Northwest **Power** and **Conservation** Council

June 2, 2015

MEMORANDUM

TO: **Council members**

FROM: Jim Ruff – Manager, Mainstem Passage and River Operations
Nancy Leonard – Fish, Wildlife and Ecosystem Monitoring and Evaluation Manager, Jeff Allen, Idaho Council Policy staff, Kendall Farley, Washington Council Policy Staff, Karl Weist, Oregon Council Policy Staff

SUBJECT: 2015 Dry Year Implementation Strategy briefing

BACKGROUND:

Presenters: There will be a panel of presenters from federal agencies. Included on the panel will be Tony Norris, Operations Research Analyst at Bonneville Power Administration; Steve Barton, Chief, Columbia Basin Water Management Division, Corps of Engineers; John Roache, Program Manager, Pacific Northwest Region River and Reservoir Operations Group, Bureau of Reclamation; and Ritchie Graves, Chief of the Columbia Hydropower Branch at NOAA Fisheries.

Summary: Based on the staff briefing at the May Council meeting in Portland, below average runoff conditions are expected throughout the Columbia River Basin this spring and summer. Dry year operations are implemented when the May final April through August volume runoff forecast from NOAA's Northwest River Forecast Center for the Columbia River at The Dalles is less than 72.2 million acre-feet (Maf), or less than 82 percent of average.[1] NOAA's final May forecast released on May 7 was for a runoff volume of only 62.4 Maf, only 71 percent of average and nearly 10 Maf less than the dry year trigger.

[1] The 30-year average April-August runoff volume for the Columbia River at The Dalles is 87.5 Maf.

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Along with the Council, the federal action agencies (BPA, Corps, Reclamation) have been closely monitoring the downward trend in water supply forecasts this winter and spring. They will inform the Council about how they expect to manage the Federal Columbia River Power System (FCRPS) throughout the remainder of the spring and summer. The federal action agencies have been working closely with NOAA Fisheries and gathering input from the regional Technical Management Team[2] (TMT) to determine the best way to meet the needs of salmon migrating in the Columbia and Snake rivers with a limited amount of water, as well as managing the system to meet the multiple purposes of the FCRPS through the remainder of the year, including power needs.

When dry year operations are triggered under NOAA's 2014 Supplemental FCRPS Biological Opinion, such as in this year, federal storage reservoirs are drawn down further than normal to provide more water for fish. A benefit of reservoirs is the ability to capture water in storage and release it later during drier times. The last time the dry year criteria was triggered occurred in 2010. However, in that year, abundant late spring precipitation improved runoff conditions, resulting in a final April-August runoff volume of 77 Maf at The Dalles. The federal agency representatives will discuss how the system is positioned to provide the non-power obligations aimed at protecting listed fish under the NOAA Fisheries FCRPS Biological Opinion, as well as meeting ongoing power needs and other purposes in the region this spring and summer.

Relevance: The Council's 2014 Fish and Wildlife Program includes a sub-strategy which addresses mainstem hydrosystem flow and passage operations. It has an objective to manage dams and reservoir operations to protect and restore ecosystem function and habitat, as well as to improve fish passage and survival through the hydrosystem. Many of the Program's current measures, including ongoing actions such as those outlined in the mainstem flow and passage operations strategy, represent priorities from earlier Fish and Wildlife Programs which are expected to continue in the 2014 Program. In addition, a principle in the Investment Strategy section urges the federal action agencies to meet their FCRPS Biological Opinion implementation and mitigation obligations.

Workplan: This presentation addresses Council work plan item 2.B, which promotes regional fish and wildlife recovery by prioritizing and implementing 2014 Fish and Wildlife Program actions.

Background: As highlighted during the staff presentation at the May Council meeting, the forecasted low runoff this year in the Columbia and Snake rivers is not due to lack of precipitation but above normal temperatures this winter and spring which has caused much of the precipitation to fall as rain instead of snow, particularly in the southern (U.S.) portions of the Columbia Basin. Due to the meager snowpack

[2] The TMT is a collaborative group of federal, state and tribal representatives making recommendations to the federal agencies concerning the implementation of the Biological Opinions for the FCRPS.

and warmer than normal temperatures, the region has already lost much of its largest storage reservoir (e.g., the snowpack). In many parts of the basin the snowpack has already melted and run off.

The interagency TMT has been meeting weekly to discuss and determine operations for fish passage and survival this spring and summer. See Table 1 for a list of planned operations for listed fish in this dry year. For example, while Biological Opinion spring flow targets will not be met, salmon managers have requested a few deviations from planned operations by using some stored water now for spring migrants to improve mainstem migration conditions. During a low flow year like this one, the salmon managers' desire has been to move as much water as possible into the spring migration, with the understanding that this will likely have implications for summer flows later and increase the risk of having less stored water for temperature control and refill reservoirs later this summer.

Table 1. Notable Water Supply Triggers for dry year operations.

Project	**Water Supply Forecast Trigger**	**Operation Triggered or Implemented**
Libby	The Dalles May final Apr-Aug 72.2 Maf	Draft 20' from full by Sept. 30. Caveat in 2015 is draft will be 20' from full by Aug. 31 to provide lower flows in Sept. for sturgeon habitat work.
Hungry Horse	The Dalles May final Apr-Aug 72.2 Maf	Draft 20' from full by Sept. 30 (instead of 10').
Non-Treaty Storage	The Dalles May final Apr-Aug 72.2 Maf	Firm release of up to 0.5 Maf of dry year NTS (in May-June or as agreed by both parties). Volume will be shaped flat during the release period unless negotiated differently with BCH. If used in 2015, the U.S. will have no right to use NTS next year.
Grand Coulee	The Dalles July final Apr-Aug 92.0 Maf	Summer draft limit is lowered 2 ft. to elev. 1278 ft. by Aug. 31 (minus an incremental storage adjustment of 0.3 ft. for 2015, for an end of Aug. elev. of 1277.7 ft.).
Libby	May final Libby Apr-Aug less than 4.8 Maf	Tiered volume of sturgeon pulse begins at WSF >4.8 Maf. The May WSF was 5.4 Maf, setting the sturgeon volume to 800 Kaf and a bull trout min flow to 7 kcfs until Aug. 31.
Dworshak	None	Draft 65' from full by Aug. 31; then down to 80' from full by Sept. 30.
Upper Snake Basin	None	Will provide 427 Kaf storage.

Spill and Transportation Operations in 2015

Spring spill for fish passage began on April 3rd at Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams on the Snake River and will continue through June 20. Spring spill operations began on April 10th at McNary, John Day, The Dalles and Bonneville Dams and will continue through June 15. Summer spill will begin on June 21 at the four lower Snake River dams and continue through August 31. Summer spill will begin on June 16 at all four lower Columbia River dams and will continue through August 31. Spill levels will be provided as outlined in the NOAA Fisheries 2014 Supplemental FCRPS Biological Opinion.

To achieve the 2014 Supplemental FCRPS Biological Opinion goal of transporting roughly 50 percent of juvenile Snake River steelhead, fish transportation operations was initiated at Lower Granite, Little Goose and Lower Monumental dams on May 1, as coordinated with the TMT.

State Drought Declarations

Since the May Council meeting, Washington Governor Inslee has declared a statewide drought emergency.

In Oregon, Governor Brown has declared drought emergencies in Baker, Crook, Deschutes, Grant, Harney, Jackson, Jefferson, Josephine, Klamath, Lake, Lane, Malheur, Morrow, Umatilla, Wasco and Wheeler counties.

Idaho Governor Otter has declared drought emergencies in Fremont, Blaine, Lincoln, Butte, and Custer counties.

No drought declarations have been issued in the State of Montana.

Washington

Under State Law, the Washington Department of Ecology can declare a drought emergency once determined by the Water Supply Availability Committee (WSAC), and the Executive Water Emergency Committee (EWEC). Washington is unique in that it has a legal definition of drought, and two conditions which differ from the U.S. Dept. of Agriculture's drought rating scale must be met. The two conditions are:

- An area has to be experiencing or projected to experience a water supply that is below 75 percent of normal, and
- Water users within those areas will likely incur undue hardships as a result of the shortage.

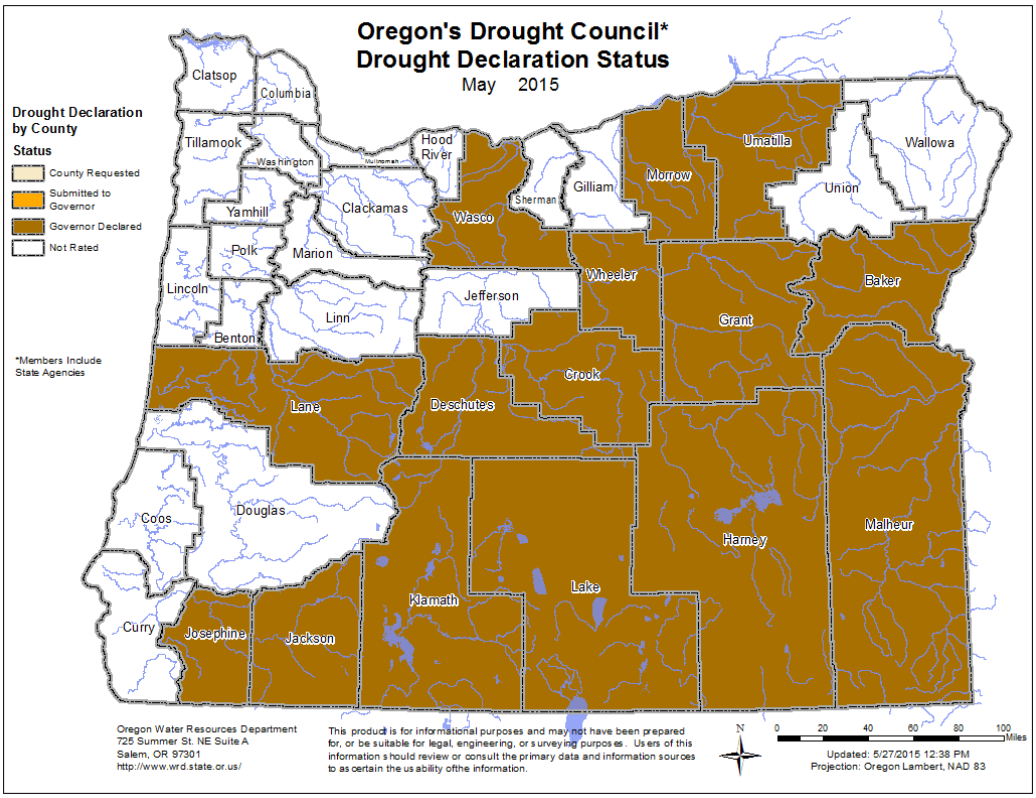
The WSAC assesses water availability and drought conditions according to the above criteria for each of the state's 62 major watersheds or Water Resource

Inventory Areas in the state, and provides recommendations to the EWEC, which is comprised of senior policy advisors to the Governor. The WSAC includes representation from the Army Corp of Engineers, Bureau of Reclamation, National Weather Service, National Resources Conservation Service, Northwest River Forecast Center, Office of Washington State Climatologist, Seattle Public Utilities, USGS, Washington Water Science Center, Washington State: Conservation Commission, Dep. of Agriculture, Dept. of Ecology, Dept. of Fish and Wildlife, Dept. of Health. Inventory Areas. Meetings are scheduled as needed, however monthly meetings have occurred since February of this year and will continue throughout the drought season.

Oregon

According to Oregon Water Resources Department, a 1988 effort in drought planning provides for a state Drought Council that is chaired and facilitated by Oregon Emergency Management whose members include state agencies, federal agencies, and non-governmental organizations. The composition of the Council was designed to be large in order to assure full representation of affected interests and jurisdictions. The Drought Council is a standing committee that meets regularly during a drought cycle.

Under the plan, the Drought Council is responsible for assessing the impact of drought conditions and making recommendations to the Governor´s senior advisors. The Water Availability Committee of Oregon (the unfortunate acronym WACO) is a subcommittee of the Drought Council with membership that includes the Water Resources Department (chair), Oregon Climate Service, snow survey section of the Natural Resource Conservation Service, National Weather Service, Oregon Department of Forestry, U.S. Geological Survey, U.S. Army Corps of Engineers, and the Northwest River Forecast Center. The subcommittee assesses water availability conditions within 14 water availability basins that cover the state of Oregon. The subcommittee meets monthly and reports to the Drought Council. In this manner the Drought Council keeps up to date on information they bring from their organizations and differing geographic areas as they go about making recommendations for response, policy, and mitigation. The Drought Council reports to the Governor´s assistant for natural resources.



Idaho

Idaho has a group similar to the Oregon Drought Council. Idaho's is named the "water supply committee" and is a standing committee that operates in all water years, not just drought years. It has similar composition in membership to Oregon's, and functions primarily as an information exchange for water supply information and conditions.

More Info: **Dry years and Tributaries - How the Council can contribute to the Columbia River Basin's preparedness for dry water years**

The focus about dry water year impacts has mainly been on Mainstem /system water management, passage operations, and power supply implications. The tributaries are going to be impacted as well, especially in terms of low summer and fall flows with warm water temperatures. Given the emphasis in the Fish and Wildlife Program on improving tributary habitat conditions for key species, it's worth asking:

- What is the Council's Role; and,
- What tools are available?

Council Role
The Council has no management authority over freshwater management. This authority lies with the state water resources departments. The Council, however, can encourage the use of tools by water management agencies and increase investment in tools that are currently funded by the Council.

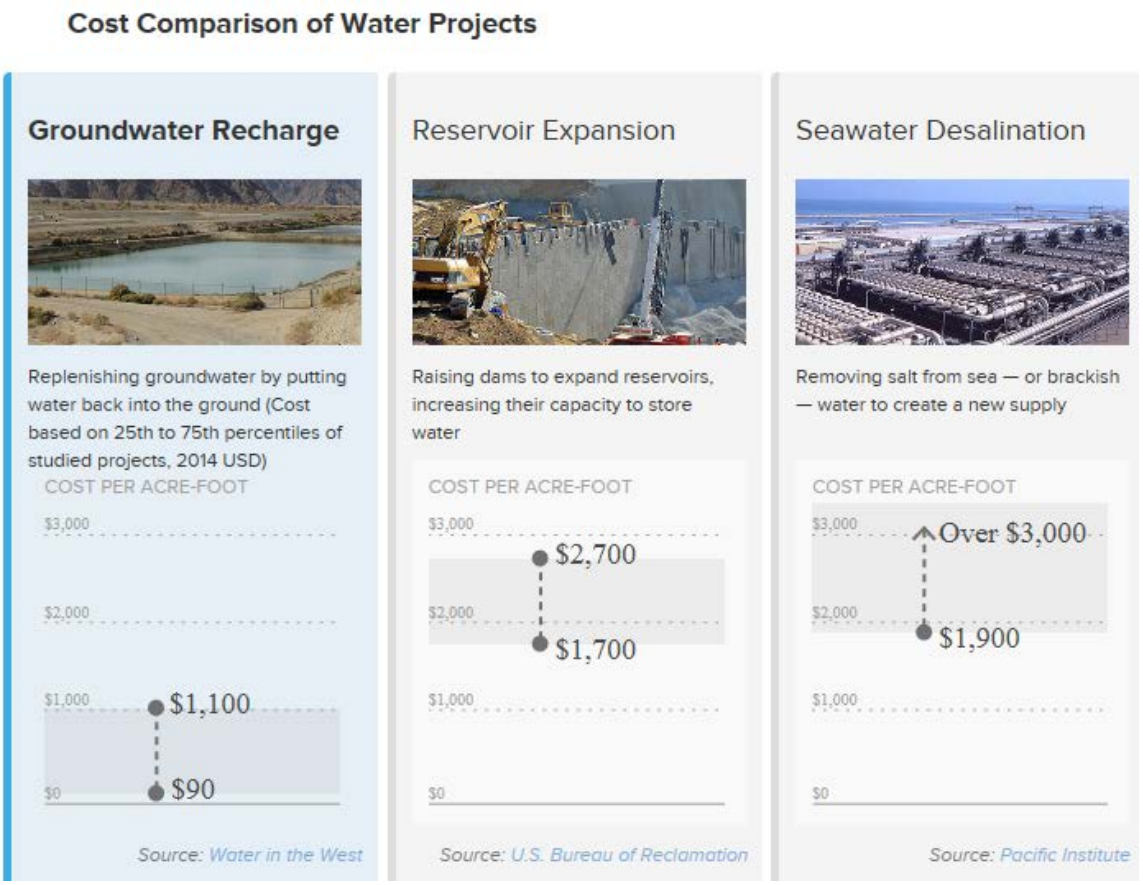
Tools
There are several existing tools that can and are used to help fish and other aquatic species and their habitat in the tributaries during a dry year.

Currently used by the Council:
- The water transaction program (WTP). The WTP is one tool that the Council could leverage to help prepare for, and to mitigate for, impacts of dry years in tributaries of the Columbia Basin. The Council could urge NFWF and its partners and Bonneville to increase investment in WTP to mitigate for dry year impacts, such as by increasing the amount of water allocated for in-stream use during dry year.
- Refinement of the 2014 Program ecosystem function objectives. During this process the region could recommend that the Program include ecosystem function objectives that contribute to mitigating for dry water years.

Could be encouraged by the Council
- There are several tools and management options available that can be (and are used) to provide relief to tributary species and their habitat during dry years by state water resource departments and their partners. These partners include the governors' offices and other state agencies, the water users, irrigation districts and irrigation associations, and in some situations the Bureau of Reclamation and water contractors. The Council could encourage the implementation of these tools by the water management agencies and encourage project sponsors to following the recommendations of the state water management agencies.
- Examples of these tools include:
    - Enhance interstate coordination for freshwater management
    - Water-saving (conservation) and efficiency approaches
    - Freshwater recycling, reuse, and use of gray water
    - Surface water banking and water markets
    - Water supply infrastructures for transfers
    - Coordinating use of surface water and groundwater
    - Recharge – groundwater banking

For more information consult:
- US National Drought Policy Commission Report http://govinfo.library.unt.edu/drought/finalreport/fullreport/pdf/reportfull.pdf
- Panning for Drought report http://www.drought.gov/drought/content/resources/planning-home,

- http://www.ready.gov/drought
- PNW Drought Portal http://www.drought.gov/drought/regional-programs/pacific/looking-ahead
- U.S. Drought Portal http://www.drought.gov/drought/
- What you can do http://environment.nationalgeographic.com/environment/freshwater/top-ten/
- DGS Water Conservation Efforts http://www.dgs.ca.gov/dgs/Home/water.aspx
- At Home Easy Ways to Conserve Water http://www.groundwater.org/action/home/conserve.html
- Water Recycling and Reuse the Environmental Benefits http://www.epa.gov/region9/water/recycling/
- Improving Water Management through Groundwater Banking http://www.pacinst.org/wp-content/uploads/sites/21/2013/02/groundwater_banking3.pdf
- Cost Comparison of water projects http://waterinthewest.stanford.edu/groundwater/charts/cost-comparison/index.html



Extracts from the 2008 FCRPS BiOp regarding dry years:

http://www.salmonrecovery.gov/BiologicalOpinions/FCRPSBiOp/2008FCRPSBiOp.aspx

Page 8-22 - In very dry years, RPA 14 requires the Action Agencies to maximize transport for Snake River migrants in early spring through May 31. Dry years correspond to high temperature years and maximizing transport ensures that migrants are not exposed to near lethal conditions.

Pages 13-3 and 13-4 - The Corps should study the potential for reducing flood control specified storage reservoir drafting during below average water years. Specified drafting in according with current Corps flood control criteria can result in excessive attenuation of flows during below average water years in a manner that may reduce salmon and steelhead survival. Further, such forced drafts can reduce system flexibility, thereby affecting other water uses (e.g., power production). Current operations often result in late season drafts that are both difficult to achieve and adverse to subsequent fish survival by attenuating discharge during the peak of the juvenile emigration. For example, under current operational constraints it is sometimes difficult to achieve the end-of-April target elevation at Lake Roosevelt without exceeding the maximum 1-foot per day drawdown rate, even while the risk of subsequent downstream flooding is very low. The intent of this recommendation is to encourage detailed consideration of the potential for modifying flood control operations in a manner that avoids any increased risk of substantial flood damage while avoiding excessive spring flow attenuation in below average water years.

From page 15 of '*NOAA Fisheries' Reasonable and Prudent Alternative Table of Actions'*,

RPA 14: **Dry Water Year Operations**	**Implementation Plans, Annual Progress Reporting and Comprehensive RPA Evaluations**
Flow management during dry years is often critical to maintaining and improving habitat conditions for ESA-listed species. A dry water year is defined as the lowest 20th percentile years based on the Northwest River Forecast Center's (NWRFC) averages for their statistical period of record (currently 1971 to 2000) using the May final water supply forecast for the April to August period as measured at The Dalles. The Action Agencies will complete the following activities to further the continuing efforts to address the dry flow years: Within the defined "buckets" of available water (reservoir draft limits identified in RPA Action 4), flexibility will be exercised in a dry water year to distribute available water across the expected migration season to optimize biological benefits and anadromous fish survival. The Action Agencies will coordinate use of this flexibility in the Regional Forum TMT. In dry water years, operating plans developed under the Treaty may result in Treaty reservoirs being operated below their normal refill levels in the late spring and summer, therefore, increasing flows during that period relative to a standard refill operation. Annual agreements between the U.S. and Canadian entities to provide flow augmentation storage in Canada for U.S. fisheries needs will include provisions that allow flexibility for the release of any stored water to provide U.S. fisheries benefits in dry water years, to the extent possible. BPA will explore opportunities in future long-term NTS storage agreements to develop mutually beneficial in-season agreements with BC Hydro to shape water releases using NTS space within the year and between years to improve flows in the lowest 20th percentile water years to the benefit of ESA-listed ESUs, considering their status. Upon issuance of the FCRPS Biological Opinion, the Action Agencies will convene a technical workgroup to scope and initiate investigations of alternative dry water year flow strategies to enhance flows in dry years for the benefit of ESA-listed ESUs. In very dry years, the Action Agencies will maximize transport for Snake River migrants in early spring, and will continue transport through May 31 (see RPA 30). BPA will implement, as appropriate, its *Guide to Tools and Principles for a Dry Year Strategy* to reduce the effect energy requirements may pose to fish operations and other project purposes.	**Implementation Plans** Dry water year operations will be described in the Annual Water Management Plan and seasonal updates. **Annual Progress Report** Annual progress reports will describe actions taken during dry water years. There is no other physical or biological monitoring or reporting. **2013 and 2016 Comprehensive RPA Evaluation Report** Comprehensive Evaluation Report will summarize actions taken during dry water years. There is no other physical or biological monitoring or reporting.

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Attachment 1: Fish Operations at Federal Reservoirs

Dworshak

- Operate to standard flood control criteria; shift system flood control to Grand Coulee in below average water years, if possible.
- Provide minimum flows while not exceeding Idaho State TDG water quality standard of 110%.
- Refill by about June 30.
- Draft to meet elevation 1535 feet by end of August with draft to 1520 feet in September.
- Regulate outflow temperatures to attempt to maintain water temperatures at Lower Granite tailwater at or below 68° F.
- Maximum project discharge for salmon flow augmentation to be within State of Idaho TDG water quality standards

Libby

- Follow interim VARQ flood control procedures
- Follow variable December 31 flood control draft based on early season water supply forecast
- When not operating to minimum flows, operate to achieve 75% chance of reaching the upper flood control rule curve on or about April 10 (the exact date to be determined during inseason management)
- Operate to provide tiered white sturgeon augmentation volumes for spawning/recruitment consistent with the 2006 USFWS BiOp in May, June and July; shaped in coordination with TMT.
- Refill by early July (exact date to be determined during in-season management) as best as possible given available water supply and spring operations and consistent with flood control requirements to provide summer flow augmentation.
- Draft to 10 feet from full by the end of September (except in lowest 20th percentile water years, as measured at The Dalles, when draft increased to 20 feet from full by end of September). If project fails to refill to draft limit, release inflows or operate to meet minimum flows.
- Meet minimum flow requirements for bull trout from May 15 to September 30 and 4000 cfs in October through April for resident fish.
- Provide even or gradually-declining flows during the summer months (minimize double peak).
- Limit spill to avoid exceeding Montana State TDG standard of 110%, when possible, and in a manner consistent with the Action Agencies responsibilities to resident listed fish under the ESA.
- Limit outflow fluctuations by operating to ramping rates set in the 2006 USFWS BiOp to avoid stranding bull trout.

Grand Coulee

- Use standard flood control criteria including adjustments for flood control shifts from Dworshak and Brownlee.
- Operate to achieve 85% chance of reaching URC elevation by about April 10.
- Refill by about June 30 each year (exact date to be determined during inseason management).
- Take advantage of reservoir draft for flood control during high water years to perform drum gate maintenance. Drum gate maintenance may be deferred in some dry water years; however, drum gate maintenance must occur at a minimum one time in a three year period, two times in a five year period and three times in a seven year period.
- Draft to meet salmon flow objectives during July-August with variable draft limit of 1278-1280 feet by August 31 based on the water supply forecast.
    - Implementation of the Lake Roosevelt drawdown component of Washington's Columbia River Water Management Program will draft an additional 1.0 foot in non-drought years and 1.8 feet in drought years from Lake Roosevelt by the end of August for instream and out-of-stream use.
    - Reduce pumping into Banks Lake; and allow Banks Lake to operate up to 5 feet from full

pool during August to help meet salmon flow objectives when needed.
- May be used to help meet tailwater elevations below Bonneville Dam to support chum spawning and incubation.
- Operates to help meet Priest Rapids flow objective to support fall Chinook spawning and incubation.
- Operate to minimize TDG.

Hungry Horse
- Follow interim VARQ flood control procedures.
- Maintain minimum flows all year for bull trout with a sliding scale based on the forecast. Operate to meet minimum flows of 3200-3500 cfs at Columbia Falls on the mainstem Flathead River and 400-900 cfs in the South Fork Flathead River.
- When not operating to minimum flows, operate to achieve 75% chance of reaching URC elevation by about April 10.
- Refill by about June 30 each year (exact date to be determined during inseason management).
- When needed to meet lower Columbia flow augmentation objectives, draft during July-September to a draft limit of 3550 feet (10 feet from full) by September 30, except in the driest 20 percentile of water conditions limit draft to 3540 feet (20 feet from full). If don't refill to the draft limit pass inflows or operate to meet minimum flows.
- Provide even or gradually-declining flows during summer months (minimize double peak).
- Limit spill to maximum of 15% of outflow to avoid exceeding Montana State TDG standards of 110% to the extent possible.
- Limit outflow fluctuations by operating to ramping rates set in 2006 USFWS BiOp to avoid stranding bull trout.

Albeni Falls
- Use standard flood control criteria.
- Operate to provide kokanee spawning conditions (winter pool levels).

Lower Snake projects
- Operate at minimum operating pool (MOP) elevation from April 3 until small numbers of juvenile migrants are present unless adjusted to meet authorized project purposes. For Lower Granite – operate at MOP until enough natural cooling has occurred in the Lower Granite forebay, generally after October 1.
- Configure fish passage facilities and conduct fish passage operations to achieve the juvenile passage performance goals.
- Spill in accordance with Water Management Plan (WMP) Table 4 unless modified by implementation planning and adaptive management decisions.
- Collect fish and transport at Lower Granite, Little Goose and Lower Monumental dams; provide fish spill in years when seasonal average flows are greater than 65,000 cfs during spring months.

Lower Columbia projects
- Operate John Day pool at the lowest elevation that continues to allow irrigation from April 10 through September 30.
- Configure fish passage facilities and conduct fish passage operations to achieve the juvenile passage performance goals.
- Spill in accordance with WMP Table 4 unless modified by implementation planning or adaptive management decisions.
- Collect fish and transport during the summer at McNary unless modified through implementation planning or adaptive management decisions.

Seasonal Flow Objectives and Planning Dates
Operate reservoirs to attempt to meet these flow objectives (UPA Table 3):

Location	Spring		Summer	
	Dates	Objective	Dates	Objective
Snake River at Lower Granite Dam	4/03 - 6/20	85 - 100[1]	6/21 - 8/31	50 - 55[1]
Columbia River at McNary Dam	4/10 - 6/30	220 - 260[1]	7/01 - 8/31	200
Columbia River at Priest Rapids Dam	4/10 - 6/30	135	N/A	N/A
Columbia River at Bonneville Dam	11/1 - emergence	125 – 160[2]	N/A	N/A

[1] Objective varies according to water volume forecasts.
[2] Objective varies based on actual and forecasted water conditions.

Flow Objectives to Velocities Conversion Tables

Lower Columbia Water Travel Time			
Scenario	**July- Aug Ave (Kcfs)**	**WTT IHR to Bon Pool at Flow days**	**WTT IHR to Bon Pool at Flow ft/s**
Min Spring BIOP	220000	8.8	0.97
Max Spring BIOP	260000	7.4	1.15
Summer BIOP	200000	9.7	0.89

Lower Snake Water Travel Time			
Scenario	**Flow Ave (Kcfs)**	**WTT through LGR pool to IHR at Flow days**	**WTT through LGR pool to IHR at Flow ft/s**
Min Spring BIOP	85000	10.1	0.71
Max Spring BIOP	100000	8.6	0.84
Min Summer BIOP	50000	17.2	0.42
Summer BIOP	55000	15.6	0.46

Attachment 2: Operational Flexibilities and Requirements

Operations at Salmon Manager's Discretion

General Principles:

- Consideration will be given to resident fish when making operational decisions.
- The greatest flexibility exists In-Season (April through August).
- While specific minimum reservoir elevations, flow priorities, minimum flows and flow objectives are identified in the Biological Assessment, after meeting statutory and legal obligations, there is some level of flow, and shaping of flow at the salmon manager's discretion during the April – August period (subject to April through July flood control limits).
- Operations at Dworshak for temperature control during July and August are at the salmon manager's discretion, while the Corps meets its statutory obligation (CWA and TDG standards), and must be consistent with the SRBA agreement.
- Aside from planning dates established to bookend juvenile bypass spill; its start and end are at the salmon manager's discretion.
- As long as the planning date for the beginning of MOP operations has been met, the specific operation to draft pools to MOP is at the salmon manager's discretion.
- [PLACEHOLDER] Up to four days of B2 Corner Collector flow will be provided in March for Spring Creek hatchery releases

Period	Operational Discretion
April	▪ On or after April 3 on the Snake and April 10 on the Columbia, specify beginning of juvenile passage spill ▪ Specify beginning and shape of steelhead flows in the mid-Columbia
May	▪ Shape spring flow augmentation for mid-Columbia steelhead as needed.
June	▪ Shape spring flow augmentation for mid-Columbia steelhead as needed. ▪ No later than June 30 dictate transition from spring to summer operation at McNary ▪ Within 2006 USFWS BiOp, set duration and shape of sturgeon pulse at Libby once the Corps has met statutory obligations for flood control. ▪ Use Dworshak as needed to manage temperature (while meeting state TDG objectives)
July	▪ Define shape of summer flow augmentation ▪ Use Dworshak as needed to manage temperature (while meeting state TDG objectives)
August	▪ Define shape of summer flow augmentation ▪ Use Dworshak as needed to manage temperature (while meeting state TDG objectives)

Hydro System Operating Rules

General Principles:

- Operate to meet April 10 Upper Rule Curve at Libby, Hungry Horse and Grand Coulee within parameters described in the BA, while meeting minimum flow requirements.
- Refill storage projects by about June 30 (exact date to be determined through inseason management).
- Draft storage projects no lower than summer draft limits (August 31 for GCL, September 30 for LIB, DWR and HGH) identified in Attachment 1 while meeting statutory obligations. If the project fails to refill to draft limit, release inflows or operate to meet minimum flows.
- Provide flow to meet the Hanford Reach Fall Chinook Protection Program.
- Operate to draft limits informed by flow and temperature objectives identified in section 1.2.1 (Table 2) and Attachment 1. Draft limits may not be needed at all reservoirs in all years to meet these objectives.

- April through August flows are a higher priority than chum flow in the fall and winter.

Project	Operation
Storage Projects	• Implement storage project operations as prescribed in Attachment 1.
Run of River Projects	• Spill in accordance with Tables x and x in section 1.4.1 and Proposed interim transport strategy in table xx in section 1.4.3 unless modified by implementation planning and adaptive management decisions. • End MOP as stated in Attachment 1.

1.2.5 Dry Water Year Operations

Some actions are modified in dry water years to optimize benefits to ESA-listed salmon and steelhead in light of environmental conditions. These specific modifications are as follows:

Flexibility in Managing Flows

Dry water years can amplify the tradeoffs between managing flows to meet competing fishery objectives. For example, maintaining rearing flows for chum below Bonneville Dam and fall Chinook in the Hanford Reach can reduce the amount of water available for spring migrants, and refilling reservoirs for summer migrants may divert flows for spring migrants. The operational flexibilities outlined in Attachment 2 can be used to address such tradeoffs and to distribute the available water across the expected migration season to optimize biological benefits and anadromous fish survival in dry years, while taking into account the needs of resident fish and other reservoir objectives. Exercise of this flexibility will be coordinated through the TMT's in-season management process.

Treaty and Non-Treaty Storage Operations

- Operations of Treaty Storage in Dry Years. Operating plans develop under the Treaty and prepared in advance of the operating year, are developed to meet power and flood control objectives. These operating plans include draft of Treaty projects in low water conditions to meet regional loads – termed "proportional draft." In dry water years, Treaty reservoirs would be operated below their normal refill levels in the late spring and summer, therefore increasing flows during that period relative to a standard refill operation.

- Store in Canada for Non-Power Purposes. To the extent possible, annual agreements between the U.S. and Canadian Entities to provide flow augmentation storage in Canada for U.S. fisheries needs will include provisions that allow flexibility for the release of any stored water to provide U.S. fisheries benefits.

- Use of Non-Treaty Storage Space. BPA will explore opportunities in future long-term non-Treaty storage agreements to develop mutually beneficial in-season agreements with Canada to shape water releases using non-Treaty storage space within the year and between years to improve flows in the lowest 20th percentile water years to the benefit of ESA-listed ESUs, considering ESU status.

Spring Transportation

- In water years when the Snake River projected seasonal average (April – June) flow is less than 65kcfs (~ lowest 15% of all water years), transportation will be initiated on April 3 at the Snake River collector projects and will be maximized (i.e. no voluntary spill or bypass provided) until May 31.

- In water years when the Snake River projected seasonal average (April – June) flow is between 65 and 80 kcfs (~lowest 15-28% of all water years), inriver migration would be provided through spill and bypass in the early spring, followed by spill and transportation

in the early-mid spring, and maximized transportation in the late-mid spring until May 31 at all Snake River Collector projects.

- If average seasonal (April-June) flows in the Columbia River are predicted to be below 125 kcfs (roughly the 2001 level of 124.1kcfs), transportation from McNary Dam would be maximized from April 10 - June 14.

Investigation of Other Dry Water Year Flow Strategies

The issue of improving spring flows in dry water years has been deliberated in the collaboration process. Though the relationship of flow levels to survival of juvenile fish migrating through the hydroelectric system is not clear, it is generally understood that inriver survival of juvenile migrants is considerably lower in low flow years than in average and higher flow years. During the collaboration, several scenarios were modeled to investigate alternative flow management actions that might improve spring flows in low flow years for the benefit of juvenile spring Chinook, steelhead and sockeye from the upper Columbia and Snake rivers. Though the collaboration did not reach definitive conclusion on this topic, the Action Agencies believe this issue warrants further investigation and propose the following:

Upon issuance of the FCRPS BiOp by NOAA Fisheries, the Action Agencies will convene a technical workgroup under the guidance of the Policy Work Group to scope and initiate investigations of a dry water year flow strategy. The investigations will include modeling of FCRPS operations, COMPASS fish survival modeling, and consideration of compatible operations of Canadian projects possible new Non-Treaty storage agreements. Operational constraints and guidelines under the discretion of the Action Agencies and the fishery management entities will be relaxed, as needed and appropriate, to ensure consideration, evaluation, and development of options to improve spring flows in dry water years. Biological and economic effects of various dry water flow options will be estimated. Changes in administrative procedures and agreements necessary to implement a given option will be documented and assessed.

A technical workgroup will be convened and preliminary results will be reported by August 31, 2008.

Implementation of BPA's "Guide to Tools and Principles for a Dry Year Strategy"
Implementation of BPA's "Guide to Tools and Principles for a Dry Year Strategy" (Guide) may reduce the effect energy needs may pose to other projects purposes, including fish and wildlife needs, by increasing the supply or reducing the demand for energy in dry years. The Guide was developed in response to the energy crisis of 2000 and 2001 and addresses principles and tools BPA will employ to meet its load obligations in dry water conditions; the Guide does not address changes to fish operations, but lists the tools to be considered in dry water conditions.

Principles: During dry years, BPA will make decisions on what dry year tools to pursue to maintain power system stability and reliability while meeting other statutory responsibilities, including responsibilities to:

- Balance both non-power and power uses during the energy shortage;
- Maintain federal trust responsibilities;
- Protect fish and wildlife consistent with Endangered Species Act; the 1980 Northwest Power Act, and other laws;
- Act in a sound and business like manner;
    - Provide an adequate, efficient, economical, and reliable power supply;
    - Provide a cost-effective solution to the energy shortage to maintain rates as low as possible to minimize the economic impact to the region and the FCRPS.

Tools: It is impossible to create, in advance, a meaningful and prioritized list of events that would trigger the use of dry year tools. The individual circumstances associated with a dry year (such as the regional scope and the state of the regional economy) and the relative cost (including energy and commodity market prices) and availability of tools all impact the appropriate response. Therefore, the use of dry year tools can be used at any time to temporarily solve energy shortages that threaten the ability of BPA to meet its load obligation subject to the dry year principles.

Dry Year Tools that add flow to the Columbia and reduce power emergency risk:

- **Columbia Basin Project Water Conservation.** Enter into agreements with the U.S. Bureau of Reclamation and the irrigation districts to leave project land fallow, capped at some percent in order to limit disruption to the local agricultural economy. Approximately 4 acre feet of water per acre of land left fallow would remain in the mainstem Columbia River to improve flows and increase power generation. This would also save energy by reducing energy consumed pumping water into Banks Lake from Roosevelt reservoir. This program has to be triggered early in January/February before investments and contracts are entered into by irrigators.
- **Irrigation Load Buy-down.** Enter into agreements with BPA's eastside load-following customers to reduce irrigation pump load (either aquifer or surface water lift). Note that this program has to be triggered in January/February before investments are made in planting. In addition, because this program is done on a public utility or electric cooperative scale, it is difficult to assign what portion of the program would be attributable to pumps that take water directly out of surface streams or rivers to those pumps which access aquifer storage.

Dry Year Tools that reduce power emergency risk:

- **Direct Service Industry (DSI) Load Buy-down.** DSIs no longer purchase power directly from BPA, but receive a capped financial benefit based upon their level operation

and other criteria. DSI are also currently operating at levels substantially below historical levels. These two factors limit the potential amount of load reduction that could be achieved.

- **Direct Service Industry (DSI) Load Buy-down.** DSIs no longer purchase power directly from BPA, but receive a capped financial benefit based upon their level operation and other criteria. DSI are also currently operating at levels substantially below historical levels. These two factors limit the potential amount of load reduction that could be achieved.
- **Energy Efficiency.** Three energy efficiency programs could by implemented relatively quickly: compact fluorescent bulbs, Irrigation Scheduling, and commercial pre-rinse valves.
- **Industrial Load Buy-down.** The four largest industrial end-use consumers of BPA's load-following customers consume approximately 400 average megawatts total. There may be opportunities to either substitute market purchases for energy intensive processes (such as buying market pulp as opposed to grinding it on site) or to temporarily shut down processes or machines. The price and quantity of opportunities depend in part on the economic conditions of the commodity products that these mills produce.
- **Market and Option Purchases.** There are power products available in power markets that can be used to meet BPA's load obligations but prices and quantities available may not always be advantageous.
- **Power Exchanges.** Power from one utility is exchanged for power from another utility system. Utilities may have unique load and resource characteristics that make energy trades advantageous. For example, California generally has peak load in the summer while in the Pacific Northwest loads (in the major west side load centers) peak in the winter.
- **Public Awareness Campaign.** This can be acted on alone or the first step before a Regional Curtailment is enacted. The amount of energy conserved by eliciting public requests is hard to quantify, but it has been estimated at around a 5 percent. The amount of energy conserved is also not only unpredictable, it is usually only for very short-term periods.
- **Regional Curtailment.** Coordinate with regional governors to exercise emergency powers to impose mandatory load curtailments.
- **Storage Agreement.** Storage agreements between BPA and other utilities that have storage capability may be used to improve reliability in a low flow period. This would reduce power production in one period while increasing it in another. This type of agreement involving energy shaping can usually be reached in a short time frame. However, in order to provide additional water (not just energy) during dry water years the only likely reservoirs that can be used are in Canada and it takes considerably more time to develop agreements and store the water to be re-shaped. Any such storage agreements would be under the auspices of the Columbia River Treaty or would utilize non-Treaty storage space in Canada, as outlined above.