **7.1.5 Increased Flow Capacity at Libby**

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

Pending funding approval, the USACE will begin an evaluation (with completion in 2003) of flood control levels and public safety concerns along the banks of the Kootenai River below Libby Dam, and the feasibility of increasing releases above any identified channel capacity constraints through structural or non-structural means.<sup>38</sup> NEPA documentation will be required for this action, and may be addressed for the flows themselves (but not the means by which additional capacity would be achieved) through the VARQ EIS.

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<sup>36</sup> 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

<sup>37</sup> USFWS BiOp at Section 11.A.1.1.c Page 93

<sup>38</sup> USFWS BiOp at Section 8.3.a Page 80

No work is scheduled in 2003 on the following BiOp actions, related to increasing flow capacity at Libby, because of the delay of the Libby Spill test due to lack of water last year.

USFWS BiOp at Section 8.2.a.3 Page 78

USFWS BiOp at Section 8.2.a.4 Page 78

USFWS BiOp at Section 8.2.a.5 Page 79

[Need to get update from NWS on this]

### **7.1.6 Kootenai River Investigation**

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

Cross sectional data for the report of the proposed Kootenai River channel capacity investigation has begun to be collected.<sup>39</sup>

## **7.2 Hungry Horse Coordination**

An annual operational schedule to be supplemented on a monthly basis will be provided by Reclamation 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 Hungry Horse Reservoir and estimates of monthly discharge from Hungry Horse Dam. The monthly supplement shall include a report of actual operations over the previous month and shall include daily water surface elevation at Hungry Horse Reservoir and hourly spill and releases at Hungry Horse Dam. The purpose of this action is to provide for better coordination.<sup>40</sup>

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. 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.

## **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

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<sup>39</sup> USFWS BiOp at Section 8.2.a.2 Page 78

<sup>40</sup> USFWS BiOp at Section 11.A.1.2.A Page 93

water temperature monitoring, and related studies. The BiOp also includes RPAs 130 to 143, which are water quality actions.<sup>41</sup>

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 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**

High levels of TDG can be lethal to fish. Environmental monitoring at the dams is necessary to ensure that gas levels do not exceed TDG thresholds established in the 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 ten 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 spill season. The variance from the State of Oregon was issued on March 8, 2002.

The variance provides for a revision of the total dissolved gas standard from 110 percent to a revised standard of 115 percent in the forebays and 120 percent in the tailwaters of McNary, John Day, The Dalles, and Bonneville dams, and the Camas location, from April 1, 2002 to August 31, 2002. The 115 percent and 120 percent caps are based on the 12 highest hourly measurements per calendar day. Also, a cap of total dissolved gas of 125 percent, based on the two highest hours, is in effect.

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<sup>41</sup> NMFS BiOp Section 9.4.2.4 Page 9-29, Action 5

In 1999, the State of Washington had issued a modified TDG water quality standard, which is in effect through the 2002 water year. Additional actions with the State of Washington were not required for the 2002 water year.

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. Due to the conditions provided by the State and Tribes, the forecasted drought conditions and the foreseen use of Dworshak water releases, there was no further pursuit of a water quality variance by the Corps for the 2001 water year. The Corps did not pursue obtaining a variance from the State of Idaho for 2002.

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 percent TDG, and the tailwater levels are close to, but do not exceed, daily (12 highest hours) average of 120 percent TDG. Also, a cap of total dissolved gas of 125 percent, 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 in 2000 and 2001.

See:

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

The 2003 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 with BC Hydro to be provided and released during the migration season.<sup>42</sup>

BPA and the Corps shall continue to request, and negotiate with BC Hydro for storage of water in non-Treaty storage space during the spring for subsequent release in July and August for flow enhancement, as long as operations forecasts indicate that water stored in the spring can be released in July and August.<sup>43</sup>

The shaping and release of water behind Canadian Treaty storage projects in July and August shall be requested and negotiated with BC Hydro.<sup>44</sup>

### **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.<sup>45</sup> The purpose of this action is to provide for better coordination.

### **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.<sup>46</sup>

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.<sup>47</sup>

### **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 with out reducing flood control protection.

USACE will conduct a system wide flood control study. No work is scheduled in 2003 pending appropriation of funds.<sup>48</sup>

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<sup>42</sup> NMFS BiOp at Section 9.6.1.2.5 Page 9-67, Action 24

<sup>43</sup> NMFS BiOp at Section 9.6.1.2.5 Page 9-67, Action 25

<sup>44</sup> NMFS BiOp at Section 9.6.1.2.5 Page 9-67, Action 26

<sup>45</sup> USFWS BiOp at Section 11.A.1.4.d Page 94

<sup>46</sup> 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

<sup>47</sup> USFWS BiOp at Section 8.1.g Page 76

<sup>48</sup> NMFS BiOp Section 9.6.1.2.6 Page 72, Action 35

### **7.8 Banks Lake Flow Augmentation**

Reclamation will assess effects of drafting Banks Lake to elevation 1,560 feet by the end of August. Reclamation is preparing an EIS for National Environmental Policy Act compliance to implement this action in August 2003.<sup>49</sup>

The purpose of the proposed operation at Banks Lake is to enhance and attempt to meet target flows in the Columbia River during the juvenile out migration of ESA listed salmonid stocks by altering the August drawdown of Banks Lake from elevation 1,565 feet down to 1,560 feet.

### **7.9 Dworshak Draft to 1,500' Adult Evaluation**

The purpose of the Dworshak draft to 1,500 feet is to evaluate whether releasing approximately 200 kaf of water during September provides a benefit to adult migrants. The ongoing temperature monitoring and field evaluations will continue in 2003.<sup>50</sup>

Water Conditions at the end of last year allow 200 KAF of storage from Dworshak to be released in September.

[get update from NWW]

### **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 2002.<sup>51</sup>

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.<sup>52</sup>

Reclamation will provide NMFS with a report on unauthorized use of Reclamation project water. Although unauthorized use is not a federal action, Reclamation will work with its districts and their water users to prepare a report by December 2002.<sup>53</sup>

Reclamation shall complete ESA consultations on its tributary projects below Chief Joseph Dam. Consultations are in progress and scheduled to be completed in 2002 for the Crooked River, Deschutes, Arnold, Umatilla, Yakima, and Tualatin Projects.<sup>54</sup>

[update from USBR]

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<sup>49</sup> NMFS BiOp at Section 9.6.1.2.6 Page 9-70, Action 31

<sup>50</sup> NMFS BiOp at Section 9.6.1.2.6 Page 9-71, Action 34

<sup>51</sup> NMFS BiOp Section 9.6.1.2.6 Page 68, Action 27

<sup>52</sup> NMFS BiOp Section 9.6.1.2.6 Page 68, Action 28

<sup>53</sup> NMFS BiOp Section 9.6.1.2.6 Page 69, Action 29

<sup>54</sup> NMFS BiOp Section 9.6.1.2.6 Page 69, Action 30

The Action Agencies shall acquire water for instream 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 2002 will involve a settlement, another ESA consultation on the Upper Snake projects, and authorizing legislation from Idaho.<sup>55</sup>

[update from USBR]

On the Columbia Basin Project, Reclamation will identify and evaluate salmon attraction problems in the wasteways and drains, initiate water quality monitoring and evaluation of return flows, and complete the construction of screens at the Burbank No. 2 and 3 pumps in 2002.<sup>56</sup>

## **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).<sup>57</sup>

### **8.2 McNary**

Juvenile spring migrants collected at McNary Dam shall be bypassed.<sup>58</sup>

Collection of subyearling fall chinook for transportation at McNary Dam shall not be initiated until inriver migratory conditions are deteriorating (i.e., no longer spring-like).<sup>49</sup> 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.

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<sup>55</sup> NMFS BiOp at Section 9.6.1.2.6 Page 9-70, Action 32

<sup>56</sup> NMFS BiOp Section 9.6.1.2.7, Page 74-75, Actions 37, 38, 39

<sup>57</sup> NMFS BiOp at Section 9.6.1.3.2 Page 9-76, Action 40

<sup>58</sup> NMFS BiOp at Section 9.6.1.3.4 Page 9-76, Action 41

## **9.0 Resident Fish Substrategy 1.1: Create conditions below Libby Dam that facilitate KWS 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 to take place in 2002 among USACE, USFWS, MDFWP and other interested parties 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.<sup>59</sup>

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<sup>59</sup> USFWS BiOp at Section 8.1.c Page 73,

**Table 4.** “Tiered” volumes of water for sturgeon flow enhancement to be provided 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 Service and in-season management of water actually available.

<b>Forecast runoff Volume (maf*) at Libby</b>	<b>Sturgeon flow volume (maf) from Libby Dam on May-June</b>
0.00 < forecast < 4.80	Sturgeon flows not requested
4.80 < forecast < 6.00	0.4
6.00 < forecast < 6.70	0.5
6.70 < forecast < 8.10	0.7
8.10 < forecast < 8.90	1.2
8.90 < forecast	1.6

(USFWS BiOp, page 15 and part of Appendix A of the USFWS BiOp)

*\*maf = million acre-feet*

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. Specific release recommendations will be developed in consultation with action agencies and submitted annually through the TMT or similar regional process.<sup>60</sup>

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 control of Libby Dam.)<sup>61</sup>

The Action Agencies are currently working with the state of Montana and the USFWS on the sturgeon tiered flows.

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.

The Action Agencies are currently working with the state of Montana and the USFWS on the sturgeon tiered flows.

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<sup>60</sup> USFWS BiOp at Section 8.2.c Page 80

<sup>61</sup> USFWS BiOp at Section 8.3.b Page 80

### 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.<sup>62</sup>

## 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 – August volume runoff forecast at Libby.

If Libby is below 2,439 on July 1 Libby will provide the USFWS bull trout minimum flow.<sup>63</sup>

**Table 5.** 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-fee<sup>64</sup>

<sup>62</sup> USFWS BiOp at Section 8.1.a Page 73

<sup>63</sup> USFWS BiOp at Section 11.A,1,1.b Page 93

<sup>64</sup> USFWS BiOp at Section 8.3.g Page 81

### 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.<sup>65</sup> Exact operational constraints are shown in paragraphs below.

The following ramp rates will be used.

**Table 6.** 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 one unit 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)

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<sup>65</sup> USFWS BiOp at Section 10.A.1 Page 87

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.<sup>66</sup>

Variances to ramping rates during years where runoff forecasting or shortage shortfalls occur, or variances are necessary to provide augmentation water for other listed species, will be negotiated through the TMT process. This is expected in only the lowest 20<sup>th</sup> percentile water years.<sup>14</sup>

Note: The ramp rates will be followed except when they would causes 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.”<sup>67</sup>

Daily load following in the outflow from Libby Dam will be limited to the extent that levees in Kootenai Valley are no longer damaged, and public outreach materials addressing this issue shall be provided.<sup>68</sup>

<sup>66</sup> USFWS BiOp at Section 3.A.2 Page 14

<sup>67</sup> USFWS BiOp at Section 3.A.2 Page 13

<sup>68</sup> USFWS BiOp at Section 8.3.f Page 81



## **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.<sup>69</sup> Exact operational measures are shown in paragraphs below.

The following ramp rates will be used.

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<sup>69</sup> USFWS BiOp at Section 10.A.1.2 Page 88

**Table 7.** Ramp rates prescribed for Hungry Horse Dam releases to protect resident fish and their food organisms in the Flathead River.

<b>Daily and Hourly Maximum Ramp Up Rates for Hungry Horse Dam (as measured by daily flows, not daily averages, restricted by hourly rates).</b>		
<b>Flow Range (measured at Columbia Falls)</b>	<b>Ramp Up Unit (Daily Max)</b>	<b>Ramp Up Unit (Hourly max)</b>
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)

<b>Daily and Hourly Maximum Ramp Down Rates for Hungry Horse Dam (as measured by daily flows, not daily averages, restricted by hourly rates)</b>		
<b>Flow Range (measured at Columbia Falls)</b>	<b>Ramp Down Unit (Daily max)</b>	<b>Ramp Down Unit (Hourly max)</b>
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.<sup>70</sup>

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 20<sup>th</sup> percentile water years.<sup>22</sup>

Note: The ramp rates will be followed except when they would cause a unit(s) to operate a zone that could result in premature wear or failure of the units. In this case the project will utilize a

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<sup>70</sup> USFWS BiOp at Section 3.A.1 Page 8

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.”<sup>71</sup>

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 – 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.<sup>72</sup> 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 – 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.<sup>73</sup>

## 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 Inriver Only		FCRPS Combined 2 (Transport + Inriver + Differential Mortality of Transported Fish)
			System	Per Project 1	
<b>Chinook Salmon</b>					
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

<sup>71</sup> USFWS BiOp at Section 3.A.1 Page 7

<sup>72</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-63, Action 19 and USFWS BiOp at Section 3.A.1 Page 6

<sup>73</sup> NMFS BiOp at Section 9.6.1.2.3 Page 9-63, Action 19 and USFWS BiOp at Section 3.A.1 Page 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
<b>Steelhead</b>					
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.

<sup>1</sup>  
Per-project inriver survival rate calculated as the xth root of the system inriver 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.

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

## 12.0 Non – BiOp Actions

### 12.1 Keenlyside Dam (Arrow)

#### 12.1.1 Mountain Whitefish

Spawning flow levels are set the third week in December between 45-55 kcfs. Spawning continues through mid-January. Egg protection flows are set 10-15 kcfs lower than the spawning flow. . (Note this is not a BiOp action)

#### 12.1.2 Rainbow Trout

Rainbow trout spawning begins in April. Protection levels begin somewhere between 15-25 kcfs. The goal is to have stable flows or ever-increasing flows through June. . (Note this is not a BiOp action)

## **12.2 Libby**

### **12.2.1 Burbot**

For burbot spawning below Libby (LIB) maintain low flows (6-8 kcfs) from Libby dam to provide access to Burbot spawning areas upstream of Kootenay Lake on the Kootenai River in Idaho. This low flow period should last January through February. (Note this is not a BiOp action)

## **12.3 Grand Coulee**

### **12.3.1 Kokanee**

Fill Grand Coulee to 1283 by October 1<sup>st</sup>. Maintain elevation 1283 – 1285 ft. or greater through October for brood stock collection and access to tributaries. (Note this is not a BiOp action)

## **12.4 Hanford Reach Protection Flows**

Grant County PUD limits outflow from Priest Rapids Dam to minimize juvenile fish stranding. (Note: This is not a BiOp operation.)

## **12.5 Vernita Bar Protection Flows**

Flow operations are conducted at Vernita Bar so fall chinook salmon can establish redds (spawn) at an elevation that redds will not be dewatered later. Flows are generally reduced in October and November when redds are being established. Flow reductions are limited through fish emergence in early May. (Note: This is not a BiOp operation but is included pursuant to the Vernita Bar Settlement Agreement.)

## **12.6 McNary**

### **12.6.1 Reactor barges**

Several times a year the navy transports old reactors on barges for disposal at Hanford. In support of these operations we hold the forebay steady at McNary and put limits on the flows out of priest rapids and Chief Joe. (Note this is not a BiOp action)

### **12.6.2 Waterfowl nesting**

To improve waterfowl nesting conditions in the McNary pool between March and May each year we operate the pool in the top foot of the pool range for several hours every four days. (Note this is not a BiOp action)

### **12.6.3 Waterfowl hunting enhancement**

In order to enhance Waterfowl hunting we hold the McNary pool Constant several times a week from October – January. (Note this is not a BiOp action)

#### **12.6.4 Hydroplane races**

In July, the McNary pool is held steady for hydroplane races. (Note this is not a BiOp action)

### **12.7 John Day**

#### **12.7.1 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 foot of the pool range for several hours every four days. (Note this is not a BiOp action)

#### **12.7.2 Waterfowl hunting enhancement**

In order to enhance Waterfowl hunting we hold the John Day pool constant several times a week from October – January. (Note this is not a BiOp action)

### **12.8 Bonneville**

#### **12.8.1 Tribal Fishing**

To support tribal fishing the Bonneville pool is normally held between elevation 75 to 76.5 feet during tribal fishing seasons. (Note this is not a BiOp action)

#### **12.8.2 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. (*Note: This is not a BiOp measure.*)

### **13.0 Conclusion**

This draft 2003 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.