

RECLAMATION

Managing Water in the West

KLAMATH PROJECT 2011 OPERATIONS PLAN (REVISED)

May 25, 2011

INTRODUCTION

This is the 2011 Operations Plan (Plan) for the Bureau of Reclamation's (Reclamation) Klamath Project (Project), which is located within the upper Klamath River Basin in southern Oregon and northern California. This Plan describes estimated Project operations from April 1, 2011, through March 31, 2012 based upon current and expected hydrologic conditions.

Reclamation developed this Plan to serve as a planning aid for agricultural water users, Klamath Basin Tribes, national wildlife refuges, and other interested parties. This plan provides an estimated Project water supply to the following areas:

- Upper Klamath Lake delivery area: This area includes lands in Oregon and California that receive Project water primarily from Upper Klamath Lake (UKL) and/or the Klamath River. This area also includes the Tule Lake and Lower Klamath National Wildlife Refuges.
- East Side delivery area: This area includes lands within the Langell Valley Irrigation District and Horsefly Irrigation District on the east side of the Project area. This area receives water from Clear Lake Reservoir, Gerber Reservoir, and the Lost River.

In response to both the 2010 National Marine Fisheries Service (NMFS) biological opinion (BO) and the 2008 U.S. Fish and Wildlife Service (Service) BO, Reclamation has developed a "Variable Base Flow" (VBF) procedure for the 2011 operations. The VBF procedure was developed based on these objectives: (1) provide certainty in compliance with the UKL minimum elevations, as outlined in Table 2-1 of the 2008 Service BO; and (2) provide a procedure that tracks the flows outlined in Table 18 of the 2010 NMFS BO and Reasonable and Prudent Alternatives (RPA), which are designed to meet the needs of coho salmon during critical periods of the year. The elements of the VBF procedure are described in more detail below.

Variable Base Flow Procedure

For the April through September time period, a base flow in the Klamath River below Iron Gate Dam (IGD) will be determined for each month using a table that is based on the most current 70% exceedence UKL Inflow forecast through September as issued by Natural Resources Conservation Service (NRCS). This table (Table 1) relates inflow forecasts from percent of average to a "base" flow past Iron Gate.

Table 1: Forecast and Flows Used to Determine Iron Gate Dam (IGD) Base Flows in Each Time Period

Current NRCS 70% Exceedence Forecast through September	April 1st -15th	April 16th - 30th	May 1st -15th	May 16th - 31st	June 1st -15th	June 16th - 30th	July 1st -15th	July 16th - 31st	August 1st - 31st	September 1st - 31st
(% Average)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
28%	1325	1325	1175	1175	1025	1025	805	805	942	1000
37%	1383	1383	1255	1255	1099	1099	838	838	947	1000
41%	1442	1442	1335	1335	1173	1173	872	872	952	1000
46%	1500	1500	1415	1415	1246	1246	905	905	957	1000
61%	1500	1500	1509	1509	1320	1320	925	925	964	1003
63%	1500	1500	1603	1603	1379	1379	945	945	971	1006
66%	1500	1500	1670	1670	1439	1439	973	973	984	1012
71%	1500	1500	1736	1736	1498	1498	1001	1001	997	1018
76%	1500	1500	1803	1803	1522	1522	1029	1029	1010	1024
79%	1745	1745	1865	1865	1546	1546	1034	1034	1013	1029
86%	1989	1989	1928	1928	1570	1570	1040	1040	1017	1034
92%	2234	2234	1990	1990	1594	1594	1045	1045	1021	1038
93%	2478	2478	2053	2053	1616	1616	1051	1051	1024	1043
103%	2723	2723	2115	2115	1638	1638	1056	1056	1028	1048
106%	2877	2877	2379	2379	1660	1660	1063	1063	1032	1054
124%	3030	3030	2642	2642	1682	1682	1070	1070	1035	1060
130%	3182	3182	2748	2748	1702	1702	1074	1074	1037	1064
139%	3333	3333	2854	2854	1723	1723	1078	1078	1039	1067
150%	3485	3485	2960	2960	1743	1743	1082	1082	1041	1071

For the 2011 operations year, the April 1st 70% exceedance UKL inflow forecast for April – September was 595,000 Acre-Feet (AF), or 116% of the NRCS average inflow for this time period (515,000 AF). The more recent May – September forecast was 420,000 AF or 124% of average. Using Table 1, the base Iron Gate flows for April were between 2877 cfs and 3030 cfs for April 1st – 15th. Using liner interpolation, the flows were required to average a minimum of 2962 cfs.

As the elevation of UKL fluctuates, additional releases will be made above certain “threshold” elevations. The threshold elevations for UKL were developed through a trial and error process in order to better track the 2010 NMFS RPA Table 18 flows while maintaining the 2008 Service BO minimums for UKL. The threshold elevations are shown below in Table 2. Flows will be released to mimic the natural inflow pattern into UKL as best as possible above these elevations. During the month of June, Reclamation will be working with NMFS and FWS to determine whether or not flows above 1,743 cfs are warranted based on the current hydrologic conditions.

Table 2: Threshold Elevations

Time Period	Threshold Elevations for UKL (in feet)
April 1-15	4143.0
April 16-30	4142.9
May 1-15	4142.6
May 16-31	4142.4
June 1-15	4142.5
June 16-30	4142.5
July 1-15	4141.8
July 16-31	4141.8
August 1-15	4141.0
August 16-31	
September	4141.0

In periods when Threshold Releases are being made during the months of March, April and May, a maximum controlled flow release will be determined. Threshold Releases will not be increased above the maximum unless required for flood control. Therefore, the elevation of UKL will increase above the threshold elevations shown above if the flows at IGD are at maximum. Maximum flows will be determined based on the current % of average forecast shown in Table 3. Once the flood control limit is reached, flows will be released in order to maintain a full lake until the flows decrease back to the maximum flow.

Table 3: Forecast and Maximum Flows for March through May

	March	April	May
Current 70% Exceedence Forecast	Max Flow (cfs)	Max Flow (cfs)	Max Flow (cfs)
≥103%	3940	3930	3225
106%	3990	4065	3390
124%	4160	4230	3480
130%	4285	4425	3615
139%	4355	4585	3710
150+%	4460	4790	3845

UPPER KLAMATH LAKE DELIVERY AREA

ESTIMATED INFLOW TO UKL DURING 2011:

The estimated inflow (in AF) to UKL from April 1 through September 30, 2011, using the NRCS forecast at 50% exceedance and 70% exceedance were 630,000 AF and 595,000 AF, respectively. As of May 1, 2011, UKL elevation was 4143.10 ft and storage above elevation 4136.0 is approximately 498,000 AF with an additional 23,500 AF stored in the Agency Lake Ranch and Barnes Ranch areas.

ESTIMATED PROJECT WATER SUPPLY FROM UKL FOR IRRIGATION AND REFUGES DURING 2011:

- **Water Supply for Irrigation:**
 - **Project Demand:** The Project water demand for irrigation from UKL is estimated to be between 320,000 AF and 349,000 AF for April 1st through September 30th of 2011 based on historical usage from 1981-2000 in similar year types.
 - **Project Deliveries:** The Project water supply for irrigation from UKL is estimated to be about 334,000 AF through September 30, 2011. This estimate is based upon the hydrological conditions existing on April 1st and the 70% exceedance inflow forecast for April through September. This quantity may increase or decrease because actual conditions may differ from those assumed by the forecast model. Project water deliveries after October 1, 2011, would be contingent upon availability of water from UKL.
- **Water Supply for Refuges:** Based on the 70% exceedance inflow forecast for April through September, it is expected that approximately 20,000 AF of water will be available from UKL for the Refuge. This quantity may increase or decrease depending on current hydrologic conditions and may not be evenly distributed over all months.

EAST SIDE DELIVERY AREA

ESTIMATED PROJECT WATER SUPPLY FOR THE EAST SIDE DELIVERY AREA DURING 2011:

- **Water Supply for Irrigation:**
 - **Clear Lake Reservoir Project Demand:** The Project water demands for irrigation from Clear Lake Reservoir are expected to be the average at 34,071 AF to be used April 1st through September 30th of 2011.
 - **Gerber Reservoir Project Demand:** The Project water demands for irrigation from Gerber Reservoir are expected to be average at 35,012 AF to be used April 1st through September 30th of 2011.
 - **Project Deliveries:** Full project deliveries based on the above stated demands are expected to be made from both Clear Lake and Gerber Reservoirs for 2011. This was determined by the elevations on April 1st, the minimum elevations on September 30th, the estimated evaporation and the estimated seepage.

Table 4 displays the elevations of Clear Lake and Gerber Reservoirs on April 1st, the forecasted April through September inflows (various exceedances) and the minimum elevations needed to meet the BO requirements for endangered suckers on September 30 (i.e., to provide adequate over-wintering habitat for endangered suckers).

Table 4. Estimated Project Water Supply for East Side Delivery Area

	April 1 Elevation (feet)	April 1 Capacity (AF)	Forecast (90% Exc) (AF)	Forecast (70% Exc) (AF)	Forecast (50% Exc) (AF)	ESA Minimum Sept 30 Elevation	ESA Minimum Sept 30 Capacity (AF)
Clear Lake Reservoir	4526.23	130,220	39,000	54,000	65,000	4520.6	41,150
Gerber Reservoir	4823.38	52,500	13,100	20,000	25,000	4798.1	25,778

OTHER INFORMATION RELEVANT TO 2011 OPERATIONS PLAN

LAKE AND RIVER REQUIREMENTS AFFECTING AVAILABILITY OF WATER FOR IRRIGATION AND REFUGE USE

KLAMATH RIVER OPERATIONAL FLOW REQUIREMENTS:

The river flow operational criteria include the following down ramping rates at Iron Gate Dam (IGD):

- When the flow at IGD is greater than 3,000 cubic feet per second (CFS): IGD ramp down rates will follow the rate of decline of inflows into UKL combined with accretions between Keno Dam and IGD.
- When IGD flows are above 1750 CFS but less than 3,000 CFS: Decreases in flows of 300 CFS or less per 24-hour period, and no more than 125 CFS per four-hour period.
- When IGD flows are 1,750 CFS or less: Decreases in flows of 150 CFS or less per 24-hour period, and no more than 50 CFS per two-hour period.

LAKE ELEVATION CRITERIA FOR UKL:

Reclamation will operate the Project so that elevations in UKL are maintained at levels that are consistent with Reclamation's 2007 Biological Assessment and the 2008 Service's BO as shown in Table 5.

If UKL elevations begin to drop below the minimum elevation trajectories, Reclamation will work with KID, TID, and KDD to ensure that water deliveries do not cause UKL elevations to fall below the end of month BO minimum elevations identified in Table 5 below.

Table 5. UKL BO Minimums

Date	Biological Opinion Minimum for UKL (feet)
April 30	4142.20
May 31	4141.60
June 30	4140.50
July 31	4139.30
August 31	4138.10
September 30	4137.50

COMPARISON OF ESTIMATED WATER SUPPLY TO HISTORIC DELIVERY:

The following comparison is provided for information purposes only. Table 6 compares the 2011 estimated Project water supply for irrigation from April 1st through September 30th to average historical deliveries from the indicated time periods.

Table 6. Comparison of Estimated 2011 Project Water Supply to Historic Deliveries

	2011 Estimated Supply April - September (AF)	Average Historic Delivery (AF)
UKL Delivery Area	334,000	337,381*
East Side Delivery Area	69,083	69,083**

*UKL Average Deliveries were calculated based on diversions from 1961 – 2000.

** East Side average deliveries were calculated based on the available electronic data from 1986 – 2009 but do not include years of partial deliveries.