Federal Agencies' 2001 FCRPS Operations Plan

May 25, 2001

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Executive Summary

This Operations Plan has two major elements. First is an evaluation of FCRPS conditions relative to the emergency criteria included in the Federal Agencies' Criteria and Priorities for 2001 FCRPS Operations (Appendix A). Second is a summary of operations that will be implemented this year, including a decision process for determining spring and summer spill levels.

FCRPS Conditions Relative to the Criteria

CRITERION 1: Sufficient Resources to meet near-term power system demand

54 million acre feet (MAF) is the threshold at which BPA cannot meet spring and summer power system demands without drafting reservoirs and impacting 2001-02 system reliability. A forecast buffer is added to address the risk associated with forecast error. The May forecast error buffer is 4.5 MAF.

SUMMARY RESULT: A 58.5 MAF May final volume forecast is needed to have confidence that near-term reliability can be maintained.

CRITERION 2: Sufficient Resources to maintain a 5% loss of load probability in future months

Northwest Power Planning Council (NWPPC) analysis indicates the Pacific Northwest Region currently has a 26% chance of not meeting power system demand in the December through January period of 2001-02. Additional analysis indicates that storage of up to 1500 mw-mos could reduce this probability to 20% and also significantly reduce the amount of load curtailment.

SUMMARY RESULT: 1500 mw-mos (approximately 1.5 MAF) of additional storage is necessary to maximize the reduction of the loss of load probability.

CRITERION 3: Sufficient Cash Reserves to maintain reliability

Current BPA analysis finds that there are no months in the coming 12 months that are at or above 20% probability of zero reserves. In fact, the greatest probability is 13.5%. A preliminary conclusion suggests the possibility that some reserves could be used this year to: a) fund implementation of offset actions; or b) purchase power from extra-regional sources to reduce the amount of storage needed for next winter or to further reduce next year's loss of load probability.

SUMMARY RESULT: No additional revenues are necessary to achieve the insufficient cash reserves criterion.

The financial and reliability analyses will be updated monthly upon receipt of the month's final volume forecast.

Spring/Summer Operations

- Spill start date and spill levels will be determined based on volume forecasts. May final volume forecast would need to be equal to or greater than 60 MAF for spill to be considered in May. Project priority for any spill that may be available is included on page 19.
- Transport up to 50% of juvenile migrants at McNary Dam in the spring.
- Reverse load factoring operation at Lower Granite to help move juvenile fish to collection facilities.
- Allow for consideration to reduce bull trout minimums at Libby to aid in refill.

I. Introduction

The year 2001 is shaping up to be one of the lowest water years on record with unprecedented increases in the cost of power. Under these conditions, BPA has been forced to periodically declare power system emergencies in order to maintain the reliability of the power system. Other system uses are impacted by the low water conditions and/or the operations associated with power system emergencies. Notably, the Federal Agencies are particularly concerned with implications to ESA-listed salmon and resident fish, and non-listed fish, and have made and will continue to make deliberate and careful choices about how to use the system's limited flexibility to achieve multiple objectives.

Purpose: The Action Agencies intend to implement the biological opinions issued by NMFS and FWS in December 2000. This 2001 Operations Plan (Plan) provides a framework for development of a Water Management Plan for operation of the FCRPS this year in consideration of these biological opinions. This Plan does not intend to and does not alter or affect the statutory and other legal rights, authorities, responsibilities, and obligations of the Federal Agencies and the right and authority to interpret and implement other statutory authority.

Objective: The Plan is intended to outline an operation that will both meet the reliability criteria in the Federal Agencies Criteria and Priorities (Appendix A) while making best efforts to minimize adverse impacts to fish.

Scope: The scope of actions in this document include all Federal projects in the Columbia River Basin that are coordinated to meet Northwest power demand, including the Willamette River projects.

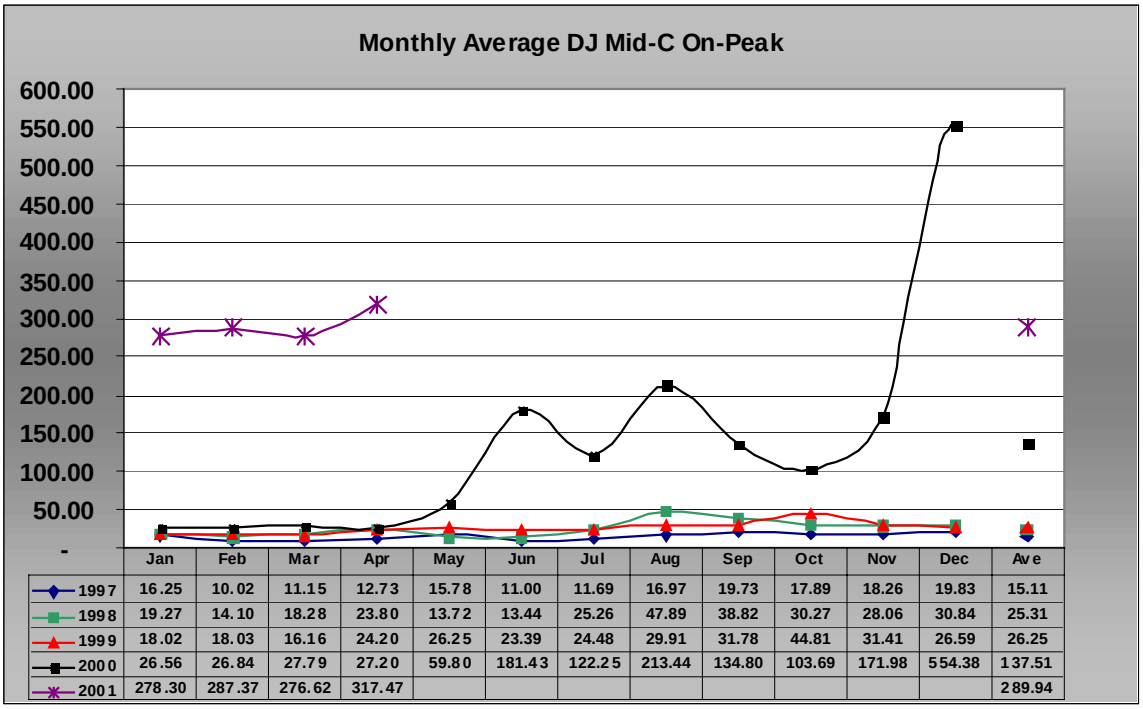
Adaptive Management and Operational Discretion: The Plan recognizes that the Federal Agencies may, through adaptive management, adjust FCRPS operations over time, as there are deteriorating or improving changes in circumstances and/or unforeseeable situations, for example, changed water supply, economic outlook, power market conditions, conditions affecting listed fish, fish and wildlife, water quality, cultural resources, or project uses. A situation could arise, such as an emergency involving fish passage, which requires the Federal Agencies to exercise their discretion to implement actions or operations not specifically addressed herein overriding elements of this plan. The Federal Agencies will, to the maximum extent possible, ensure current information and appropriate input from all interested parties is incorporated in decision making.

Updates: The financial and reliability analyses contained in this plan will be updated with new data upon receipt of monthly final volume forecasts. Having received the River Forecast Center's May final volume forecast on May 8, BPA is currently updating these analyses. If results of revised analyses warrant a change to the operational parameters, the Plan will be updated to reflect such changes. Updates to the Plan will be posted on the Technical Management Team's (TMT) website at www.nwd-wc.usace.army.mil/TMT/index.html and on the Federal Caucus's website at www.salmonrecovery.gov.

II. Background

A. West Coast Power Market

The West Coast power market does not currently have sufficient generation and transmission infrastructure to meet demand. This is evidenced by the blackouts experienced in California and the increase in West Coast wholesale prices. The above-average water conditions in recent years have insulated Northwest utilities from these effects. However, beginning in November 2000, below-average streamflows in the Northwest contributed to a sharp escalation in prices. Poor precipitation and streamflow patterns have continued through March, resulting in one of the lowest runoffs in the 70-year record. The poor water conditions in the Northwest have exacerbated the West Coast's generation and transmission inadequacies resulting in wholesale electricity prices 10 times historical average.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave
1997	16.25	10.02	11.15	12.73	15.78	11.00	11.69	16.97	19.73	17.89	18.26	19.83	15.11
1998	19.27	14.10	18.28	23.80	13.72	13.44	25.26	47.89	38.82	30.27	28.06	30.84	25.31
1999	18.02	18.03	16.16	24.20	26.25	23.39	24.48	29.91	31.78	44.81	31.41	26.59	26.25
2000	26.56	26.84	27.79	27.20	59.80	181.43	122.25	213.44	134.80	103.69	171.98	554.38	137.51
2001	278.30	287.37	276.62	317.47									289.94

B. Northwest Water Supply

The initial volume forecast in early January projected 80.4 MAF January through July runoff volume at The Dalles. The forecast has continued to deteriorate, with the current forecasted runoff volume at The Dalles down to 56.5 MAF, which would be the second lowest runoff in the 70-year record.

JANUARY-JULY 2001 RUNOFF VOLUME FORECASTS

Date (Forecast)	Grand Coulee MAF	Grand Coulee %	Lower Granite MAF	Lower Granite %	The Dalles MAF	The Dalles %
01/09 (Jan FF)	48.8	77	23.6	79	80.4	76
02/07 (Feb FF)	41.2	65	18.8	63	66.4	63
03/07 (Mar FF)	37.6	59	16.3	55	58.6	55
04/06 (Apr FF)	37.5	59	14.1	47	56.1	53
05/08 (May FF)	37.8	60	14.1	47	56.5	53

Source: NWS-RFC & USDA-NRCS
% = Percent of 1961-90 Normals
FF= Final

C. Actions by BPA to avoid emergencies

In mid-December, the Federal Agencies recognized that below-average runoff conditions were likely to persist through January. Under such conditions, BPA would not have sufficient hydro resources to meet its load obligations. Historically in low water conditions, BPA has purchased upwards of 1200 MWs from California during the winter in order to meet this shortfall. However, this winter California did not have sufficient resources to meet its own demand and market prices for power were 10 times the historical average limiting BPA's financial ability to secure sufficient resources.

Therefore, BPA pursued creative ways of reducing load obligations and increasing supply. A summary of the measures undertaken by BPA to reduce potential power supply deficits and avoid or reduce declarations of emergencies follows:

- Energy Exchanges with California—2 for 1 exchanges provided BPA with additional 500 mw-mos of energy.
- Acquisition of Power from Industries—From December-April, BPA secured almost 2600 mw-mos of voluntary load reductions at a cost of more than $310 million.
- Acquisition of Market Energy—From December-April, BPA secured almost 1000 mw-mos of market energy to augment system generation at a cost of almost than $200 million.
- Acquisition of Irrigation Load—Secured approximately 600 mw-mos of irrigation load at a cost of approximately $25 million.
- Conservation of Energy—Expedited the implementation of conservation credit.
- Oregon and Washington Calls for Conservation—Assisted governors in call for 10% reduction in consumption.
- From December-April, BPA sold approximately 1870 mw-mos of surplus generation resulting from chum and Vernita Bar operations for roughly $275 million to reduce the probability of future power emergencies.

D. Winter Operations

Throughout the fall, the system was operated to provide spawning habitat for chum salmon below Bonneville dam. On December 8, 2000, BPA declared the winter's first power emergency in anticipation of temperatures significantly colder than normal. This power emergency ended on December 12, 2000.

In early January 2001, chum spawning was complete and a minimum flow was provided during incubation of the redds. The Biological Opinion (BO) recognized that under poor water conditions there will always be a trade-off between the fall chum operation and meeting refill targets; however, the Opinion leans toward abandoning the chum operation in favor of meeting refill. Given the power situation, in early January 2001 the Federal Agencies decided to pursue an operation that combined chum and power needs for mutual benefit. It was acknowledged that in the absence of the chum operation, levels equal to or higher than the minimum flow required for chum would be needed to meet Federal load obligations. Despite this combined power and chum operation, BPA declared two multi-day power emergencies in January and February 2001 due to insufficient power on the wholesale market to meet Federal load obligations.

E. 2000 NMFS BO and Allowance for Variations in Water Conditions and for Emergencies

In its BO issued on December 21, 2000, NMFS recommended a reasonable and prudent alternative (RPA) for avoiding jeopardy to listed salmonid species and adverse destruction or modification of their critical habitat. The Corps, Bureau, and BPA are relying on this and prior biological opinions as they make operational decisions in 2001.

The 2000 NMFS BO presents a long-term RPA for avoiding jeopardy that, combined with other improvements by others, are likely to ensure a high likelihood of survival and a moderate-to-high likelihood of recovery. To avoid jeopardy, the RPA requires satisfaction of performance standards. To satisfy the performance standards, the RPA requires development of one- and five-year implementation plans to define and revise particular measures for implementation. The implementation plans include water management plans to define how to operate the FCRPS to achieve applicable performance standards. The RPA then presents an initial set of measures and actions designed to meet the performance standards, subject to revision through the one- and five-year planning process. To ensure progress toward the performance standards, the RPA provides for midpoint reviews in 2003, 2005, and 2008.

Applicable performance standards may not be met in all years. The 50-year historical record of water years shows a wide range of water conditions. Consequently, the NMFS BO recognizes that meeting flow objectives and refilling reservoirs "may not be possible every year, especially in low water years."

The NMFS BO anticipated that there could be circumstances when the power grid would require extraordinary support, and it allows for variations in case of unforeseeable power system, flood control, or other emergencies. Given current forecasts of volume runoff and power market prices, this year may turn out to have an extended period of such extraordinary circumstances. As demonstrated by actions taken to date, the Federal

Agencies view emergency actions as a last resort and do not intend to use emergency declarations in place of long-term investments that would allow fish operations while maintaining other purposes, such as an adequate and reliable power system.

III. Water Supply Forecast

- The May Final January-July runoff forecast at The Dalles is 56.5 MAF, or 53% of normal. There is a 50% likelihood of being above 56.5 MAF.
- There is a 95% likelihood of being above 45.6 MAF, a 70% likelihood of reaching at least 53.0 MAF, and a 65% likelihood of reaching 54 MAF or higher.

May 2001 Final Runoff Volume Forecasts

Location	May Final (MAF)	% of Normal
Grand Coulee (Apr-Jul)	33.3	61%
Lower Granite (Apr-Jul)	10.0	46%
The Dalles (Jan-Jul)	56.5	53%

IV. Biological Analysis

NMFS has conducted an analysis of the effects of 2001 water conditions and spill operations on juvenile fish survival through the FCRPS. Summary results indicate that in-river survival rates this year will be near the lower end of the range of survival rates projected in the 2000 Biological Opinion due to this year's extremely low flow conditions. Additionally, with spill levels being reduced from BO levels, in-river survival rates are likely to be further depressed.

While in-river survival is expected to be reduced this year, available tools predict that total system survival (transported plus in-river migrants, including some delayed effects of transportation) will be similar to that projected in the BO for Snake River spring chinook and steelhead; however, system survival for Snake River fall chinook will be lower. Based on total system survival, there appears to be little difference among alternative spill operations due to the high proportion of each run being transported. However, given the significant uncertainties associated with this analysis, a conclusion of no net reduction in total system survival for Snake River spring stocks should be considered with caution.

The anticipated negative effect of this year's low flow and reduced spill on listed mid-Columbia River stocks is expected to be significant. Though the survival benefit of transporting spring migrants from McNary Dam has considerable uncertainty associated with it, transportation has been adopted as an emergency strategy this spring. On April 30, 2001, the Federal Agencies began barge transportation of juvenile migrants at McNary Dam on an alternating day basis. An analysis of the effect of providing no spill was conducted by NMFS using the SIMPAS model. The preliminary analysis indicates that the effect of not providing any spill at lower Columbia River dams will decrease juvenile in-river survival by approximately 12% for Upper Columbia River spring chinook, and 13% to13.5% for upper Columbia and middle Columbia River steelhead

relative to providing the biological opinion spill levels. Given that transportation at McNary is operating on an alternating day basis, a majority of the upper Columbia stocks will be subject to in-river conditions, including any reduced spill resulting from power emergency declarations.

Further analysis suggests that the provision of 50 kcfs at Bonneville Dam and 30% spill at The Dalles Dam for a 30-day period during the spring migration would provide a significant survival benefit relative to a no spill condition. Providing this reduced spill volume would decrease in-river survival by only 4% for the upper Columbia River spring chinook and 5% to 6% for upper Columbia and middle Columbia River steelhead relative to the biological opinion spill levels. If the reduced spill regime is provided for a period of approximately three weeks, the associated juvenile fish survival benefits will apply to approximately 50% of the total spring migration, reducing the survival benefits accordingly.

In addition to NMFS' analysis, the Federal Agencies have reviewed and considered biological analyses from the NWPPC and CRITFC.

V. Emergency Criteria

This section quantifies the status of the FCRPS and BPA reserves relative to the Federal Agencies' power emergency criteria. The criteria are:

1. Operational Power System Reliability due to near-term insufficiency. Defined as insufficiency of electrical generation to meet Pacific Northwest electrical near-term demand. An indicator of resource scarcity may be a quick rise in prices over a few hours or days.
2. Planning Power System Reliability due to a forecasted insufficiency. The reliability criterion is exceeded when the probability of insufficient generation to meet load exceeds 5% for any of the next 12 months.
3. Power System Reliability due to inadequate BPA reserves. Reserves are needed to acquire sufficient electrical generation and maintain other BPA-funded activities, including programs to protect, mitigate, and enhance fish and wildlife. The financial criterion for a power system emergency is exceeded when the probability of FCRPS financial reserves being $0 or less after meeting all expected financial obligations exceeds 20% for any of the next 12 months.

CRITERION 1: Near-Term Insufficiency

Two analyses are used to measure achievement of this criterion:

1. NWPPC reliability study: The results of the NWPPC reliability study show that under a 53.8 MAF condition, the Northwest region may suffer load curtailments even without any fish spill this spring and summer season unless water was borrowed from some future period.
2. BPA inventory analysis: Inventory analysis results presented in the table below reach a very similar conclusion in that BPA cannot meet firm load in the 52.6 MAF year without borrowing approximately 1100 mw-mos of storage from next year (2002). However, in the 54.2 MAF condition, BPA can meet firm load. The combination of these two BPA scenarios is consistent with the Council analysis indicating that approximately 54 MAF is required to meet firm load.

The RFC May Final Forecast indicates a 35% probability of having an actual runoff of 54 MAF or less. If the Federal Agencies commit to spill based on a volume forecast that does not materialize, reservoirs will have to be drafted deeper than traditional end of summer reservoir elevations to meet load. This will affect 2001-02 winter reliability and could affect cultural resources, resident fish, and anadromous fish protection in 2002. Given these consequences, the Federal Agencies find this 35% probability too high to take management actions such as spill without taking forecast error into account. Therefore, the Federal Agencies propose a forecast error buffer that would reduce the probability of a 54 MAF condition to no greater than 25%.

The National Weather Service's River Forecast Center forecast procedure shows that in order to have no greater than a 25% chance of less than 54 MAF, the following final forecasts must be observed:

May:	58.5 MAF (54 MAF + 4.5 MAF Buffer)
June:	58.0 MAF (54 MAF + 4 MAF Buffer)
July:	57.5 MAF (54 MAF + 3.5 MAF Buffer)

SUMMARY RESULT: Actual volume of approximately 54 MAF is necessary to achieve the near-term sufficiency criterion. In addition, an allowance is needed in each of the final forecasts to ensure no greater than a 25% probability of being less than 54 MAF, which will be handled by using a forecast error buffer of 4.5 MAF in May, 4 MAF in June, and 3.5 MAF in July.

CRITERION 2: Forecasted Insufficiency

The NWPPC reliability analysis is used to measure achievement of this criterion. BPA's initial reliability analyses focused on near-term reliability through the current fiscal year (FY 2001). As the Northwest's volume runoff forecast deteriorated, regional attentions were drawn to the question of whether water could be borrowed from 2002 to enhance conditions for 2001. As part of that analysis, an understanding of FY 2002 (October 2001-September 2001) reliability was needed. The results outlined below indicate that due to poor reliability conditions in the winter of 2001-02 there is no additional storage to

borrow from 2002. In fact, the analysis suggests that additional water should be stored from 2001 in order to improve the reliability conditions for winter 2001-02.

The NWPPC's reliability study concludes that there is a 26% probability of load loss in winter 2001-02 if Federal hydro projects start next operating year at their traditional reservoir elevations. After running several sensitivities, the conclusion is that storing 1500 mw-mos into next year can reduce the loss of load probability to 20%. More importantly, the magnitude of the load misses is greatly diminished. Storing more than 1500 mw-mos has little impact on either the loss of load probability or the magnitude of load loss.

Additional Storage (mw-mos)	Loss of Load Probability	Illustrative Feb Day-Avg Load Miss (aMW)
0	26%	1825
750	22%	1250
1500	20%	350
2250	19%	300

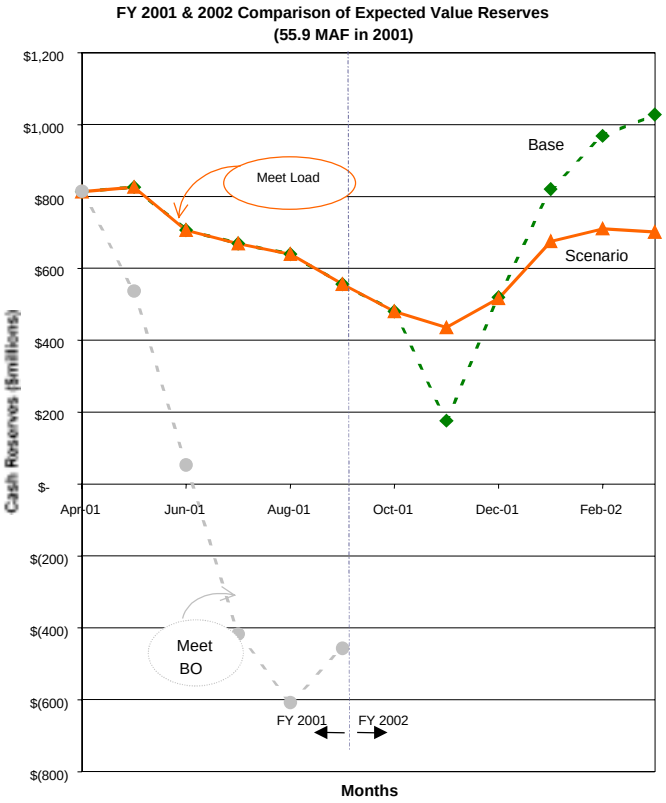
**Additional information on the NWPPC reliability study is included in Appendix B.*

Consistent with the discussion in Criterion 3 below, there may be consideration given to purchase a portion of the 1500 mw-mos from extra-regional power sources rather than store the entire quantity. The amount purchased will depend on available cash reserves, extra-regional power availability, and wholesale power market prices, but is unlikely to be more than 400 mw-mos.

SUMMARY RESULT: 1500 mw-mos (approximately 1.5 MAF) of additional storage is necessary to maximize the reduction of the loss of load probability.

CRITERION 3: Insufficient Reserves

BPA cash flow analysis is used to measure achievement of this criterion. The current flow analysis shows that with current runoff and market price projections, BPA achieves the goal of avoiding a greater than 20% chance of negative cash reserves in any of the next 12 months.



Cash Flow

(Probability of < $0 Reserves)

	Meet Load and Base Marketing	Meet Load and Marketing Scenario
Apr-01	0.0%	0.0%
May-01	0.0%	0.0%
Jun-01	0.0%	0.0%
Jul-01	3.9%	3.9%
Aug-01	5.5%	5.5%
Sep-01	6.6%	6.6%
Oct-01	7.4%	7.4%
Nov-01	13.7%	8.6%
Dec-01	7.6%	7.7%
Jan-02	4.0%	5.9%
Feb-02	7.2%	9.3%
Mar-02	11.0%	14.1%

FY2001 Ending Reserve Levels

(Probability of < $300M Reserves)

Sep-01	10.8%	10.8%

(Probability of < $650M Reserves)

Sep-01	52.0%	52.0%

Assumptions:

1. Cal ISO/PX don't pay anything due.
2. 4H10c credits applied monthly starting in February.
3. Rate increase in Base is 248% for FY2002.
4. Rate increase in Scenario is 68% for FY2002.
5. Modeling the potential financial outcomes of meeting full BO requirements includes some simplifying assumptions:
   - Assumes only one water year at 57 MAF
   - Distribution of potential outcomes would be much wider and the expected value could change significantly if more water years were evaluated
   - Forecast assumes no limitation to power purchase availability

If runoff and market prices projections remain in their current range some level of reserves might be available this year for expenditures such as:

- Implement offset actions;
- Secure extra-regional purchases to meet the 1500 mw-mos storage requirement and reduce the threshold for spill decisions;
- Secure extra-regional purchases for next winter in addition to the 1500 mw-mos of storage to further reduce next winter's loss of load probability.

<u>SUMMARY RESULT: No additional reserves are necessary to achieve the insufficient reserve criterion.</u>

ANALYSIS: Meeting All Three Criteria

The objective of the following analysis is to determine the conditions under which each of the three criteria are simultaneously met.

STEP 1:
The first step in this analysis is to determine what amount of water is needed to meet Federal load obligations assuming minimal purchases. In this analysis, the system was operated to meet load and any water not needed to meet firm load obligations is stored in the system.

If available storage is 0 it means there is no water in excess of that required to meet load. If available storage is negative, the system would need to be drafted below target levels or purchases would be needed to meet load. As this table indicates, 54 MAF is the volume threshold upon which Federal load obligations are met. The amount of available storage has an implied band of uncertainty due to load overrun/underrun, shape of the runoff or unplanned outages of large generators. Given this band of uncertainty, the near-term reliability analysis will be updated with new data upon receipt of new final volume forecasts.

Summary of Meet Load Studies	
Jan-Jul Vol.	**Available Storage After Meeting Load (mw-mos)**
52.6 MAF	-1100
54.2 MAF	550
55.7 MAF	1200
57.5 MAF	3900
59.2 MAF	3350

**For detailed information about these studies, please see Appendix A*

In those conditions where volume exceeds what is needed to meet load, storage available can be used as follows:

- Store excess water to improve ability to meet Criterion 2;
- Generate energy and revenue to build reserves and improve ability to meet Criterion 3;
- Spill to improve fish passage and survival.

STEP 2:
As stated in the threshold for Criterion 1, a forecast error buffer is added to the volume forecasts to minimize risk associated with the volume forecast error. The following table shows the result of adding the 4.5 MAF forecast error buffer for the May Final Forecast:

Available Storage Conclusions for May Final Forecast	
Adj. Jan-Jul Vol.	**Available Storage After Meeting Load (mw-mos)**
57.1 MAF	-1100
58.7 MAF	550
60.2 MAF	1200
62.0 MAF	3900
63.7 MAF	3350

The table confirms the earlier information that a May final volume forecast of approximately 58.5 MAF is required to meet load and provide a less than 25% chance of having an actual volume of at least 54 MAF.

STEP 3:
As stated in the threshold for Criterion 2, 1500 mw-mos of the storage available after meeting load will be retained in the system to maintain reliability for Winter 2001-02. The following table shows the Available Storage After Load and Reliability that may be used for spill after reducing the initial storage quantities by 1500 mw-mos:

Available Storage Conclusions	
Jan-Jul Vol.	**Available Storage After Load and Reliability (mw-mos)**
57.1 MAF	**-2600**
58.7 MAF	**-950**
60.2 MAF	**-300**
62.0 MAF	**2400**
63.7 MAF	**1850**

As the table indicates, a May final volume forecast of approximately 60 MAF is required to meet load and store sufficient volume to maintain reliability for winter 2001-02.

CONCLUSION

CRITERIA	FORECAST REQUIRED	ASSUMPTIONS
Criterion 1: Near-Term Insufficiency (< 25% Probability of < 54 MAF)	May 58.5 MAF June 58.0 MAF July 57.5 MAF Actual 54.0 MAF	May 4.5 MAF Buffer June 4.0 MAF Buffer July 3.5 MAF Buffer Actual 54 MAF
Criterion 2: Long-Term Insufficiency (< 5% Loss of Load Probability)	1.5 MAF*	1.5 MAF is used as a proxy for the 1500 mw-mos of storage needed for reliability purposes.
Criterion 3: Insufficiency Due to Inadequate Reserves (< 20% Probability of $0 Reserves)	0 MAF	
TO MEET ALL CRITERIA	**MAY 60.0 MAF** **JUNE 59.5 MAF** **JULY 59.0 MAF** **ACTUAL 55.5 MAF**	

*Depending on the location and shape of the volume, the MAF requirement to provide the mw-mos of storage for reliability could change.

As stated previously, the amount of storage available for each volume has an implied band of uncertainty due to load overrun/underrun, shape of the runoff or unplanned outages of large generators. For that reason, the analysis included in the previous sections may be updated with as new data become available, and upon receipt of new final volume forecasts.

VI. Spring Operations (April-June)

A. Spring Spill for Fish Passage

The NMFS 2000 BO calls for spill to be implemented at all three Snake River collector projects "when seasonal average flows are projected to meet or exceed 85 kcfs." Since current water supply forecasts and flow models indicate that the 85 kcfs seasonal average is unlikely to be met in Spring 2001, no spill is planned at the three Snake River collector dams.

Depending upon volume forecasts, the Federal Agencies will evaluate available storage in the hydropower system this year that may be used for spring spill at the Lower Columbia dams. The decision process for spring spill is illustrated in Figure 1. For each decision point, three illustrative levels of spring spill are allocated among lower

Columbia River hydropower projects as outlined in Table 1on page 19, based on: a) the project spill priority list below; b) the passage timing data displayed in Attachment D; and c) three illustrative levels of available storage 400 mw-mos, 600 mw-mos, and 800 mw-mos.

Given the high biological value of spring spill, in late April 2001 the Federal Agencies began exploring alternatives for targeted spill operations on the lower Columbia River. Of the alternatives researched, a contingent spill swap with Grant County PUD emerged as the only viable option that would enable targeted spill without violating the established financial and reliability criteria. Though this contingent spill swap is still undergoing the required FERC approval process, on May 16, BPA requested that the COE implement a limited spill regime at Bonneville (50 kcfs, 24 hours per day) and The Dalles (30% of project inflow, 24 hours per day) dams, up to 300 mw-mos of total volume, or approximately twenty-one days. This spill regime is consistent with the following prioritization adopted by the Federal Agencies for allocating spring spill:

1. The Dalles—This project has the lowest calculated survival rate of the lower Columbia River projects. Turbine intakes for this project are not screened and turbine survival rates are quite low.

2. Bonneville—This project has the second lowest calculated survival rate of the lower Columbia River projects. Juvenile guidance at this project is poor, which results in a high rate of turbine passage.

3. John Day—This project has the second highest survival rate of the lower Columbia River projects. Standard length screens at this project are moderately effective at providing yearling migrants a route of non-turbine passage.

4. McNary—This project has the highest calculated survival rate of the lower Columbia River projects. Extended length screens at this project are very effective in providing yearling migrants a route of non-turbine passage. Transportation is also an option from this project.

5. Ice Harbor—Few fish will remain in the lower Snake River to pass Ice Harbor this year due to the collection and transportation of fish from the upper three projects.

Figure 1

PROPOSED DECISION PROCESS FOR 2001 SPILL OPERATIONS

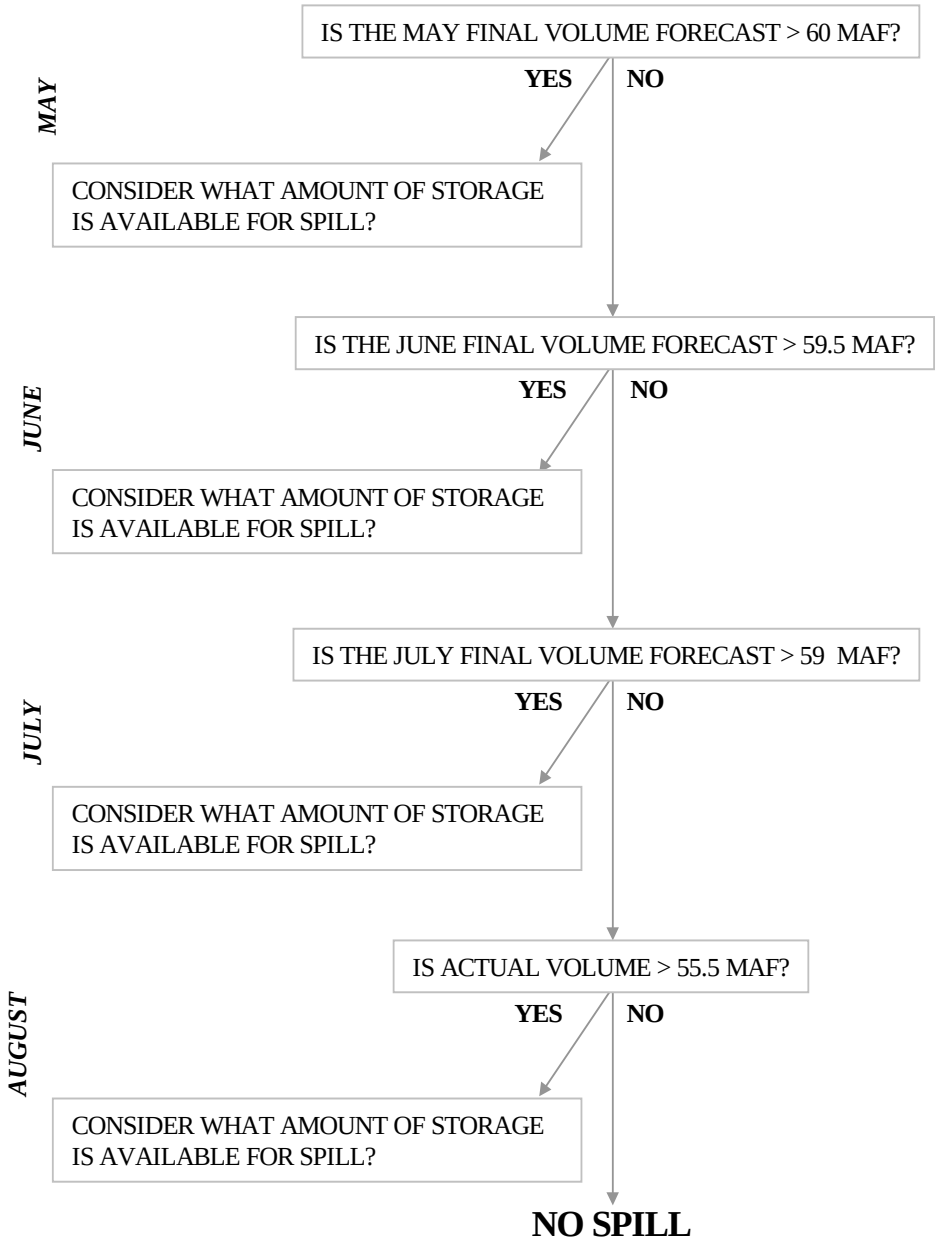


Table 1. Spill Levels Provided Under 3 Levels of Flexible Fish Storage
NOTE: This table represents where spill would be allocated and rough estimations of the levels of targeted spill given the mw-mos provided. Projects and dates of spill are flexible.

Decision Date*	**Spill Level Provided**		
May Decision	**400 mw-mos (May 7- June5)**	**600 mw-mos (May 7-June 6)**	**800 mw-mos (May 7-June 6)**
1. The Dalles	30% for 24 hours	40% for 24 hours	40% for 24 hours
2. Bonneville	50 kcfs for 24 hours	75 kcfs (day)/ 90 kcfs (nite)	75 kcfs (day)/ 90 kcfs (nite)
3. John Day	0	0	30%, 12 h/d
4. McNary	0	0	30 kcfs, 12 h/d
5. Ice Harbor	0	0	0
June Decision	**400 mw-mos (June 1-29)**	**600 mw-mos (June 1-29)**	**800 mw-mos (June 1-30)**
1. The Dalles	30% for 24 hours	40%, 24 h/d	40%, 24 h/d
2. Bonneville	50 kcfs for 24 hours	75/90 kcfs	75/90 kcfs
3. John Day	--	--	30%, 12 h/d
4. McNary	--	--	30 kcfs, 12 h/d
5. Ice Harbor	--	--	--
July Decision	**400 mw-mos (July 7-Aug 11)**	**600 mw-mos (July 1-Aug 7)**	**800 mw-mos (July 1-Aug 7)**
1. The Dalles	40%, 24 h/d	40%, 24 h/d	40%, 24 h/d
2. Bonneville	50 kcfs, 24 h/d	50 kcfs, 24 h/d	50/60 kcfs
3. John Day	--	30%, 12 h/d	30%, 12 h/d
4. McNary	--	--	
5. Ice Harbor	--	--	17 kcfs, 24 h/d
6. Dworshak Spill for Flow Aug		Remaining mw-mos	Remaining mw-mos
August Decision	**400 mw-mos (Aug 1-31)**	**600 mw-mos (Aug 1-31)**	**800 mw-mos (Aug 1-31)**
1. The Dalles	40%, 24 h/d	40%, 24 h/d	40%, 24 h/d
2. Bonneville	50 kcfs, 24 h/d	75/90 kcfs	75/90 kcfs
3. John Day	--	30%, 12 h/d	30%, 12 h/d
4. McNary	--	--	
5. Ice Harbor	--	--	17 kcfs, 24 h/d
6. Dworshak Spill for Flow Aug		Remaining mw-mos	Remaining mw-mos

**Table assumes No Spill occurs in months prior to the Decision Date.*
Spill, at those projects where it occurs, will be managed to the level of 120% TDG in tailraces and 115% in the forebays of the next project downstream, where variances to the 110% standard are in effect.

B. Spring Transport Operations

1. Snake River Transport

Spring transport from Snake River projects commenced on March 27, 2001. The benefit of transporting spring migrants from the Snake River has been demonstrated (NMFS 2000 Transport White Paper). All Snake River juvenile fish collected will be transported to below Bonneville Dam in 2001 due to the expected low flows and adverse inriver passage conditions (NMFS 2000 BO Action 40, page 9-76).

2. McNary Transport

Based on the anticipated reductions in spill and expected low river flows at lower Columbia River dams creating adverse inriver passage conditions in that reach this year, an emergency program of collection and transportation of spring migrants at McNary Dam commenced on April 30, 2001.

In addition, the biological benefits of transporting Upper Columbia spring migrants from McNary Dam will be evaluated in 2001. Under these special circumstances in 2001, up to 50% of spring migrants arriving at McNary Dam would be collected and transported to release sites below Bonneville Dam.

The proportion of the bypass-routed fish to be transported from McNary will be determined by the need to keep a certain proportion of the mid-Columbia PIT-tagged fish in-river to ensure adequate downstream detections for the PUDs' comparative survival studies and the availability of space in the barges coming from the Snake River.

C. Spring Flow Objectives at Lower Granite and McNary

The recommended average flow objective for 2001 in the NMFS 2000 BO at Lower Granite is 85 kcfs during the April 3 through June 20 period. The 2001 objective at McNary is 220 kcfs during the April 10 through June 30 period. Flows lower than the objectives will occur most weeks during the migration due to the extremely low hydrologic conditions and the need to refill headwater storage projects to their minimum elevation targets. Average spring flows at Lower Granite Dam on the Snake River are estimated to be 50 to 55 kcfs this year, and average flows at McNary Dam on the Columbia River are expected to be 135 to 140 kcfs.

D. Lower Granite Surging Operation

The Federal Agencies had proposed to conduct a Lower Granite pool surging operation during late April and May which, when combined with a limited spring flow augmentation using Brownlee and/or Dworshak storage, was anticipated to help move juveniles through the Lower Granite pool, as well as the other Lower Snake pools, to the collection facilities for transportation. The pool surging and refill operation would have required using Brownlee Reservoir to support this operation. The Federal Agencies approached Idaho Power Company (IPC) about this, but due to IPC's concerns about Brownlee refill, an agreement could not be reached. However, to facilitate water releases

later in the day from Lower Granite Dam, an additional 0.5 feet of operating range in the Lower Granite Reservoir was obtained after consulting with the Technical Management Team. This increased flexibility will allow for some reshaping of peaked discharges from the Hells Canyon complex. Whenever possible, the increased flows will be maintained until midnight to enhance the collection and transport of juvenile salmonids.

E. Spring Flow Objective for the Mid-Columbia River

The recommended average flow objective in the NMFS 2000 BO at Priest Rapids is 135 kcfs during the April 10 through June 30 period. Any flexibility to shape spring flows that is available after meeting load will be guided by the following considerations: a) the desire to refill Grand Coulee Reservoir to an elevation of 1280 feet or higher by June 30; b) the timing and magnitude of the juvenile migration; c) water temperature, spill, and total dissolved gas levels; d) adult fish; e) other requirements for improved survival of listed fish; and f) power system reliability requirements. Flows lower than the objective will occur most weeks during the migration due to the extremely low hydrologic conditions and the need to refill headwater storage projects to their minimum elevation targets. Average spring flows at Priest Rapids Dam are estimated to be 70 to 80 kcfs this year.

F. Spring Bull Trout Minimum Flow Requirements

The Federal Agencies will endeavor to maintain minimum discharges at Hungry Horse and Libby as called for in the USFWS 2000 Biological Opinion for bull trout protection and habitat productivity.

G. Vernita Bar Flows

Vernita Bar redd protection flows of 65 kcfs or greater were provided until the fall chinook emergence criteria was met. Flows were then ramped down, 5 kcfs/day, beginning May 8 to minimize stranding of chinook fry. The 2001 Hanford Reach stranding protocol will continue to be implemented as the fry mature and leave the Reach.

H. Minimum Operating Pool (MOP)

Beginning April 12, as coordinated through TMT on April 11, Little Goose and Lower Monumental reservoirs in the lower Snake River will be operated within one foot of MOP until small numbers of juvenile fish are present and adult fall chinook salmon begin entering the lower Snake River (in late August). Lower Granite and Ice Harbor pools will be operated one foot above MOP this year to maintain navigation through both reservoirs.

In the lower Columbia River, John Day Reservoir will be operated within a 1.5 foot range of the minimum level that provides irrigation pumping when requested by TMT. The planning dates for this operation are April 10 through September. BPA may request exceedances for projects to operate outside of pool restrictions if there are capacity constraints on the power system.

I. Spring Reservoir Operations

The proposed minimum elevation refill targets by June 30 in order of project priority are:

Headwater Storage Project Priority	June 30 Targeted Elevation	Probability of Achieving Target Elevation (May Final Estimate)	Reason for Priority
1. Dworshak	1580	69%	• Temperature control in Snake River • Snake River summer flow augmentation
2. Libby	2439	40%	• Columbia River summer flow augmentation • Minimum flow requirements for bull trout
3. Hungry Horse	3540	22%	• Columbia River summer flow augmentation • Minimum flow requirements for bull trout
Other Storage Project Priority	**Targeted Elevation**	**Probability of Achieving**	**Reason for Priority**
Grand Coulee	1280	N/A	• Columbia River summer flow augmentation • Tribal trust responsibilities

Due to the low level of storage in headwater storage projects this spring, the FCRPS will be operated to fill storage reservoirs to less than full pool reservoir elevations by June 30. The probabilities of reaching minimum elevation targets will be reviewed and updated with each new runoff forecast and expected operations.

1. Dworshak Operations

Refill of Dworshak to 1580 feet is a top priority due to Dworshak's ability to contribute to summer flow augmentation and the temperature control benefits it can provide in the Snake River.

2. Libby Operations

The Federal Agencies have prioritized reaching elevation 2439 feet at Libby by June 30 because it is anticipated that at this elevation Libby can be operated to pass inflow and still provide minimum flows needed for bull trout.

3. Hungry Horse Operations

The Federal Agencies have prioritized reaching elevation 3540 feet at Hungry Horse by June 30 because it is anticipated that at this elevation Hungry Horse can be operated to pass inflow and still provide minimum flows needed for bull trout. Hungry Horse outflow would not be reduced below the bull trout minimum to achieve elevation 3540.

4. Grand Coulee Operations

Grand Coulee will be operated to achieve elevations in May that allow sufficient irrigation deliveries to the Columbia Basin Project without drawing Banks Lake below elevation 1565 feet.

VII. Summer Operations (July-August)

A. Summer Spill for Fish Passage

As stated above, spill at non-collector dams is a high priority, with spill provided at the following dams in order of priority:

1. The Dalles—This project has the lowest subyearling passage survival rate of the lower Columbia River projects. Turbine intakes for this project are not screened and turbine survival rates are quite low.

2. Bonneville—This project has the second lowest subyearling passage survival rate of the lower Columbia River projects. Standard length screens at this project are not very effective at guiding subyearling migrants.

3. John Day—This project has the third lowest subyearling passage survival rate of the lower Columbia River projects. Standard length screens at this project are not very effective at guiding subyearling migrants. Spill at this project is effective at moving a good percentage of juveniles.

4. Ice Harbor—Few fish will remain in the lower Snake River to pass Ice Harbor Dam this year due to the collection and transportation of fish from the upper three projects. This project has a lower subyearling passage survival rate than McNary Dam.

Depending upon volume forecasts, the Federal Agencies will evaluate available storage in the hydropower system that may be available for summer spill. The decision process for summer spill is illustrated in Figure 1, page 18. For each decision point, three illustrative levels of summer spill are allocated among lower Columbia River hydropower projects as outlined in Table 1, page 19, based on: a) the project spill priority list above; b) the passage timing data; and c) three illustrative levels of available storage—400 mw-mos, 600 mw-mos and 800 mo-mos.

B. Summer Transport Operations

To improve overall juvenile fish survival through the FCRPS, all juvenile fish collected will be transported from the three Snake River and McNary collector dams. This transport operation is consistent with actions 42-44 in the NMFS 2000 BO. The summer transport strategy is to maximize collection and transportation due to low inriver survival rates.

C. Summer Flow Objective at Lower Granite and McNary

The recommended average flow objective for 2001 in the NMFS 2000 BO at Lower Granite is 50 kcfs during the June 21 through August 31 period. The 2001 objective at McNary is 200 kcfs during the July 1 through August 31 period. Flows lower than the objectives will occur most weeks during the summer migration due to the extremely low hydrologic conditions and the fact that some storage projects will not refill. Average summer flows at Lower Granite Dam on the Snake River are projected to be about 30 kcfs this year, and average flows at McNary Dam on the Columbia River are expected to be 95 to 100 kcfs.

Storage in Dworshak Reservoir and the use of its selective withdrawal facilities provides both flow and temperature control for Snake River subyearling chinook. Dworshak will begin drafting in late June or early July when water temperatures at Lower Granite forebay approach the state water quality standard of 68 degrees F.

D. Summer Bull Trout Minimum Flow Requirements

The Federal Agencies will endeavor to maintain minimum discharges at Hungry Horse and Libby as called for in the USFWS 2000 Biological Opinion for bull trout protection and productivity. However, as the season progresses, consideration may be given to reducing the bull trout minimums at Libby Dam to 4,000 cfs in favor of meeting refill objectives.

E. Summer Reservoir Operations

1. Storage Reservoir Operations

Generally, Federal storage projects will be drafted to the following 2000 BO elevations by August 31 for summer flow augmentation: Dworshak to 1520 feet; Libby to 2439 feet or as needed for minimum flows for bull trout; Hungry Horse to 3540 feet or as needed for minimum flows for bull trout; and Grand Coulee to 1278 feet and Banks Lake to elevation 1565 feet. These levels may be modified as necessary to store additional water that is needed to achieve the forecasted insufficiency criterion.

2. Upper Snake Reservoir Operation

Approximately 90 kaf is currently available for flow augmentation from firm Reclamation sources above Lower Granite Dam. The delivery of 43 kaf of available water will be completed by the end of May per recommendations received in the TMT. Reclamation continues to seek additional volumes of water for instream flows. In

addition, Idaho Power Company (IPC) has acquired energy associated with an estimated 109 kaf of diversion that is considered a cumulative effect of irrigation/power actions. Delivery of water from Reclamation sources will be managed through the TMT process. With respect to the delivery of augmentation water below IPC's Hells Canyon Complex, this is still an issue under discussion and has yet to be resolved.

3. Brownlee Operation

The Federal Agencies have approached IPC on potential shaping operations. They have indicated they will operate for power purposes unless otherwise compensated. This is still an issue under discussion and has yet to be resolved.

VIII. Other Operations

A. Fish Facility Operations

Operate all juvenile and adult fish passage facilities to criteria agreed to in the 2001 Fish Passage Plan, including emergency operations. Operating fish facilities within criteria will ensure adequate juvenile and adult fish passage conditions at all mainstem dams on the Snake and Columbia rivers.

B. Water Quality – Temperature and Total Dissolved Gas

Continually monitor water temperature and total dissolved gas levels in the Snake and Columbia rivers. Consider operational effects on water quality and fish passage.

C. Treaty Fishery Operations

Regarding stable pool elevations during Zone 6 fishing, the US COE has agreed to operate the Bonneville project forebay near the top 1.5 feet of the normal operating range (75.0 feet to 76.5 feet), while maintaining some operational flexibility in the other Zone 6 pools to meet other project needs.

D. Research, Monitoring, and Evaluation

2001 presents an important opportunity to learn as much as possible about juvenile and adult fish passage behavior and survival in a low water year. Various research and monitoring evaluations have been designed to evaluate the biological effects of 2001 migration conditions.

IX. Updates/Process

A. Connection to Water Management Plan, TMT Guidelines

The Federal Agencies Criteria and Priorities for 2001 FCRPS Operations (Appendix A) serves as the overarching framework to this more detailed 2001 Operational Plan. Through defining the priorities and parameters within which operations must fall this

year, the 2001 Operations Plan provides guidance to the TMT for its development of the 2001 Water Management Plan and its in-season water management activities. The Water Management Plan will be more detailed and will be adapted in season to meet the needs of fish migration, power, and changing water conditions within the parameters set by the 2001 Operations Plan.

B. Coordination on Updates

The financial and reliability analyses that drive the operational parameters will be updated on a regular basis throughout the migration season. If results of revised analyses warrant a change to the operational parameters, the 2001 Operations Plan will be updated to reflect such changes.

The Federal Agencies may update the Plan throughout the season if the Federal Executives recommend changes in the operating priorities. The Federal Agencies may also update the Emergency Criteria of the Operations Plan when changes in priorities or conditions warrant update of the technical input. Any updates to the Plan will be posted to the TMT Website at www.nwd-wc.usace.army.mil/TMT/index.html, and on the Federal Caucus's Website at www.salmonrecovery.gov. Meetings of the Regional Executives will be convened on an as-needed basis.

C. In-Season Decision Making

In-season decision making on real-time implementation of the Water Management Plan will remain the responsibility of the TMT. Using the Columbia River Regional Forum decision making construct, the Federal Executives will be the final dispute resolution body during 2001. Consistent with this construct and with the Federal Executives' meeting schedule, the TMT will meet on Wednesday morning during the same week as scheduled Federal Executive meetings. Therefore, if dispute resolution from TMT is needed, the IT may convene on Thursday, and the Executives will be available on Friday to make a final decision if necessary.

Appendix A

Federal Agencies' Criteria and Priorities for 2001 FCRPS Operations
March 30, 2001

BACKGROUND

Poor water conditions in the Columbia River basin coupled with an extraordinary power market on the West Coast have caused an unprecedented river management situation this year. In recognition of obligations to operate FCRPS projects to meet multiple purposes consistent with: (1) authorizing legislation, (2) additional laws including the Endangered Species Act (ESA), the Clean Water Act (CWA), Pacific Northwest Electric Power Planning and Conservation Act, Reclamation Laws, and cultural resource laws such as the National Historic Preservation Act and the Native American Grave Protection and Repatriation Act, (3) treaties and executive orders with Pacific Northwest Indian tribes and the Federal Government's trust responsibilities, and (4) existing Biological Opinions for the operation of hydroelectric reservoir projects in the FCRPS and the marketing and transmission of power from those projects, these principles are proposed by the regional offices of the following federal agencies: Bonneville Power Administration, U.S. Army Corps of Engineers, Bureau of Reclamation, National Marine Fisheries Service, U.S. Fish and Wildlife Service, and Environmental Protection Agency. These principles recognize that achieving the objectives of the system's multi-purpose operation this year is made more difficult by the continuing poor water conditions, and that the unprecedented power market conditions this year may result in emergency operations of the FCRPS. The six Federal agencies agree to seek consensus on emergency operations that minimize variations from the operations described in existing Biological Opinions, by considering priorities for fish operations to minimize effects on listed and unlisted fish populations, and to seek offsetting measures sufficient to achieve the objectives of the Opinions.

Existing Biological Opinions recognize that water management actions may change due to unforeseeable power system, flood control or other emergencies. Emergencies may include a power emergency; one based on insufficient power supply to meet demand in the Pacific Northwest. There may also be West Coast demand involving health and human safety that requires an emergency response. Emergency actions should be viewed as a last resort, and will not be used in place of long-term investments necessary to allow full, uninterrupted implementation of the required reservoir operations while maintaining other project purposes, such as an adequate and reliable power system.

It is recognized that federal agencies may, through adaptive management, adjust FCRPS operations over time, as there are deteriorating or improving changes in circumstances, for example water supply, economic outlook, power market conditions, conditions affecting listed fish, fish and wildlife, water quality, cultural resources, or project uses. Continued coordination will ensure federal agencies have current information and appropriate input from all interested parties on which to base their decisions.

These principles are not intended to and do not alter or affect the statutory and other legal rights, authorities, responsibilities, and obligations of the federal agencies and the right and authority to interpret and implement other statutory authority. These principles are intended only to improve the coordination of the federal agencies in their management of the FCRPS, and are not intended

to, nor do they create any right, benefit, or new trust responsibilities, substantive or procedural, enforceable at law or equity by a party against the United States, its agencies, its officers, or any person.

ACTIONS PRECEEDING AND DURING A POWER SYSTEM EMERGENCY DECLARATION

In order to meet Pacific Northwest load requirements, the following actions will be taken prior to declaring and throughout a power system emergency:

1. Provide for voluntary conservation;
2. Implement conservation measures, to the extent possible;
3. Exercise contract provisions that reduce firm load obligations;
4. Pursue purchase of load reductions consistent with criterion 3 below;
5. Pursue purchases consistent with criterion 3 below; and
6. Pursue acquisition of irrigation pumping load consistent with criterion 3 below;

POWER EMERGENCIES: CRITERIA AND PROCESS

Assuming an adjustment in FCRPS operations is required to maintain the reliability of the FCRPS, the following criteria will be used for determining a risk to reliability and a declaration of a power emergency. The criteria are:

4. Operational Power System Reliability due to near-term insufficiency. Defined as insufficiency of electrical generation to meet Pacific Northwest electrical near-term demand. An indicator of resource scarcity may be a quick rise in prices over a few hours or days.
5. Planning Power System Reliability due to a forecasted insufficiency. The reliability criterion is exceeded when the probability of insufficient generation to meet load exceeds 5% for any of the next 12 months.
6. Power System Reliability due to inadequate reserves to acquire sufficient electrical generation and maintain other BPA funded activities, including programs to protect, mitigate and enhance fish and wildlife. The financial criterion for a power system emergency is exceeded when the probability of FCRPS financial reserves being $0 or less after meeting all expected financial obligations exceeds 20% for any of the next 12 months.

These planning criteria will be estimated using statistical distributions of estimated future values for streamflows, revenues, power prices and similar inputs to cashflows, and will also take into account expected benefits of tools which are reliably available to mitigate cashflow problems, such as monthly 4(h)(10)(c) credits.

All power emergencies will be declared consistent with TMT's Interim Protocols for Emergency Operations dated September 22, 2000, or as subsequently amended, including, as soon as practicable, notice to states and tribes. The Protocols may be found at:

http://www.nwd-wc.usace.army.mil/TMT/2000/ManPlan/emerprotocl0922.PDF.

FISHERY OPERATIONS PRIORITIES FOR 2001

1. Recognizing conditions may change, the following are the priorities for fishery operations for January through August of 2001.

    a) Power/Chum Flows through a minimum of 65% emergence
    b) Full fish transportation in the Snake River
    c) Transport evaluation from McNary Dam in the spring
    d) Balance spring spill operations for ESA listed stocks (wild and hatchery) at mainstem FCRPS dams with uncertainty associated with volume forecast error
    Allocate any spill available within the following project priority
        i) The Dalles (with a consistent operation for study purposes)
        ii) Bonneville
        iii) John Day
        iv) McNary
        v) Ice Harbor
    e) Lower Granite surging operation targeted to move fish through pool to Lower Granite
    f) Balance summer flow augmentation (June 30 refill) and spring spill operations
        i) Refill of Dworshak has highest priority for providing fish flow and water quality benefits
        ii) Ensure sufficient water in Hungry Horse and Libby to provide bull trout minimum flows
    g) Minimum Operating Pool on the Snake River and John Day within 1½ foot of minimum level for irrigation pumping.
    h) Balance Vernita Bar protection level and Grand Coulee Elevation
    Consider reducing protection flows if the reduced protection flows, combined with forecasts of BPA loads or streamflows below Grand Coulee provide a high confidence of benefit in Grand Coulee elevation
    i) Summer spill operations at mainstem FCRPS dams for ESA listed stocks (wild and hatchery)
    j) Targeted spring spill for non-listed hatchery releases
    k) Targeted summer spill for non-listed hatchery releases
    l) Spring system flow augmentation, with emphasis on May

2. Monitor and evaluate (with EPA technical assistance) and consider effects on water quality and any applicable water quality standards, in determining priorities.

3. Convene TMT to seek input on the timing of implementation and provide greater definition to these priorities, with elevation to Implementation Team or Regional Federal Executives, as necessary.

(Italics indicate operations that have already been implemented and completed.)

Appendix B--Study Assumptions for BPA Analysis

To do these studies, BPA's 90-Day model was used with five different streamflow traces ranging from a January-July volume at The Dalles of 52.6 MAF to 59.2 MAF, with a mean of 55.9 MAF. Note that these studies run through September, so the fact that the 57.5 MAF case has more Flexible Storage than the 59.2 MAF case is due to differences in August-September streamflows. All federal hydro projects were initialized to their April 1 elevations and were operated according to the assumptions discussed in the Appendix. Furthermore, no fish spill was assumed in these studies and the federal hydro projects achieved their BO elevations by the end of the Summer.

- Study assumptions
  - Projects initialized to their April 1 elevations
  - Maintain Vernita Bar through May 7 (forced surplus for 1 week in the 57.5 MAF year)
  - No fish spill (but includes sluiceway spill)
  - No additional water or load loss due to irrigation buyouts.
  - LIB: 4 kcfs through June
    6 kcfs min in July-Aug or higher to achieve 2439' by end of August
    4 kcfs min in Sep or higher to achieve 2432' by end of September
  - HGH: min (.4 kcfs) or C Falls min (3.2 kcfs)
    Run harder in July-Aug if we can reach 3540' by end of August
  - DWR: min until July 1 or until 1580' is reached (keep filling if GCL gets full)
    July: run 10 kcfs until 1520' is reached, then run at min
  - Arrow: maintain trout spawning flow of 30 kcfs through June. Pick up flows mid-May if GCL needs the water, but stay above TSR elevation
    Operate to TSR or higher elevation July-Sep (this is where water is stored for Flexible Storage)
  - BRN: Pass-inflow through June (2075')
    July: draft to 2064'; Aug: draft to 2045'; Sep: draft to 2040'
  - Mica: TSR for each ESP flow
  - Dun: TSR for each ESP flow
  - Koot: Fill to 1745.3' by June (try to maintain 20 kcfs May-Aug)
    Evenly draft to 1743.3 by end of August
    Pass-inflow in Sep
  - Kerr: Min until full (2893'), then pass-inflow
  - GCL: Operate as necessary to meet load and Vernita Bar while trying to achieve at least 1280' sometime in July
    End September at 1283'

Appendix C—Additional Information from the NWPPC Reliability Study

Study Assumptions

- Loads and purchase quantities/prices consistent with previous NWPPC analysis
- Previous studies indicated risk of September problems, which required further drafts from storage. This study was initialized on October 1 and assumed no additional drafts were required in September. This will be looked into further
- DSI load assumption generally consistent with the BPA's rate mitigation proposal
- 0% load growth assumed for Oct-Dec 2001
- 2% load growth assumed for Jan-Mar 2002 (relative to 2000)
- run for 500 simulations, with Dec through March run daily with 4 demand sub-periods each day
- Temperature years were sampled randomly from the 1929-2000 historical record.
- Water years were sampled randomly from your specified water year set.
- Stochastic treatment of thermal forced outage was used in these studies.

Appendix D

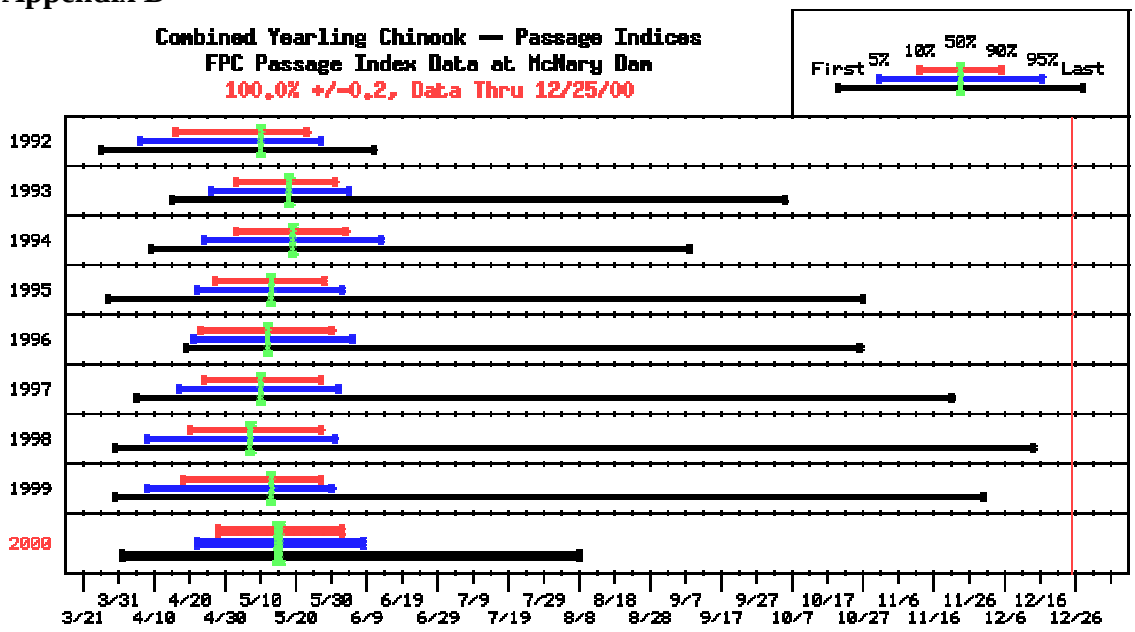


Figure 1. Combined Yearling Chinook -- Passage Indices Outmigration Timing Characteristics

FPC Passage Index Data at McNary Dam

	---------- Passage Dates ----------							
Year	First	1%	5%	10%	50%	90%	95%	Last
1992	03/26	04/04	04/06	04/16	05/10	05/23	05/27	06/11
1993	04/15	04/18	04/26	05/03	05/18	05/31	06/04	10/05
1994	04/09	04/13	04/24	05/03	05/19	06/03	06/13	09/08
1995	03/28	04/08	04/22	04/27	05/13	05/28	06/02	10/27
1996	04/19	04/19	04/21	04/23	05/12	05/30	06/05	10/26
1997	04/05	04/06	04/17	04/24	05/10	05/27	06/01	11/21
1998	03/30	04/05	04/08	04/20	05/07	05/27	05/31	12/14
1999	03/30	04/05	04/08	04/18	05/13	05/27	05/30	11/30
2000(1)	04/01	04/10	04/22	04/28	05/15	06/02	06/08	08/08
Mean(2)	04/04	04/10	04/16	04/24	05/13	05/28	06/03	10/15

Year	Middle 80% Duration (3)	Total MCN Passage
1992	38	2514319
1993	29	1729010
1994	32	2572338
1995	32	2879069
1996	38	1240878
1997	34	1184530
1998	38	1727071
1999	40	3692944
2000(1)	36	1986380

(1) Current year 2000 passage dates and durations are predicted by the Realtime Forecaster; yearly totals are to date.

(2) Mean of historical years.

(3) Duration of middle 80% of run in days.

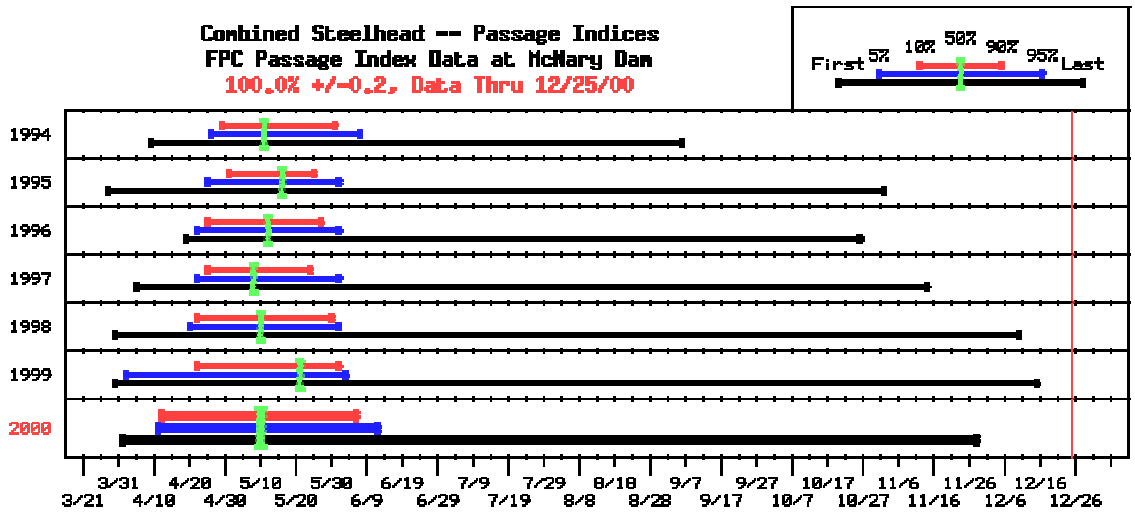


Figure 2. Combined Steelhead -- Passage Indices Outmigration Timing Characteristics FPC Passage Index Data at McNary Dam

	---------- Passage Dates ----------							
Year	First	1%	5%	10%	50%	90%	95%	Last
1994	04/09	04/19	04/26	04/29	05/11	05/31	06/07	09/06
1995	03/28	04/05	04/25	05/01	05/16	05/25	06/01	11/02
1996	04/19	04/20	04/22	04/25	05/12	05/27	06/01	10/26
1997	04/05	04/19	04/22	04/25	05/08	05/24	06/01	11/14
1998	03/30	04/16	04/20	04/22	05/10	05/30	06/01	12/10
1999	03/30	03/30	04/02	04/22	05/21	06/01	06/03	12/15
2000(1)	04/01	04/09	04/11	04/12	05/10	06/06	06/12	11/28
Mean(2)	04/04	04/13	04/19	04/26	05/13	05/28	06/02	11/07

	Middle 80% Duration	Total MCN
Year	(3)	Passage
1994	33	106520
1995	25	734878
1996	33	792462
1997	30	1234024
1998	39	571119
1999	41	1004348
2000(1)	56	617482

(1) Current year 2000 passage dates and durations are predicted by the Realtime Forecaster; yearly totals are to date.
(2) Mean of historical years.
(3) Duration of middle 80% of run in days.