

# KLAMATH PROJECT 2006 OPERATIONS PLAN

April 10, 2006

## INTRODUCTION

This is the 2006 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 expected Project operations from April 1, 2006 through March 31, 2007 based upon current and expected hydrologic conditions and consistent with the biological opinions<sup>1</sup> (BOs) issued by the U.S. Fish and Wildlife Service (Service) and National Oceanic and Atmospheric Administration (NOAA) Fisheries (formerly the National Marine Fisheries Service) as modified pursuant to the U.S. District Court ruling CIV. NO CO2-2006 SBA dated March 27, 2006. The Plan is initially derived from the April 1, 2006 Natural Resource Conservation Service (NRCS) inflow forecast. Reclamation developed this Plan to serve as a planning aid for agricultural water users, Klamath Basin Tribes, national wildlife refuges and other interested parties. Attachment A summarizes the planning methodology Reclamation used to develop the Plan. This plan provides an estimated Project water supply to the following areas:

- Upper Klamath Lake delivery area: This area generally 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 generally 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.

## UPPER KLAMATH LAKE (UKL) DELIVERY AREA

### 1. ESTIMATED INFLOW TO UKL DURING 2006:

- The predicted inflow (in acre-feet) to UKL from April 1 through September 30, 2006, using the NRCS forecast at 50% exceedance, is 820,000 acre-feet for lake elevation operational criteria<sup>2</sup>; and at 70% exceedance, is 772,000 acre-feet for river flow operational criteria.

### 2. UKL WATER YEAR TYPE DURING 2006:

- The initial water year type applicable to Upper Klamath Lake is ABOVE AVERAGE for lake elevation operations planning, subject to changes in actual hydrologic conditions subsequent to April 1. Table 1 shows the four water year types used for lake elevation operations planning:

Table 1. UKL Water Year Types for Lake Elevation Planning

	Water Year Type			
	Above Average	Below Average	Dry	Critical Dry
UKL Inflow (1000 acre-feet)	More than 500	500 to 312	312 to 185	Less than 185
Occurrence(s) during 10-yr period	1993, 1995, 1996, 1997, 1998, 1999	1990	1991	1992, 1994

<sup>1</sup> U.S. Fish and Wildlife Service and National Marine Fisheries Service Biological Opinions on Klamath Project Operations from June 1, 2002 through March 31, 2012, respectively dated May 31, 2002.

<sup>2</sup> In accordance with RPA-Element 1 of the Service's May 31, 2002 Biological Opinion (pg. 118).

- The initial water year type applicable to the Klamath River is ABOVE AVERAGE for river flow operations planning, subject to changes in actual hydrologic conditions subsequent to April 1. Table 2 shows the five water year types for river flow operations planning:

Table 2. UKL Water Year Types for River Flow Planning

	Water Year Type				
	Wet	Above Average	Average	Below Average	Dry
UKL Inflow (1000 acre-feet)	More than 785.2	785.2 to 568.6	568.5 to 458.4	458.3 to 286.8	Less than 286.8
Occurrences(s) during 10-yr period	1999	1993, 1996, 1998	1995, 1997	1990	1991, 1992, 1994

3. LAKE ELEVATION AND RIVER FLOW OPERATIONAL CRITERIA FOR UKL:

- Reclamation will operate the Project so that elevations in UKL do not recede lower than the average end-of-month elevations that occurred between October 1, 1989 and September 30, 1999 (the “ten-year” period) for the corresponding water year type<sup>3</sup>. Table 3 displays these elevations:

Table 3. Lake Elevation Operational Criteria for UKL

	Water Year Type			
	Above Average	Below Average	Dry	Critical Dry
March 31	4142.5	4142.7	4141.7	4142.0
April 30	4142.9	4142.8	4142.2	4141.9
May 31	4143.1	4142.7	4142.4	4141.4
June 30	4142.6	4142.1	4141.5	4140.1
July 31	4141.5	4140.7	4140.3	4138.9
August 31	4140.5	4139.6	4139.0	4137.6
September 30	4139.8	4138.9	4138.2	4137.1
October 31	4139.7	4138.8	4138.2	4137.3
November 30	4140.3	4139.0	4139.0	4138.1
December 31	4141.0	4138.8	4139.7	4138.9
January 31	4141.5	4139.5	4140.3	4140.1
February 28	4141.9	4141.7	4140.4	4141.1

- Pursuant to the U.S. District Court ruling CIV. NO CO2-2006 SBA, Reclamation will operate the Project so that Klamath River flows at Iron Gate Dam (IGD) meet or exceed the operational criteria in Table 4. Table 4 incorporates the requirements of Phase III of the NOAA BO which delineates the flows of Table 9 consistent with the Reasonable and Prudent Alternative in the final biological opinion<sup>4</sup>.

Table 4. Klamath River Operational Criteria for Flows at IGD

Month	Water Year Type and Flow (cubic feet/second)				
	Wet	Above Average	Average	Below Average	Dry
April	2050	2700	2850	1575	1500
May	2600	3025	3025	1044	1500
June	2900	3000	1500	1525	1400
July	1000	1000	1000	1000	1000
August	1000	1000	1000	1000	1000
September	1000	1000	1000	1000	1000
October	1300	1300	1300	1300	1300
November	1300	1300	1300	1300	1300
December	1300	1300	1300	1300	1300
January	1300	1300	1300	1300	1300
February	1300	1300	1300	1300	1300
March	2300	2525	2750	1725	1450

<sup>3</sup> U.S. Fish and Wildlife Service. Biological Opinion on Klamath Project Operations from June 1, 2002 through March 31, 2012, dated May 31, 2002, pages 11 and 118.

<sup>4</sup>Source: Table 9, Page 67, May 31, 2002 BO.

- The river flow operational criteria include the following down ramping rates at IGD:
  1. When IGD flows are above 1750 cubic feet per second (CFS): Decreases in flows of 300 CFS or less per 24-hour period, and no more than 125 CFS per four-hour period.
  2. 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.
- The lake elevation operational criteria will use a curve to transition from one end-of-month elevation to the succeeding month, as described in Attachment A. A similar curve for river flows is still being developed for future use.

#### 4. PROJECT WATER BANK FOR 2006:

- Beginning on April 1, and extending throughout the irrigation season, Reclamation will release water bank water for the purpose of achieving the required Table 4 flows . If the water year type changes, based on changes in inflow, then NOAA Fisheries and Reclamation will revise the flow schedule for the new water year type.

The Project water bank will be 100,000 acre-feet. During 2006, Reclamation is pursuing reasonable options for securing water to meet the water bank requirement. Table 4 displays the flows (CFS) at Iron Gate Dam (IGD) for an ABOVE AVERAGE water year type (WYT).

#### 5. ESTIMATED PROJECT WATER SUPPLY FROM UKL FOR IRRIGATION AND REFUGES DURING 2006:

- Water Supply for Irrigation. The estimated Project water supply (assuming an ABOVE AVERAGE water year type) for irrigation from UKL from April 1 through September 30, 2006 is 322,700 acre-feet based upon the hydrological conditions existing on April 1. This quantity may be reduced if hydrologic conditions deteriorate during the season or drought allocations are required. This quantity takes into consideration the 100,000 acre-feet of water acquired for the water bank through land idling and groundwater substitution. This quantity may increase or decrease in response to hydrological conditions after April 1 because actual conditions may differ widely from those assumed by the forecast model. Project water deliveries after October 1, would be contingent upon availability of water from UKL consistent with Tables 3 and 4, and hydrological conditions from October 2006 through March 2007.
- Water Supply for Refuges. The estimated amount of Project water from UKL for delivery to national wildlife refuges from April 1 through October 31, 2006 will be 56,000 acre-feet. This was estimated in relation to historic deliveries to refuges.

### EAST SIDE DELIVERY AREA

#### ESTIMATED PROJECT WATER SUPPLY FOR THE EAST SIDE DELIVERY AREA DURING 2006:

- The estimated Project water supply for irrigation from Gerber Reservoir and Clear Lake from April 1 through September 30, 2006 is 60,000 acre-feet. Table 6 displays the projected elevations of Gerber Reservoir and Clear Lake on April 1; 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); and the difference between the April 1 and September 30 reservoir/lake capacities, minus evaporation and seepage. The difference between the

reservoir/lake capacity on April 1 and September 30 is the estimated Project water supply for irrigation.

Table 6. Estimated Project Water Supply for East Side Delivery Area

	Projected April 1 Elevation	April 1 Capacity (acre-feet)	ESA Minimum Sept 30 Elevation	Sept 30 Capacity (acre-feet)	April 1 - Sept 30 Evap/Seepage (acre-feet)	Estimated Sept 30 Elevation	Net Diff. Between April 1 and Sept 30 Capacities
Gerber Reservoir	4836.02	96,658	4798.1	84,300	6,400 (est)	4832.70	30,000
Clear Lake	4529.88	203,870	4520.6	188,282	60,000 (est)	4529.13	30,000
Total amount of project water available for East Side delivery area							60,000

## OTHER INFORMATION RELEVANT TO 2006 OPERATIONS PLAN

### COMPARISON OF ESTIMATED WATER SUPPLY TO HISTORIC DELIVERY:

- The following comparison is provided for information purposes only and uses an ABOVE AVERAGE water year type for the UKL delivery area (5 WYT) and an ABOVE AVERAGE water year type for the East Side delivery area (4 WYT). Table 7 compares the 2006 estimated Project water supply for irrigation and refuges to historical deliveries from 1961 to 2004.

Table 7. Comparison of Estimated 2006 Project Water Supply to Historic Deliveries

	2006 Estimated Supply (1000 acre-feet)	Historic Delivery (1961-2005) During Above Average Water Year Types (1000 acre-feet)
UKL Delivery Area	322.7	Ave = 322.7 (299.0 to 344.8)
National Wildlife Refuges	56.0	Ave = 41.9 (25.5 to 63.2)
East Side Delivery Area	60.0	Ave = 68.6 (46.4 to 84.9)

# ATTACHMENT A

## Klamath Project - 2006 Operations Plan

### GENERAL DESCRIPTION OF 2006 OPERATIONS PLANNING PROCESS

The 2006 operations plan was developed in accordance with the 2002 Service and NOAA Fisheries biological opinions, and the U.S. District Court ruling CIV. NO CO2-2006 SBA of March 27, 2006. The information in the plan is developed as follows:

#### FOR THE UPPER KLAMATH LAKE (UKL) DELIVERY AREA:

##### 1. ESTIMATE INFLOWS TO UKL:

- Reclamation estimates the inflow (in acre-feet) using the NRCS forecast beginning in early January (for information purposes) and revises the inflow predictions in early February, March and on April 1. The estimate of predicted inflows uses the 50% exceedance for UKL for lake elevation planning considerations<sup>5</sup> and a 70% exceedance for UKL river flow planning considerations.

##### 2. DETERMINE WATER YEAR TYPE FOR 2006:

- UKL water year types for Project operations planning purposes are defined by actual historic inflow. The methodology used to define the water year type parameters was explained in the *Klamath Project 1998 Operations Plan Environmental Assessment*<sup>6</sup>. For UKL, water year type is defined by the forecast inflow between April 1 and September 30 annually. In early April (usually on or after April 10), Reclamation will determine the water year type most likely to occur from April through September. As a result of ESA consultation, two sets of water year types have been defined for purposes of annual operations planning<sup>7</sup>. For lake elevation planning, Reclamation will use four water year types: (1) above average; (2) below average; (3) dry; and (4) critical dry. For river flow planning, Reclamation will use five water year types: (1) wet; (2) above average; (3) average; (4) below average and; (5) dry. Reclamation will continue to monitor the NRCS forecasts in May and June. After June, actual inflow to UKL will be regularly monitored. The continued monitoring of predicted and actual inflows will allow Reclamation to adapt Project operation to respond to the actual water year type if precipitation and hydrological conditions after April 1 vary significantly from conditions prior to April 1. The water year type changes to either wetter or drier year types after April 1, in response to actual hydrologic conditions<sup>8</sup>.

##### 3. LAKE ELEVATION AND RIVER FLOW OPERATIONAL CRITERIA FOR 2006:

- Water deliveries for irrigation from UKL will be provided within the operations regime observed from water year 1990 through water year 1999 (ten-year period) consistent with the

<sup>5</sup> In accordance with RPA-Element 1 of the FWS May 31, 2002 Biological Opinion (pg. 118).

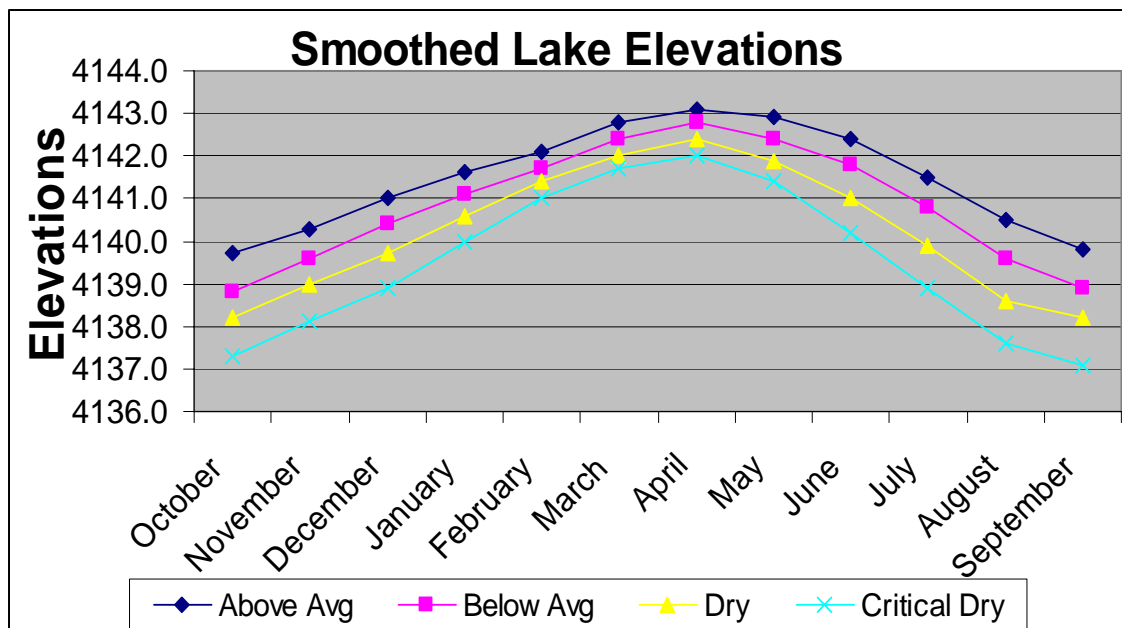
<sup>6</sup> Klamath Project 1998 Annual Operations Plan Environmental Assessment. Pgs. 14-15.

<sup>7</sup> U.S. Fish and Wildlife Service and National Marine Fisheries Service Biological Opinions on Klamath Project Operations from June 1, 2002 through March 31, 2012, respectively dated May 31, 2002.

<sup>8</sup> In accordance with Memorandum and Letters to the Service, NOAA Fisheries and Klamath Basin Tribes dated July 10, 2002.

findings of the National Research Council’s Interim Report of February 2002. The observed values for the lake levels and river flows that occurred during the ten-year period were used as criteria to determine the Project’s irrigation and refuge deliveries in Reclamation’s biological assessment (BA). The operational criteria for river flows have been revised to be consistent with the U.S. District Court ruling CIV. NO CO2-2006 SBA dated March 27, 2006 which requires Reclamation to operate the Project so that Klamath River flows at or below Iron Gate Dam remain at or above the Phase III flows described in Table 9 of the Biological Opinion<sup>9</sup>.

- The lake elevation and river flow operational criteria specify certain elevations/flows at certain time steps (end-of-month for lake elevations and average monthly or semi-monthly for river flows). During Project operations in 2002 and 2003, Reclamation found that transitioning from one time step to the next succeeding step resulted in abrupt changes in elevations/flows, especially when the water year type changed to either a wetter or drier year types after April 1, as described in No. 2 above. Such abrupt changes were at times viewed as being adverse to the lake or river resources. For 2004, 2005, and 2006 operations, Reclamation developed a curve, rather than abrupt steps, to permit a smoother transition of lake elevations from one time step to the next<sup>10</sup>. The curve was developed in consultation with the Service, Tribes and water users.



#### 4. QUANTIFY THE PROJECT WATER BANK REQUIREMENTS FOR 2006:

- Reclamation’s 2002 BA proposed establishment and use of a “water bank” and that the size of the water bank would be determined using criteria set out in the 2002 BA. However, as a result of ESA consultation, the Service and NOAA Fisheries established the water bank size for 2006 at 100,000 acre-feet in the 2002 biological opinions (page 11 and page 56 in the respective opinions). Therefore, the water bank size has been determined and does not require the calculation as outlined in the 2002 BA. Reclamation has agreed to operate the Project during 2006 consistent with the 2002 biological opinions<sup>11</sup>.

<sup>9</sup> National Marine Fisheries Service, Biological Opinion on Klamath Project Operations, dated May 31, 2002, pages 66-68.

<sup>10</sup> Memorandum from Reclamation to the Service dated April 2, 2004.

<sup>11</sup> Letter from Reclamation’s Mid-Pacific Regional Director to the Service and NOAA Fisheries dated January 2, 2003.

- During 2006, Reclamation continues to pursue reasonable options for securing water and based on contracts ratified to date, will meet the water bank requirement. Reclamation believes that several sources of water, including regulatory storage, forbearance of surface water use, and groundwater are feasible for the water bank. Forbearance of surface water includes water used for both irrigation and refuges. Forbearance of irrigation use involves farmers voluntarily idling their lands in return for compensation. Groundwater or conjunctive use involves using pumped groundwater from wells to supplement surface water supplies. The refuges are providing approximately 15,000 acre-feet of water to the water bank this year from storage on refuge properties. There may be additional shortages to irrigation and refuge deliveries due to hydrological conditions after the water bank is deducted from the Project water supply. Agricultural users would not be compensated for these additional shortages that result from unanticipated hydrologic conditions.
- Reclamation's compliance with the biological opinions requires a water bank which involves acquiring water from all components of the Project, including refuges. The water bank amount has been established for 2006 (i.e., 100,000 acre-feet). The extent that the irrigation and refuge components of the Project provide water for the water bank will be based upon their Project water use. This means that when Project irrigators are required to reduce a portion of their Project water use through forbearance, then Project water deliveries to refuges would be reduced by a similar proportion.

#### 5. ESTIMATED PROJECT WATER SUPPLY FOR IRRIGATION AND REFUGES FOR 2006:

Reclamation estimated the Project water supply for irrigation and refuges available from the Klamath River upstream from Keno Dam by:

- First, estimating inflow from April 1 through September 30, 2006
- Second, determining the applicable water year type for 2006
- Third, quantifying the applicable water bank amount for 2006
- Fourth, determining the minimum historic amount of water for agriculture based on the year type
- Fifth, using the elevation/flow operational criteria for the applicable water year type
- Last, estimating the available Project water supply, after deducting the water bank amount, using the KPOPFOR forecasting model that may be available, keeping in mind that actual conditions may differ significantly from the model

#### 6. REFUGE WATER SUPPLY:

- Project water has historically been delivered to Tule Lake and Lower Klamath National Wildlife Refuges during Project operation (see Table 7) for maintaining seasonal and permanent refuge wetlands. Reclamation considered historic refuge deliveries to assist with 2006 operations planning. The Service provided information related to refuge management and operation during various water year types. The refuges receive water year-round, not just during April-September. October-March water deliveries are important to the refuge and affect overall Project operation. Reclamation may be required to adjust refuge Project water deliveries to meet the 2002 biological opinion requirements and irrigation deliveries, when necessary. Should additional requirements for Project water develop then Project water deliveries to refuges could be further reduced. If additional hydrologic shortages occur, refuge deliveries could be completely curtailed.
- Reclamation stated in its 2002 BA that national wildlife refuges, including Tule Lake, Lower Klamath, Upper Klamath Lake and Clear Lake Refuges, are under the jurisdiction of the Service

and their operation is subject to the Service's management and control<sup>12</sup>. The BA described only those effects on the refuges that resulted from operation of the Klamath Project and not the effects of refuge operation. During 2006, Reclamation will operate the Project consistent with the requirements of the 2002 biological opinions, including establishment/use of a water bank, and provide adequate water to Lower Klamath and Tule Lake National Wildlife Refuges, when in priority and when water is available<sup>13</sup>. This requires consideration of refuge water deliveries as part of the 2006 operations plan because those deliveries contribute to Reclamation's ability to meet the biological opinion requirements and its legal obligations.

#### 7. OTHER INFORMATION RELEVANT TO THE OPERATIONS PLAN:

Reclamation considered other information relevant to the operations plan that could influence the UKL Project water supply for irrigation and refuges, such as:

- Comparing the estimated 2006 Project water supply for the UKL delivery area to historic UKL irrigation and refuge deliveries, and comparing the estimated 2006 Project water supply for the East Side delivery area to historic East Side irrigation deliveries. The comparison of estimated supplies to historic deliveries serves to inform both Reclamation and Project water users of potential needs for additional demand reduction/supply enhancement measures. Reclamation may investigate and implement measures to either further reduce demand or enhance supply as a result of the comparison, if needed. Such measures would be in addition to those implemented to establish the water bank.
- Reclamation considered the effects of pre-season fall/winter irrigation of agricultural and lease lands in the UKL delivery area. This pre-irrigation could, during drier hydrologic conditions, affect Reclamation's ability to meet the UKL operational criteria for endangered suckers by reducing the amount of water storage in the lake. If such a circumstance were to arise, then Project operation could be modified in response to pre-season irrigation and/or the available supply for pre-irrigation could be reduced. This condition did not occur prior to April 1, 2006.

Precipitation in Klamath Falls, Oregon during February and March establishes the agricultural demand index when the irrigation season starts in early April. This index is integrated into the operation planning model used to predict the Project water supply.

#### FOR THE EAST SIDE DELIVERY AREA:

##### ESTIMATED PROJECT WATER SUPPLY FOR THE EAST SIDE DELIVERY AREA DURING 2006:

- Reclamation will operate the Project reservoirs that serve the East Side delivery area (Gerber Reservoir and Clear Lake) consistent with the 2002 biological opinions, as amended to clarify application of the operational criteria for endangered suckers<sup>14</sup>. This operation ensures that reservoir/lake elevations do not recede lower than the minimum elevations needed to protect endangered suckers on September 30, i.e., elevations 4798.1 for Gerber Reservoir and 4520.6 for Clear Lake. Reclamation estimated the Project water supply for irrigation by: (1) determining the

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<sup>12</sup> Biological Assessment. The Effects of Proposed Actions Related to Klamath Project Operation (April 1, 2002-March 31, 2012) on Federally-listed Threatened and Endangered Species, dated February 25, 2002, pages 13-14.

<sup>13</sup> Pacific Southwest Regional Solicitor's Memorandum, dated July 25, 1995, regarding certain legal rights and obligations related to the Bureau of Reclamation.

<sup>14</sup> U.S. Fish and Wildlife Service. Amendment to 2002 Biological Opinion on the Effects of the 10-Year Operation Plan for the Klamath P (FWS#1-10-02-F-121), as it Relates to Operation of Clear Lake and Gerber Reservoir. March 4, 2003.



April 1 reservoir/lake volume (assuming that the April 1 elevation is no less than the minimum required elevation to protect endangered suckers); (2) adding any inflows and subtracting evaporation/seepage between April 1 and September 30; and (3) subtracting the September 30 reservoir/lake volume at the minimum required elevations to protect endangered suckers.

## REFERENCE SOURCES:

Klamath Basin Area Office Water Bank Web Page can be referenced at:

[http://www.usbr.gov/mp/kbao/pilot\\_water\\_bank/latest.pdf](http://www.usbr.gov/mp/kbao/pilot_water_bank/latest.pdf)

General Information on the Klamath Project can be referenced at:

<http://www.usbr.gov/mp/kbao/>