CHAPTER 2.0
DESCRIPTION OF PROPOSED ACTION

2.1 INTRODUCTION

This chapter provides information and references materials that describe the proposed action. The proposed action is the continuance of the current O&M programs for Reclamation project facilities in the Deschutes River basin. Reclamation projects included in this consultation are the Deschutes Project in the upper Deschutes River basin; the Crooked River Project in the Crooked River subbasin; and the Wapinitia Project located in the White River subbasin, tributary to the lower Deschutes River. The *Operations Description of the Deschutes River Basin Projects* report (Reclamation 2003a) provides a comprehensive description of Project operations and hydrologic conditions.

2.1.1 Federal Facilities Included in the Proposed Action

A list of storage and diversion facilities associated with the three projects is provided in Table 2-1. Not all of the facilities listed in Table 2-1 are included in the proposed action. Reclamation holds title to only some of the diversion facilities within the Federal Reclamation projects; water rights related to most of the Federal facilities are primarily held by the respective irrigation districts. The Oregon State Watermaster oversees the delivery of water from these facilities according to existing water rights and consistent with state water law. Further, actual day-to-day operations are conducted by the primary irrigation districts associated with these Federal projects.

This consultation involves O&M activities associated with those facilities for which Reclamation has authority to operate, largely defined by Reclamation ownership. Storage, diversion, and delivery facilities comprising the proposed action include:

Deschutes Project

- Crane Prairie Dam and Reservoir
- Wickiup Dam and Reservoir
- Haystack Dam and Reservoir
- North Unit Headworks and Main Canal
- Distribution system for NUID project lands

Crooked River Project

- Bowman Dam and Prineville Reservoir
- Crooked River Diversion Dam and Feed Canal
- Crooked River Distribution Canal
- Barnes Butte and Ochoco Relift Pumping Plants
- Nine small pumping plants and associated canals

Wapinitia Project

- Wasco Dam and Clear Lake

Other facilities associated with the Federal Reclamation projects are owned, operated, and maintained by the irrigation districts or other parties. Reclamation has no authority in directing operations associated with these private facilities. Limited actions associated with these facilities are interrelated and interdependent to the proposed action in this consultation and include:

- Diversion of Crane Prairie Reservoir storage water by Arnold, Central Oregon, and Lone Pine Irrigation Districts
- Diversion of natural flow water into the North Unit Main Canal by NUID
- Diversion of water from the Crooked River by NUID's Crooked River Pumping Plant
- Storage, flood control operations, release, and diversion of Ochoco Reservoir storage water by OID
- Diversion of natural flow from the Crooked River by the Crooked River Diversion Dam
- Conveyance of Prineville Reservoir storage water into diversion facilities owned by OID
- Diversions of Prineville Reservoir storage water by privately-owned canals, including Rice Baldwin, Central Ditch, Lowline Ditch, and People's Ditch
- Diversion of Clear Lake storage water by JFDIC's Clear Creek Diversion.

Table 2-1. Major Facilities Associated with Federal Projects in the Deschutes River Basin

Facility	Ownership	Stream	Year Constructed or Rehabilitated	Entity Responsible for O&M	Comments
DESCHUTES RIVER PROJECT					
Crane Prairie Dam and Reservoir	United States	Deschutes River	1940	COID (Transferred)[1]	55,300 acre-feet active storage
Wickiup Dam and Reservoir	United States	Deschutes River	1949	NUID (Transferred)	200,000 acre-feet active storage
Haystack Dam and Equalizing Reservoir	United States	Off-stream	1957	NUID (Transferred)	5,600 acre-feet active storage
Arnold Diversion Dam and Canal	Arnold ID	Deschutes River	1951	Arnold ID	Diverts Deschutes River water comprised of storage from Crane Prairie Reservoir and privately-held natural flow water rights.
Central Oregon Diversion Dam and Canal	COID	Deschutes River	1900	COID	Diverts Deschutes River water comprised of storage from Crane Prairie Reservoir and privately-held natural flow water rights.
North Canal Dam	Private	Deschutes River	1912-1914		Private - Owner not established
North Unit Headworks and Main Canal	United States	Deschutes River	1949	NUID (Transferred)	Diverts Deschutes River water comprised of storage from Wickiup Reservoir and privately-held natural flow water rights.
North Canal Diversion Dam and Pilot Butte Canal	COID	Deschutes River	1900	COID	Diverts Deschutes River water comprised of storage from Crane Prairie Reservoir and privately-held natural flow water rights.
Crooked River Pumping Plant	NUID	Crooked River	1968	NUID	Diverts Crooked River water using water right held by NUID and delivers to Deschutes Project lands and to non-Project Crooked River lands.
CROOKED RIVER PROJECT					
Arthur R. Bowman Dam and Prineville Reservoir	United States	Crooked River	1961	OID (Reserved[2])	148,640 acre-feet active storage (150,216 acre-feet storage capacity)
Ochoco Dam and Reservoir	OID	Ochoco Creek	1918-1920; 1950; 1995	OID	39,000 acre-feet active storage 5,266 acre-feet storage accessed by pump

Facility	Ownership	Stream	Year Constructed or Rehabilitated	Entity Responsible for O&M	Comments
Crooked River Diversion Dam and Feed Canal	United States	Crooked River	1961; 2000	OID (Transferred)	Diverts Crooked River Water comprised of Prineville Reservoir storage water and privately-held natural flow water rights.
Barnes Butte and Ochoco Relift Pumping Plants	United States	Off-stream	1961	OID (Transferred)	Pumps water from Crooked River Feed Canal to Crooked River Distribution Canal and Ochoco Main Canal, respectively.
Crooked River Distribution Canal	United States	Off-stream	1961	OID (Transferred)	Distributes Crooked River water to OID project lands
Central Ditch People's Ditch Rice Baldwin Ditch Lowline Ditch	All Private	Crooked River		All Private	Diverts Crooked River water comprised of Prineville Reservoir storage water and privately-held natural flow water rights
Ochoco Main Canal	OID	Ochoco Creek	1917	OID	Diverts water from Ochoco Dam
9 small pumping plants and distribution canals	United States	Off-stream	Various	OID (Transferred)	Pumps water from Crooked River Distribution Canal or Ochoco Main Canal into distribution canals.
Rye Grass Canal	OID	Ochoco Creek	1897	OID	Diverts from Ochoco Creek and captures return flows in the system.
WAPINITIA PROJECT					
Wasco Dam and Clear Lake	United States	Clear Creek (White River tributary)	1959	JFDIC (Transferred)	11,900 acre-feet active storage
Clear Creek Diversion Dam	JFDIC	Frog Creek and Clear Creek	Unknown	JFDIC	

[1] "Transferred Works" are facilities in which daily responsibility for O&M activities are transferred to and financed by the irrigation district.
[2] "Reserved Works" are facilities in which the O&M is the responsibility of the United States. Daily O&M responsibility may be contracted to another entity, but the United States maintains the financial responsibility.

Reclamation facilities may be transferred or reserved works. Transferred works mean that daily operation and maintenance activities have been transferred to and are financed by the contracting entity (usually an irrigation district), but the ownership remains with the U.S. Government.

Reserved works, typically dams and reservoirs which serve more than one function, are operated and maintained by Reclamation, either directly or by contract with one or more irrigation districts. Reclamation maintains financial responsibility and collects O&M costs from contracting entities who receive water from that project. All of the Federal facilities included in the proposed action are transferred works, with the exception of Bowman Dam in the Crooked River Project which is a reserved work operated by OID under contract.

Reclamation conducts regular inspections of dams that it has jurisdiction over to ensure that structural integrity, safety, and maintenance requirements are met by the designated operating entities. Reclamation provides runoff forecasts to dam operators and at times requires specific operations to protect the facility.

Reclamation's water management is dictated by its authorities, annual water supply, water rights, contracts, and irrigation demand. An explanation of how Reclamation operates the water storage and delivery system is lengthy. This BA provides a summary of these operations and refers to accompanying documents that provide more detailed information.

Operations Description of the Deschutes River Basin Projects [Reclamation 2003a] (Operations Report)

The Operations Report describes O&M activities at Reclamation's Deschutes, Crooked River, and Wapinitia Projects. A comprehensive overview is provided about irrigation development, associated facilities, project authorizations, water rights, contracts, and general system operation for each project. Information contained in this report is referenced throughout this chapter.

2.2 DESCRIPTION OF THE PROPOSED ACTION

Operating strategies for Reclamation projects are based on legal and statutory requirements, including Congressional authorizing legislation, state water law, and contractual obligations. Specific legal and statutory requirements for each of the projects are described later in this chapter in Section 2.3. All Reclamation projects in the Deschutes River basin are authorized for the purpose of irrigation, primarily to develop more reliable water supplies. Legislation subsequent to the 1902 and 1939 Reclamation

Acts also authorizes some storage facilities to be used for flood control, limited recreation, and fish and wildlife purposes. In addition, all dams must be operated in a manner that protects them from potential failure. These three purposes—irrigation water supply, flood control, and preservation of the dam—are the primary strategies for operating the reservoirs. General operating strategies for achieving these purposes are summarized below.

2.2.1 General Operations

Reservoirs that are operated for irrigation and flood control have three major operating seasons:

- **Winter operations (approximately November – early March)** — There are no releases for irrigation; low winter releases are made. A specific amount of space may be required to control potential winter rain-on-snow or other flooding events. Water is released, if necessary, to achieve or maintain the required space. Space may also be required during this period in anticipation of spring runoff from melting snow. Typically, irrigation demand has drawn the reservoirs well below winter/spring flood control levels and they refill during the winter until reaching flood control levels.

- **Spring flood control and/or refill (approximately March – June)** — Reservoirs without flood control obligations store available inflow. Reservoirs with flood control operations are maintained to help control runoff, with releases dependent on the forecast runoff volume and timing. These reservoirs are filled for irrigation water supply as the runoff diminishes and generally reach their highest surface level in May. In the Deschutes River basin, Prineville Reservoir is the only Federally-owned reservoir officially operated for formal flood control in this manner.

- **Summer drawdown season (approximately June – October)** — This season begins when natural flow is insufficient to meet irrigation demand, i.e., inflow is less than the demand. Release of storage (drafting of the reservoir) is required to meet the demands. In dry years, drawdown may begin before June.

2.2.1.1 Flood Control

Many Reclamation storage facilities are operated for flood protection by drafting the reservoir during non-flooding periods to provide space to store high flows that result from rainfall and snowmelt. Flood control operations may be formal or informal. Formal flood control means that operating criteria were developed under Section 7 of the Flood Control Act of 1944. In practice, the Corps and Reclamation jointly develop the criteria

in a manner that balances flood control potential with irrigation water supply potential. Bowman Dam and Ochoco Dam are the only dams in the Deschutes River basin operated under formal flood control rules and signed agreements. Informal flood control follows operating rules developed by Reclamation and does not involve coordination with the Corps.

2.2.1.2 Incidental Operations

Operations do consider recreation and fish and wildlife needs, although they are secondary or incidental to operation for irrigation and flood control.

2.2.1.3 Special Operational Requests

There are instances when Reclamation can accommodate a special request for a change in routine operations while still meeting primary requirements. Sometimes these operational changes are made in response to emergency circumstances. For example:

- Reservoir releases may be reduced temporarily to improve the likelihood of finding a drowned victim.
- Water releases may be changed in response to unexpected equipment malfunction or breakdown.
- River flows may be reduced temporarily for construction of bridges, placement of stream gages, and installation of shoreline revetments.

In these instances, Reclamation would look for an opportunity to release needed storage from another reservoir.

Within applicable constraints, Reclamation has altered operational approaches to improve conditions for fish and wildlife or the environment. These changes are implemented consistent with Reclamation's authorities, state water law, and only if contractual obligations and public safety are not impacted.

Specific operation of Reclamation facilities comprising the proposed action are summarized in the remainder of this chapter. A detailed description is provided in the Operations Report and is referenced as appropriate.

2.2.2 Deschutes Project Operations

The Deschutes Project lands stretch north and northeast from the city of Bend to Madras, Oregon (Figure 2-1). Approximately 85,000 acres are irrigated to produce grain, hay, mint, potatoes, seeds, and irrigated pasture. Additional lands are irrigated in the area

using privately developed water supplies. Principal federally-owned features included in the proposed action are Crane Prairie Dam and Reservoir, Wickiup Dam and Reservoir, Haystack Dam and Reservoir, and North Unit Headworks and Main Canal. Total active capacity of the Federal reservoirs is 255,300 acre-feet. In addition, Haystack Reservoir functions as a re-regulating reservoir and temporarily restores water transported in the irrigation system.

Four irrigation districts have contracts for this storage water, including NUID, COID, Lone Pine Irrigation District (also known as Crook County Improvement District No. 1), and Arnold Irrigation District. Arnold, Lone Pine, and Central Oregon Irrigation Districts use storage in Crane Prairie Reservoir to supplement water supplies obtained from other privately developed sources. COID irrigates about 45,000 acres; Lone Pine ID irrigates about 2,400 acres; and Arnold ID irrigates about 4,400 acres. All diversion and distribution facilities for these three irrigation districts are privately owned and operated. The water right to divert the stored water is privately held. The proposed action includes storing water in and releasing water from Crane Prairie Reservoir for diversion at several privately-owned diversions. Diversion of stored water by COID, Lone Pine ID, and Arnold ID is an interrelated and interdependent action.

NUID uses storage in Wickiup and Haystack Reservoirs to provide a full supply of water to irrigate its lands. Project water is used to irrigate about 50,000 acres. NUID irrigates an additional 8,800 acres using non-project water obtained from water pumped from the Crooked River. The pumping of Crooked River water is interrelated and interdependent to the proposed action.

To summarize, the following project operations are included in the proposed action. Refer to pages 32-49 in the Operations Report for a more detailed description.

- Storage in and release of water from Crane Prairie Dam and Reservoir for diversion (an interrelated and interdependent action is diversion of storage water by private facilities)

- Storage in and release of water from Wickiup Dam and Reservoir for diversion

- Diversion of Wickiup Reservoir storage water by North Unit Headworks and Main Canal (an interrelated and interdependent action is the diversion of natural flow water)

- Storage in and release of water from Haystack Dam and Reservoir for diversion

Deschutes Project, Oregon

Major Facilities

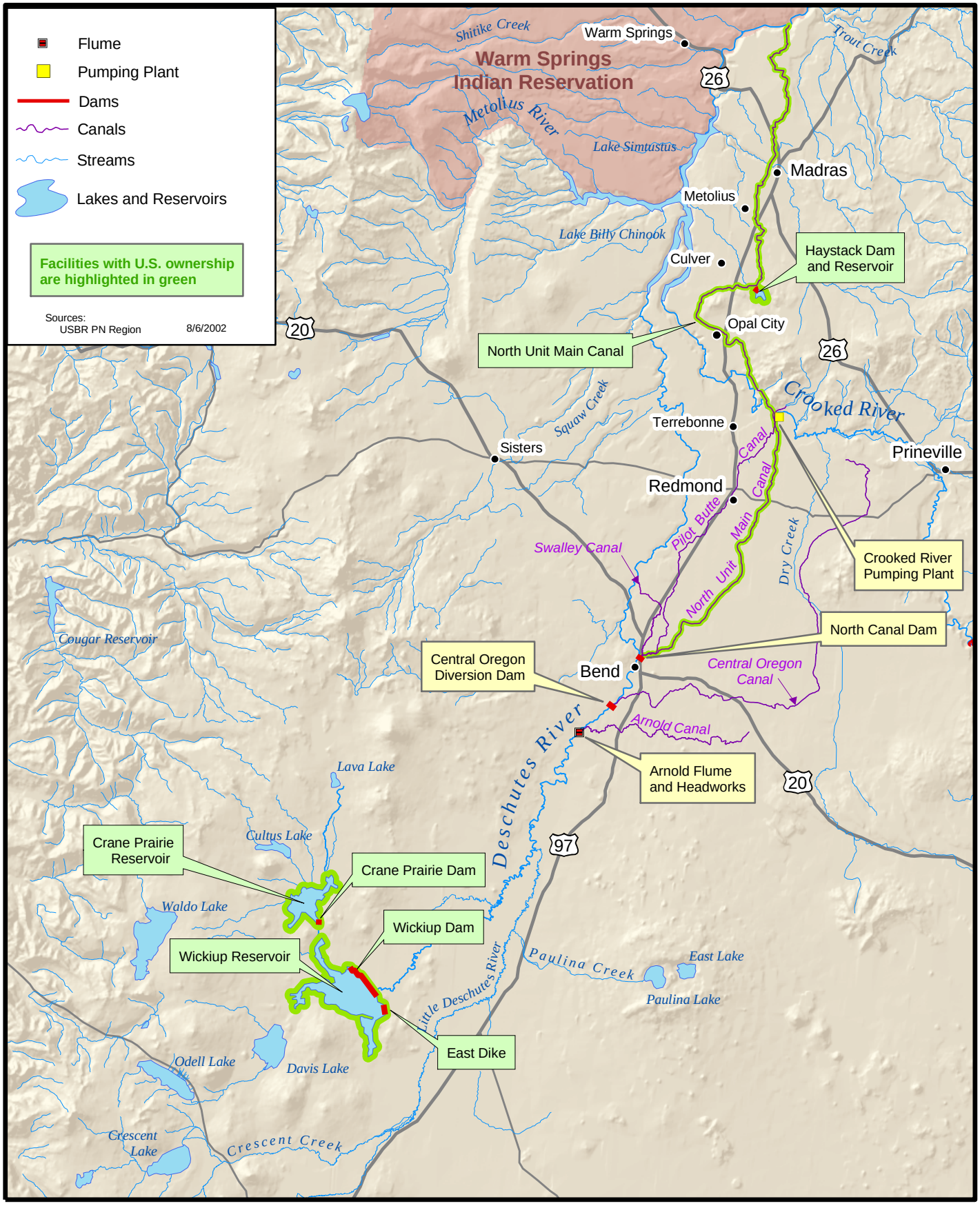

Figure 2-1

2.2.2.1 Storage and Delivery of Water

Crane Prairie and Wickiup Reservoirs store water for use in the Deschutes Project and are operated together as a combined system. The operation of these two reservoirs is generally governed by the January 4, 1938, inter-district contract and the water rights associated with storage of the Deschutes River water.

The inter-district contract stipulates the priority for storing water between the two reservoirs. Following the irrigation season, water can be stored in Crane Prairie Reservoir at any time or at any rate provided that storage is below 30,000 acre-feet. After storage has reached 30,000 acre-feet, inflow is bypassed to Wickiup Reservoir until storage in Wickiup Reservoir reaches 180,000 acre-feet, at which time storage is resumed at Crane Prairie Reservoir until a total of 45,000 acre-feet of storage is filled. Wickiup Reservoir is then filled to a total of 200,000 acre-feet (full pool) prior to further filling of Crane Prairie Reservoir.

Crane Prairie Reservoir has a maximum storage capacity of 50,000 acre-feet, of which 30,000 acre-feet is identified as "reliable storage supply" in the inter-district contract, and 20,000 acre-feet is identified as "surplus water available." Table 2-2 shows the storage is allocated as follows:

Table 2-2. Crane Prairie Reservoir Storage Allocation

District	Allocation of Reliable Storage Supply (acre-feet)	Allocation of Surplus Storage (acre-feet)	Total Allocation (acre-feet)
Lone Pine ID	10,500		10,500
Arnold ID	10,500	3,000	13,500
COID	9,000	17,000	26,000
TOTAL	30,000	20,000	50,000

Allocation of the surplus storage water is complex. Of the first 15,000 acre-feet, 1/5 accrues to Arnold ID, up to a maximum of 3,000 acre-feet, and 4/5 accrues to COID, up to a maximum of 12,000 acre-feet. The remainder of the surplus storage (5,000 acre-feet) accrues to COID.

At the time of the inter-district contract, it was anticipated that the capacity of Crane Prairie Reservoir would be 50,000 acre-feet. The actual capacity of the reservoir is 55,300 acre-feet. In the wettest years water is stored above 50,000 acre-feet, but only after Wickiup Reservoir has reached or is assured to reach full capacity of 200,000 acre-feet. Any water stored above 50,000 acre-feet is released during the subsequent irrigation season as excess flow (above irrigation demand) to augment the Deschutes River in the Bend area (Gorman 2002).

Reservoir refill operations are managed to maximize storage each year and maintain to the extent possible uniform flows below each reservoir. With modern satellite telemetered reservoir outflows and snowpack measurements, operations are becoming more responsive to changes in water conditions through the winter. Typically, the irrigation season ends and storage commences in October.

Reservoir outflows are determined after considering the amount of reservoir storage and the present inflow. Daily changes on the river are organized by the Watermaster, an OWRD employee, to meet storage requirements and irrigation demands. Irrigation personnel are contacted to implement the changes in releases at the projects.

Crane Prairie and Wickiup Dams are operated under informal flood control rules, which are rarely invoked. The reservoirs undergo an annual review of hydrologic conditions as they approach full capacity. If the review indicates elevated inflow is likely, a flood plan is developed by Reclamation in cooperation with the irrigation districts and the Oregon State Watermaster.

Crane Prairie Dam and Reservoir Operation

Reclamation has title to Crane Prairie Dam and Reservoir; however, as a transferred work, daily O&M is the responsibility of COID personnel. Reclamation owns no water rights for storing or diverting Crane Prairie stored water.

Irrigation releases typically begin by mid-to-late April. Nonirrigation releases may occur earlier if the reservoir is full and must pass inflow. The reservoir does not typically begin to draft appreciably until late May or early June. Irrigation releases typically peak in June and July between 200 cfs and 500 cfs, but can be higher or lower depending on the water supply. In dry years, lower flows are maintained in order to stretch the water supply over the entire season. An effort is made to set a summer flow that can be maintained without constant adjustments. Releases are typically reduced to minimum downstream flows in late October or early November. Although Crane Prairie Reservoir has no minimum flow requirements, the watermaster and the irrigation districts have a non-binding agreement to release a minimum of 30 cfs to protect instream resources. Winter flows below Crane Prairie Dam are often higher than this in all but the driest years.

Table 2-3 summarizes operations at Crane Prairie Dam and Reservoir. Table 2-4 shows the average monthly flow exceedance for water years 1990 to 2001 below Crane Prairie Dam. From the table, the 90 percent exceedance for October was 64 cfs, meaning that 90 percent of the time average monthly October flows equal or exceed 64 cfs. Figure 2-2 and Figure 2-3 show annual hydrographs of river flows below Crane Prairie Dam for the period 1991 through 2001, which includes dry and wet year sequences.

Table 2-3. Summary of Crane Prairie Dam and Reservoir Operations

Item	Comment
Releases	
30 cfs	Informal (non-binding) minimum release by agreement of watermaster and irrigation districts.
200-500 cfs	Typical peak irrigation release.
Rate of rise (maximum)	No standard ramping rate as it depends on the flows, trying not to make sudden changes.
Rate of drop (maximum)	No standard ramping rate as it depends on the flows, trying not to make sudden changes.
Reservoir Content	
Minimum pool	None required; typically stays above 10,000 acre-feet. Recorded minimum of 9,470 acre-feet in 1980.[1]
24,000 acre-feet	Average end-of-September carryover (1961-2001 period of record).
30,000 acre-feet	Maximum storage level until Wickiup Reservoir reaches 180,000 acre-feet
45,000 acre-feet	Maximum storage level until Wickiup Reservoir reaches 200,000 acre-feet
55,300 acre-feet	Full pool; achieved in about 1 out of every 3 years
Allocation of Reservoir Content	
COID	26,000 acre-feet
Arnold ID	13,500 acre-feet
Lone Pine ID	10,500 acre-feet
[1]1961 - 2002 period of record. For the period 1925-1960, the reservoir reached empty or near empty in 14 of the years, with the latest occurring in 1950.	

Table 2-4. Average Monthly Flow (cfs) Exceedance below Crane Prairie Dam, Deschutes River Basin

Gage Location (period of record)	Percent Exceedance	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Deschutes River													
Below:	90%	64	45	51	74	45	29	65	160	131	134	117	109
Crane Prairie Res.	50%	195	163	132	126	124	151	148	271	268	269	271	276
(water years 1990-2001)	10%	432	338	302	427	333	310	264	525	578	536	503	487
* Information from http://pn.usbr.gov/hydromet/index.html													

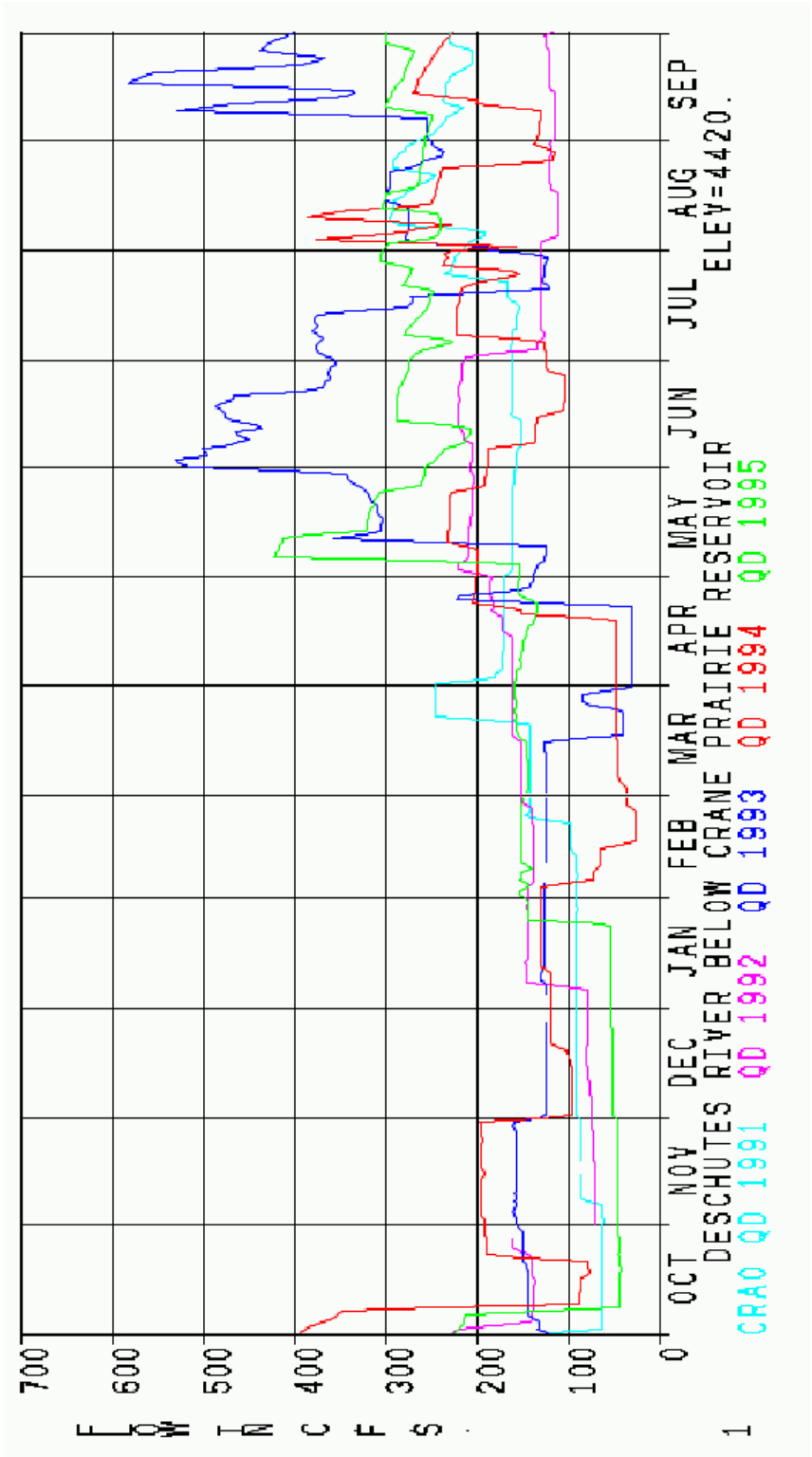

Figure 2-2. Daily Average Flow (QD) for the Deschutes River below Crane Prairie Dam, 1991-1995 (dry year series)

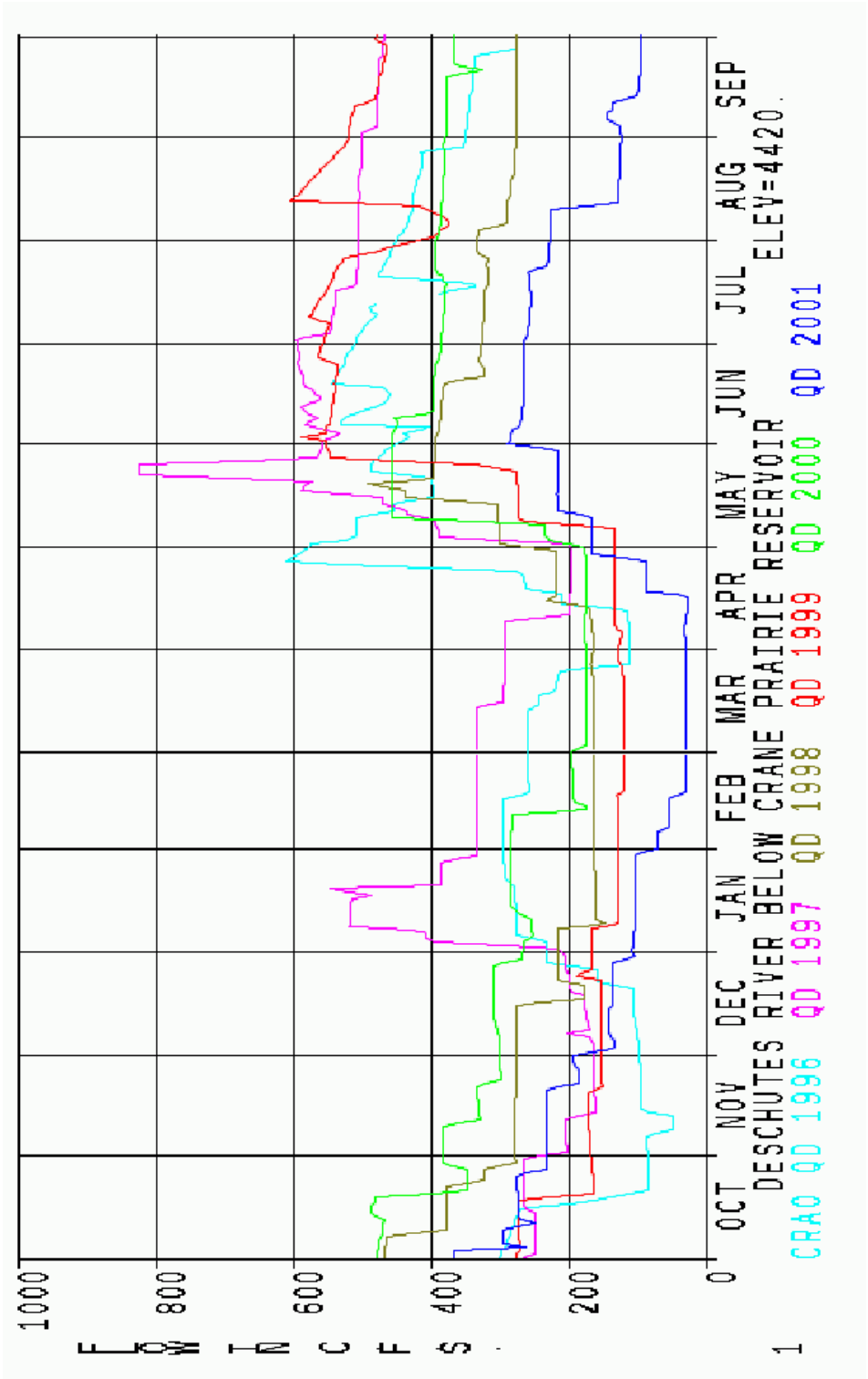

Figure 2-3. Daily Average Flow (QD) for the Deschutes River below Crane Prairie Dam, 1996-2001 (wet year series)

Wickiup Dam and Reservoir Operation

NUID operates Wickiup Dam and Reservoir according to the terms of the inter-district contract described earlier. Day-to-day operations are directed by the Watermaster to meet storage requirements and irrigation demands. Reclamation does not hold the water right for storing or diverting Wickiup stored water.

The irrigation season extends from April 1 to October 31, with the reservoir typically beginning to refill by mid-October. The filling schedule must adhere to the terms of the inter-district contract, which allows Wickiup Reservoir to fill at any time and at any rate provided that storage is below 180,000 acre-feet, while meeting minimum downstream releases (discussed later in this chapter). After storage has reached 180,000 acre-feet, outflow from Crane Prairie Reservoir is curtailed until that reservoir reaches 45,000 acre-feet. Wickiup Reservoir is then filled to 200,000 acre-feet (full pool) prior to further filling of Crane Prairie Reservoir beyond 45,000 acre-feet.

Irrigation releases typically begin by mid-April and the reservoir commences drafting. In wet years this can be delayed until early May, and in extremely wet years the reservoir may not draft until early June. Irrigation releases typically peak in July between about 1,400 cfs and 1,600 cfs, but can be higher. Irrigation demand begins to diminish in September and releases are typically down to minimum flows by the middle of October.

During the nonirrigation season, a minimum flow of 20 cfs is normally maintained at the gaging station about 1,000 feet downstream from Wickiup Dam. This minimum flow was established following a hearing held in September 1954 on the amended application to increase the storage in Wickiup Reservoir. The Oregon State Engineer identified a minimum release of 20 cfs for downstream conservation. Under normal storage conditions, this amount can be readily obtained from the downstream toe drain along the toe of the dam. Flows higher than 20 cfs can usually be supplied in a series of wet years without risk to refill (and thus to storage rights), as was the case from 1997 to 2001.

Wickiup Dam and Reservoir operations are summarized in Table 2-5. Table 2-6 shows the average monthly flow exceedance for water years 1990 through 2001 below Wickiup Dam. From the table, the 90 percent exceedance for October was 215 cfs, meaning that 90 percent of the time average monthly October flows equal or exceed 215 cfs. Figure 2-4 and Figure 2-5 show annual hydrographs of river flows below Wickiup Dam for the period 1991 through 2001, which includes sequences of dry and wet years.

Table 2-5. Summary of Wickiup Dam and Reservoir Operations

Item	Comment
Releases	
20 cfs +200 cfs	Minimum release by order of Oregon State Engineer in 1954 Typical minimum release in wetter years (roughly 40 percent of years)
1400-1600 cfs	Typical peak irrigation release
Rate of rise (maximum)	Existing limits are 1 foot per hour, but watermaster voluntarily operates to ½ foot per day. USFS proposed rates are 0.1 foot per 4-hours; adhered to when possible. Reservoir elevation, flood operations, and downstream conditions will dictate the release criteria.
Rate of drop (maximum)	Daily limits same as above. USFS proposed hourly limit is 0.2 foot per 12 hours; adhered to when possible.
Reservoir Content	
Minimum pool	None required; typically stays above 25,000 acre-feet. Recent recorded minimum was 15,600 acre-feet (1994).[1]
61,000 acre-feet	Average end-of-September carryover.
180,000 acre-feet	Maximum storage limit until Crane Prairie Reservoir fills to 45,000 acre-feet.
200,000 acre-feet	Full pool; achieved or nearly achieved in approximately 70 percent of years.
[1] The reservoir reached 8,100 acre-feet and 8,800 acre-feet in 1955 and 1970, respectively, and reached 1,980 acre-feet in 1952.	

Table 2-6. Average Monthly Flow (cfs) Exceedance below Wickiup Dam, Deschutes River Basin*

Gage Location (period of record)	Percent Exceedance	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Deschutes River													
Below:	90%	215	20	19	17	19	22	101	711	899	1209	1237	905
Wickiup Res.	50%	493	25	36	23	33	94	585	1003	1294	1458	1419	1172
(water years	10%	919	710	573	914	1053	739	784	1364	1557	1772	1630	1422
1990-2001)													
* Information from http://pn.usbr.gov/hydromet/index.html													

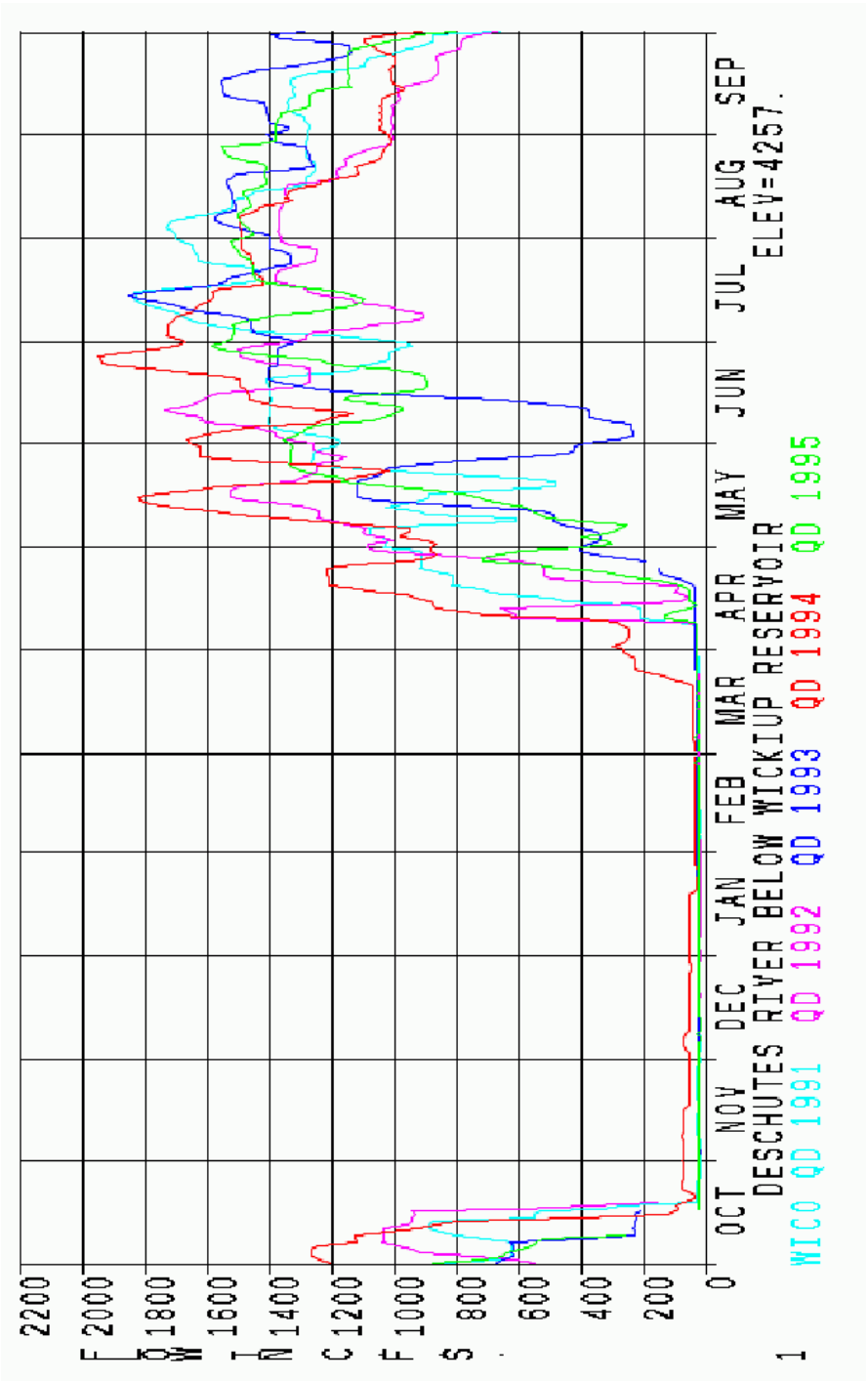

Figure 2-4. Daily Average Flow (QD) for the Deschutes River below Wickiup Dam (WICO), 1991-1995 (dry year series)

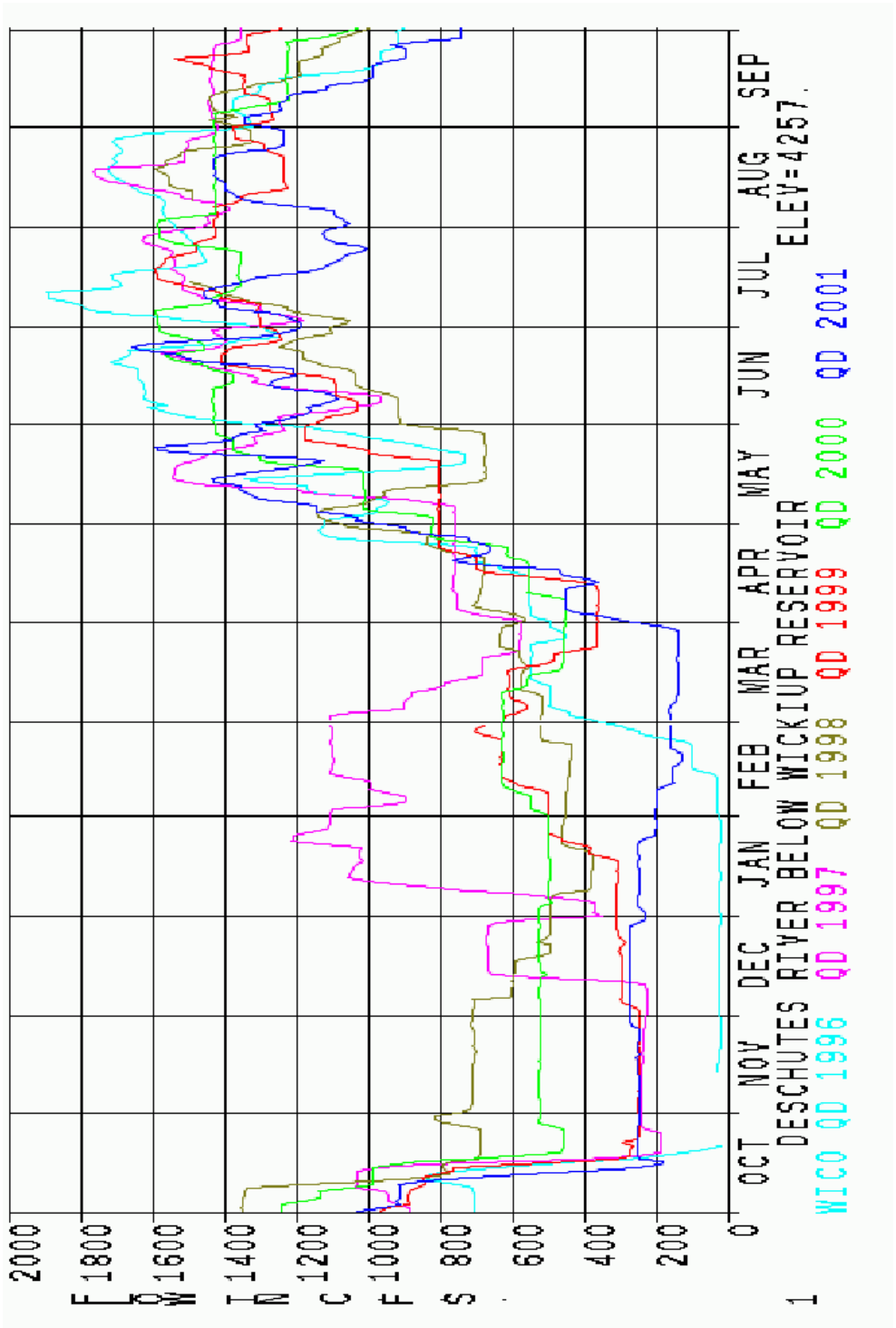

Figure 2-5. Daily Average Flow (QD) for the Deschutes River below Wickiup Dam (WICO), 1996-2001 (wet year series)

Haystack Dam and Reservoir Operation

Haystack Dam and Reservoir is an off-stream storage facility. Because of the distance from Wickiup Reservoir to the NUID project lands (about 100 miles), the regulatory storage provided by Haystack Reservoir is required. Inflow to Haystack Reservoir is primarily provided by two diversions: (1) from the Deschutes River near Bend, Oregon, by means of North Unit Main Canal, and (2) the Crooked River Pumping Plant at a point where the North Unit Main Canal crosses the Crooked River. In addition, natural inflow can occur from Haystack Creek, although this is typically minor compared to the canal feeds. Infrequent rain-on-snow flood events are the only source of appreciable inflow from Haystack Creek.

If the reservoir levels go into surcharge conditions (more than 100 percent full), Haystack Feeder Canal acts as a spillway for emergency releases. During the nonirrigation season, the Haystack Feeder Canal control gates are kept in the full open position as a precaution in order to insure the capability to bypass flood flows up to 800 cfs.

During the irrigation season, which usually runs from early to mid-April through mid-October, the reservoir typically operates between elevations of about 2828 feet to 2841 feet (2,900 acre-feet to 5,500 acre-feet) in order to supply irrigation releases. Operations follow a cyclic pattern where the reservoir is drafted and then refilled periodically to maintain its operating range. In October following the irrigation season, the reservoir is typically refilled to an elevation range of 2835 feet to 2838 feet (4,150 acre-feet to 4,750 acre-feet). During the nonirrigation season, all outflows from the reservoir are curtailed and the reservoir is maintained at a fairly constant elevation until the following April.

Because it is an off-stream reservoir and discharges to the NUID canal, there are no minimum flows or ramping rates associated with the operation of Haystack Reservoir. The typical minimum reservoir level of approximately 2,900 acre-feet is sufficient to maintain fishery and recreational resources associated with the reservoir. There is no established minimum pool.

2.2.2.2 Diversion of Water

The primary diversion point for Deschutes project water occurs at the North Canal Dam on the main Deschutes River near Bend at RM 164.8. Due to numerous changes in canal companies and ownerships over the years, it is unclear who owns North Canal Dam. However, it is clear that Reclamation does not own the feature, and therefore, bears no responsibility for the O&M of the dam.

Four irrigation districts divert water into their respective canals at the North Canal Dam – NUID using the North Unit Main Canal, Lone Pine ID and COID using the North Canal

(also called the Pilot Butte Canal), and Swalley ID using the Swalley Canal. Only NUID, Lone Pine ID, and COID divert Federal project water.

Diversion of Crane Prairie storage water by COID, Arnold ID, and Lone Pine ID occurs through privately owned and operated diversion facilities. Reclamation does not own or operate these diversion facilities or possess the diversion water rights. The Oregon State Watermaster regulates diversion of this water. Delivery and diversion of Crane Prairie storage water into these private facilities is interrelated and interdependent to the proposed action.

The North Canal Dam is the last major diversion point for irrigation water from the Deschutes River, and marks the low flow point on the river just downstream of the dam. The diversion of natural and storage flows, mostly by private diversions, along with diversions of Deschutes project water essentially dewaters the Deschutes River by the time it passes the North Canal Dam. Irrigators early on recognized the need to provide a minimum release past the North Canal Dam, and since the early 1960s a non-binding "gentlemen's agreement" among several of the major irrigation districts has provided at least 30 cfs. The parties to this agreement include NUID, COID, Tumalo ID, and Swalley ID. In addition to the 30 cfs, the Watermaster must pass about 5 cfs to meet several small irrigation demands further downstream.

The DRC and other interested parties have made a significant effort in the last few years to improve flows past North Canal Dam (along with other locations in the basin) by leasing or purchasing water rights from traditional irrigation users. The combination of leases, "gentlemen's agreements," and irrigation flow totaled approximately 45 cfs passing North Canal Dam during the 2002 irrigation season. This "minimum" will vary from year-to-year depending on the water supply and demands and leasing arrangements negotiated.

North Unit Headworks and Main Canal

The North Unit Main Canal, with headworks located at North Canal Dam, is the principal water delivery feature for the Deschutes Project. This is the only federally-owned diversion facility associated with the Deschutes Project. The canal has a maximum diversion capacity of 1,100 cfs, although diversions during the irrigation season are generally from 247 cfs in October to 640 cfs in July. Annual average diversions are 193,559 acre-feet/year (based on period of record from 1961-2000) which includes storage water from Wickiup Reservoir and natural flow water rights (LaMarche 2001).

NUID has been able to reduce their peak demand and increase the reliability of their storage water through conservation and efficiency improvements. In the past, maximum diversion into the North Unit Main Canal was often at the 1,100 cfs capacity, where

maximum demand now will typically call for about 800 cfs (although higher flows may sometimes be needed for short periods to keep the system in balance).

The diversion contains a fish screen complex constructed in 1945 which does not meet current fish screening standards. Reclamation has completed preliminary designs to upgrade the fish screen to comply with current standards.

The irrigation diversion season is generally April 1 to November 1. NUID diverts both natural flows and storage water into the North Unit Main Canal. Anytime natural flows on the Deschutes River are above about 1,500 cfs, as calculated by the Watermaster, some or all of NUID's demands can be met from natural flows. However, NUID's natural flow rights are junior to all major irrigators on the river, and once Deschutes River natural flows drop to 1,500 cfs or less, it relies entirely on storage water from Wickiup Reservoir. Because of this heavy reliance on stored water and the uncertainty of reservoir refill in future years, NUID operates in a very conservative manner to maximize the carryover water in Wickiup Reservoir.

The average monthly flow exceedance for water years 1915 through 1991 below North Canal Dam are shown in Table 2-7. These flows reflect hydrologic effects of diversions associated with the proposed, interrelated and interdependent, and private actions. The diversion of natural flow rights by COID, Lone Pine ID, Arnold ID, Tumalo ID, and Swalley ID are not part of the proposed or interrelated and interdependent actions.

Table 2-7. Average Monthly Flow (cfs) Exceedance below North Canal Dam, Deschutes River Basin*

Gage Location (period of record)	Percent Exceedance	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Deschutes River													
Below: Bend (water years 1915-1991)	90%	70	372	450	482	478	441	88	34	29	29	25	26
	50%	241	661	798	835	863	845	286	106	106	73	83	113
	10%	802	1140	1217	1274	1320	1408	1161	680	627	352	430	512
* Information from http://pn.usbr.gov/hydromet/index.html													

2.2.3 Crooked River Project Operations

The Crooked River Project is located near Prineville, Oregon (Figure 2-6). About 23,000 acres are irrigated using project water, with OID irrigating about 21,000 of those acres. A number of smaller irrigation associations or individual users irrigate less than 2,000 acres with Prineville Reservoir storage water. Irrigated acres produce grain, hay, garlic,

turf, grass seed, mint, and irrigated pasture on farm units ranging in size from large livestock ranches to small suburban residential tracts.

Principal federally-owned features included in the proposed action are Arthur R. Bowman Dam, Prineville Reservoir, and the Crooked River Diversion Dam, Feed Canal, and Distribution Canal. Additionally, Reclamation has title to several off-stream pumping plants and distribution canals within the OID irrigation system. Reclamation also holds a water right to store water behind Bowman Dam and divert the stored water into federally and privately-owned facilities.

Ochoco Dam and Reservoir, which stores and releases Ochoco Creek water, is a privately-owned facility operated by OID. Reclamation does not hold the water right for storing or diverting Ochoco Creek water. However, operation of OID-owned facilities is coordinated with operation of Bowman Dam and Prineville Reservoir and other Federal facilities in the Crooked River Project; therefore, operations of OID-owned facilities are included as interrelated and interdependent activities in this consultation.

The following is a brief summary of project operations included in the proposed action. Refer to pages 66-81 in the Operations Report for a detailed description. The proposed action includes:

- Storage and release of water from Prineville Reservoir and Bowman Dam.
- Diversion of Prineville Reservoir storage water by contractors into the Crooked River Feed Canal and other private facilities. (Diversion of natural flow water into the Crooked River Feed Canal is an interrelated and interdependent action.)
- Conveyance of Prineville Reservoir storage water in federally-owned facilities

2.2.3.1 Storage and Delivery of Water

The total active capacity of Prineville Reservoir is 148,640 acre-feet. Prineville Reservoir serves as a primary water supply for some lands within OID, as well as a supplemental water supply to the district and other individuals. Additionally, OID relies on storage water in Ochoco Reservoir to provide primary and supplementary supplies of water to district members. Operations of Bowman Dam are part of the proposed action. Operations at Ochoco Dam are interrelated and interdependent to the proposed action.

Crooked River Project, Oregon

Major Facilities

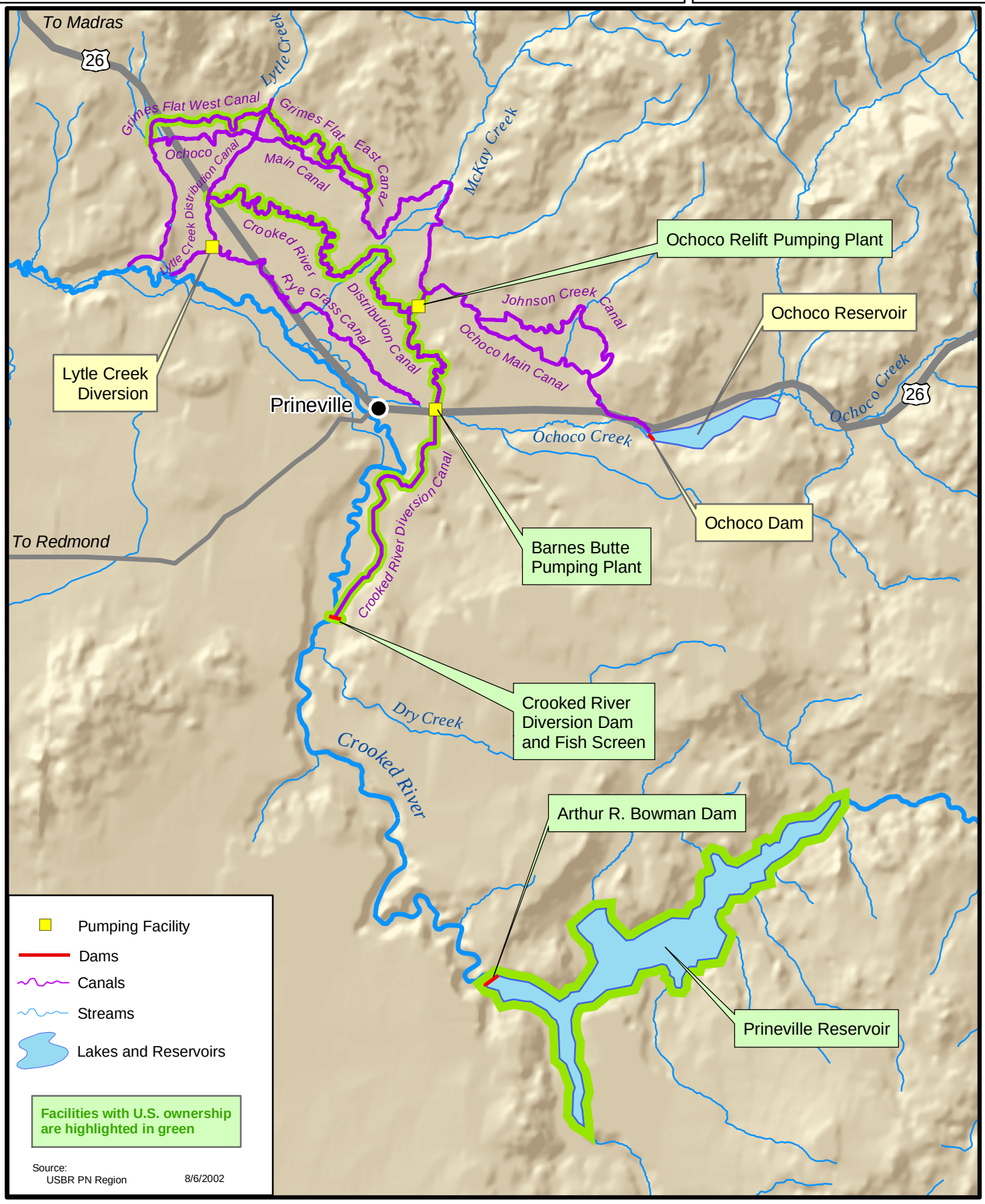

Figure 2-6

Reclamation forecasts runoff for the Crooked River at Prineville Reservoir and Ochoco Creek at Ochoco Reservoir for effective utilization of storage space for flood control and water conservation. Prineville and Ochoco Reservoirs are filled concurrently, based on runoff forecasts.

Bowman Dam and Prineville Reservoir Operation

Crooked River flows are comprised of winter snowfall and spring runoff in its upstream watershed and from spring flows as the river approaches its confluence with the Deschutes River. Upper Crooked River flows are highly variable, both seasonally and annually. This reach of the river is fed mostly by surface runoff, and soils are shallower and less porous than in the Deschutes River subbasin. Nearly all of the annual volume of reservoir inflow typically occurs during the December through June period (95 percent). Inflows from July through September account for less than 1 percent of the total, with inflows often less than 10 cfs.

Prineville Reservoir has a much better refill probability than Ochoco Reservoir. Maximum fill occurs at Prineville Reservoir in approximately 3 out of 4 years, where Ochoco Reservoir only fills about 50 percent of the years. Therefore, priority is placed on using irrigation water from Prineville Reservoir to the maximum extent feasible, with Ochoco Reservoir releases made only to serve those lands with insufficient or no access to Prineville Reservoir water.

Reclamation has contracted with OID to perform O&M at Bowman Dam and Prineville Reservoir. Reservoir releases are made by OID between April 1 and October 31 as required to meet irrigation demand. OID coordinates water delivery requests within the district and calls orders into the damtender who makes releases from Prineville Reservoir.

Bowman Dam is operated under formal flood control rules and signed agreements. Flood control criteria at Bowman Dam involves flood control rule curves established by the Corps that prescribe the amount of reservoir space needed to control the predicted volume of runoff. A series of rule curves or tables determine the space requirement for a given water supply forecast on a particular date. Rule curves were developed using historic runoff, system storage potential, and downstream flow restrictions (i.e., downstream channel capacity).

Flood control operation for Bowman Dam begins with no less than 60,000 acre-feet of evacuated space (equivalent to a maximum storage of 88,640 acre-feet of water) in Prineville Reservoir on November 15 through February 15. During this time, water may not be stored if only 60,000 acre-feet of space is vacant. After February 15, the reservoir can be filled as determined by a special forecast runoff equation and related established rule curve through April 30. Final fill may occur between April 1 and April 30 depending on forecasted runoff volume. Once flood control space has been filled, flow begins to occur over the uncontrolled spillway crest. Releases from the outlet works are managed to minimize property damage.

Authorizing legislation for the Crooked River Project mandates a minimum 10 cfs release through Prineville Reservoir. Currently, Reclamation maintains minimum releases ranging between 10-75 cfs below Bowman Dam. Storable inflows are bypassed if existing contractual obligations are not impacted. The lower flows in that range are released in drier years and extended drought conditions when refill of the reservoir is jeopardized. The uncontracted storage in Prineville Reservoir is used to achieve these releases. The legal mandated minimum release remains 10 cfs.

Recreation on Prineville Reservoir is a consideration of current operations, although not specifically an authorized purpose. If sufficient storage exists and spaceholder contracts can be met, an attempt is made to keep enough water in Prineville Reservoir to maintain boat access at ramps at Prineville State Park through peak visitation periods (typically May - August).

Table 2-8 summarizes operations at Bowman Dam and Prineville Reservoir. Table 2-9 shows the average monthly flow exceedance for water years 1990 through 2001 below Bowman Dam (Prineville Reservoir). From the table, the 90 percent exceedance for October was 44 cfs, meaning that 90 percent of the time average monthly October flows equal or exceed 44 cfs. Figure 2-7 and Figure 2-8 show annual hydrographs of river flows below Bowman Dam for the period 1991 through 2001, which includes sequences of dry and wet years.

Table 2-8. Summary of Bowman Dam and Prineville Reservoir Operations

Item	Comment
Releases	
10 cfs	Minimum authorized release
30-35 cfs	Typical informal minimum release during extreme drought, but may be as low as 10 cfs.
75 cfs	Informal minimum release target provided by bypassing inflows from Reclamation's uncontracted storage space
200-240 cfs	Typical peak irrigation releases
2,000 cfs	Informal target, not to exceed for flood control; increased bank erosion above this level
Rate of change (maximum)	None
Reservoir Content	
Minimum pool	None required; recent recorded minimum pool was 22,450 acre-feet in 1993.
Maximum winter flood control pool (November 15 - February 15)	88,640 acre-feet
83,000 acre-feet	Average end-of-October carryover storage
148,640 acre-feet	Full pool; achieved roughly 3 out of 4 years

Table 2-9. Average Monthly Flow (cfs) Exceedance below Bowman Dam*, Crooked River

Gage Location (period of record)	Percent Exceedance	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Crooked River													
Near:	90%	44	33	31	30	31	26	79	159	179	187	196	122
Prineville below	50%	115	74	68	65	91	218	373	249	228	222	227	206
Bowman Dam	10%	297	160	782	1308	1636	1548	2742	1022	1090	315	372	262
(water years 1990-2001)													
* Information from http://pn.usbr.gov/hydromet/index.html													

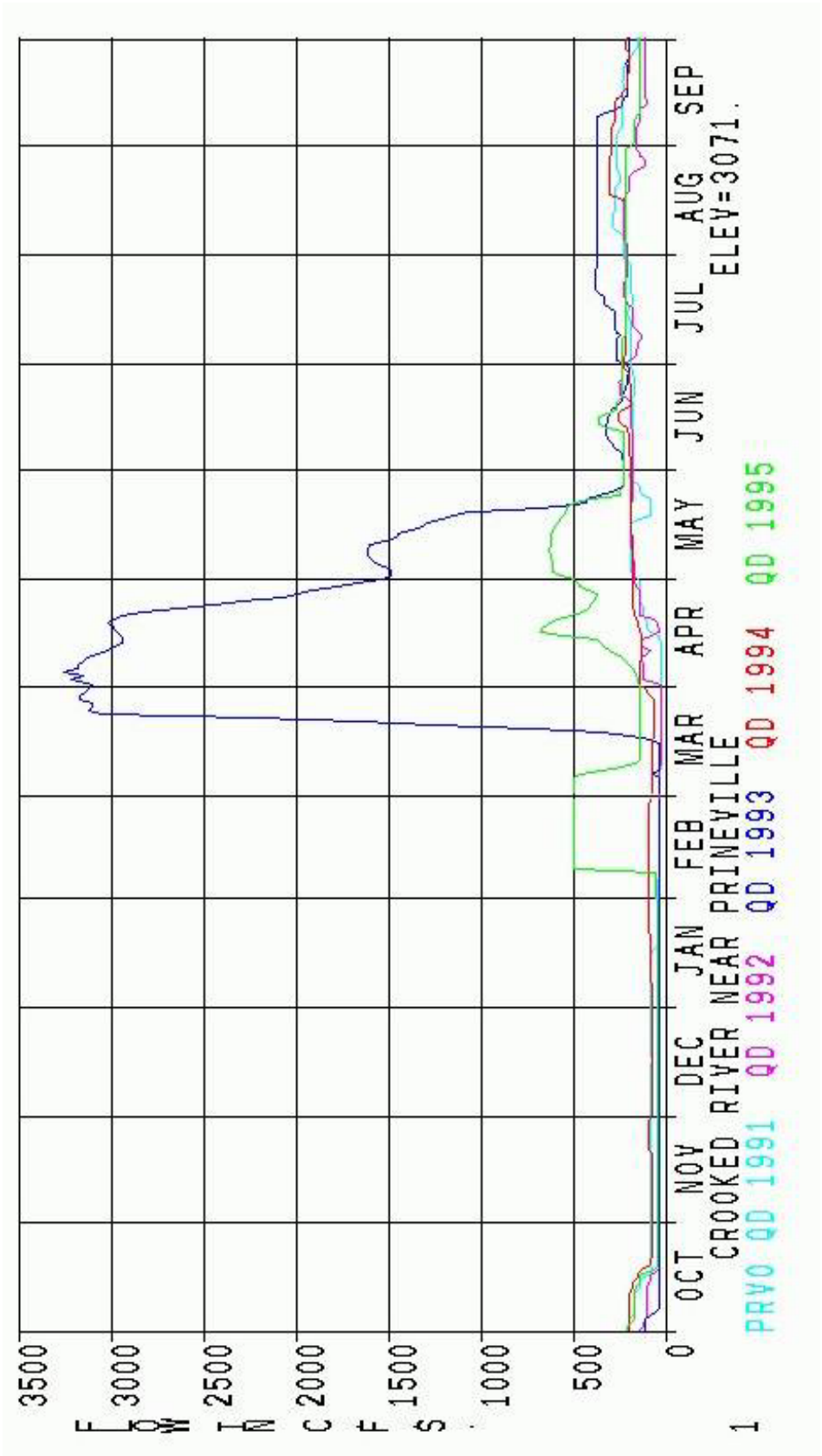

Figure 2-7. Daily Average Flow (QD) for the Crooked River below Prineville Reservoir (PRVO), 1991-1995 (dry year series)

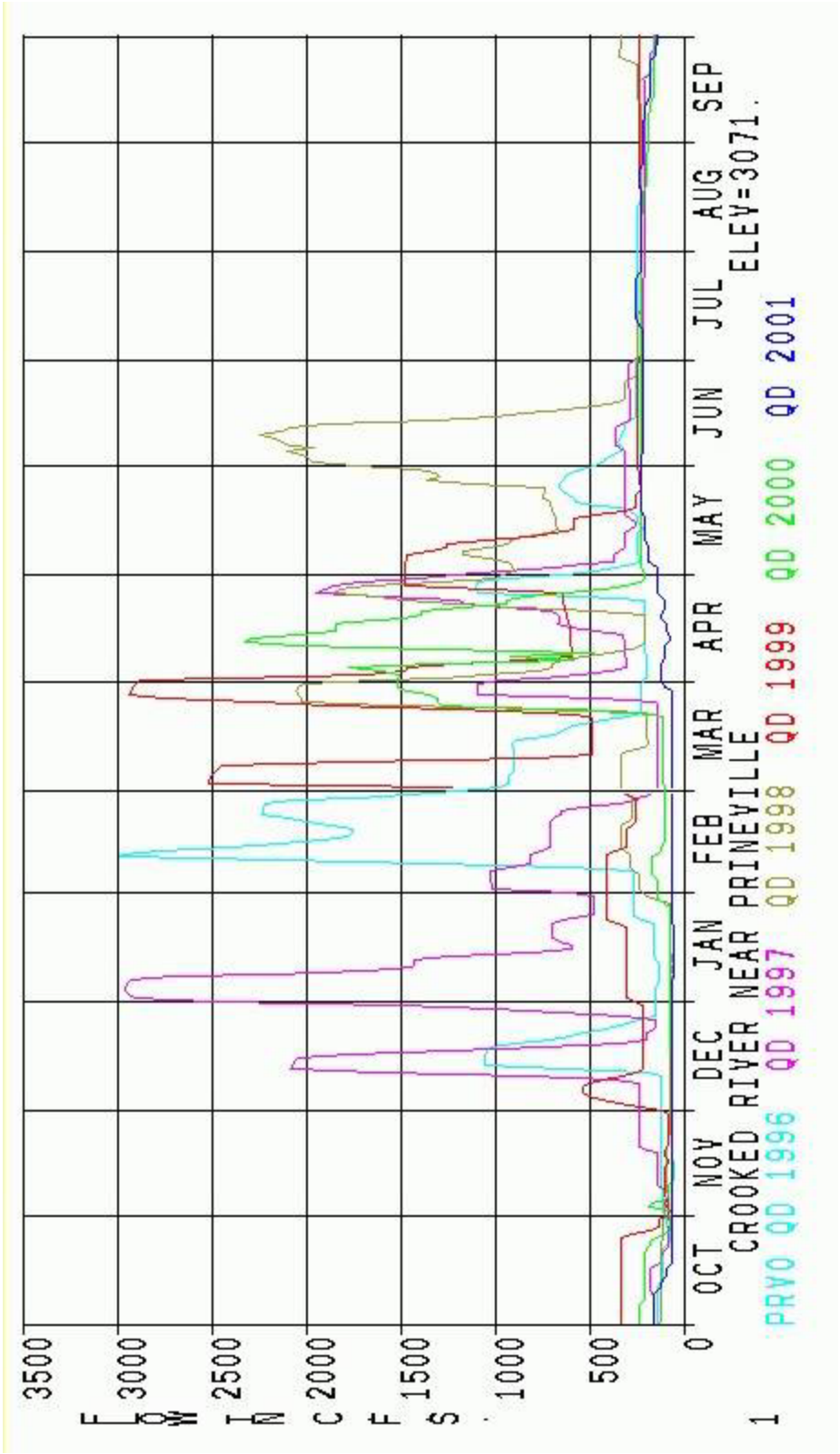

Figure 2-8. Daily Average Flows (QD) for the Crooked River below Prineville Reservoir (PVRO), 1996-2001(wet year series)

2.2.3.2 Diversion of Water

Prineville Reservoir storage water is diverted primarily by the Crooked River Diversion Dam into the Feed Canal, located upstream from the city of Prineville at RM 56 on the Crooked River. This is the only federally-owned diversion facility on the Crooked River. In 2000, Reclamation constructed a new diversion weir, fish screen, and fish bypass and outfall structure to improve resident fish protection at the diversion. Design of the new features was reviewed and approved by the USFWS and ODFW.

The canal capacity is 180 cfs. Average 1994 through 2001 flows diverted into the Crooked River Feed Canal are 50,985 acre-feet per water year, comprised of Prineville storage water and natural flow rights held by OID. Approximately 40 cfs bypasses this diversion to meet non-OID irrigation diversions with water rights to natural flows and/or contracted storage water, and to maintain flows in the Crooked River. OID and Reclamation have cooperatively made the non-binding decision to maintain at least 10 cfs through the low flow point on the Crooked River, roughly the stretch between the golf course near the city of Prineville to the confluence with Ochoco and McKay Creeks, to prevent the river from drying up.

From the diversion dam, the Crooked River Feed Canal runs north 8.3 miles and is siphoned under Ochoco Creek to the Barnes Butte Pumping Plant, serving irrigable lands along its course. The Barnes Butte Pumping Plant lifts a maximum of 147 cfs from the end of the Feed Canal to the head of the 15.8-mile-long Crooked River Distribution Canal which runs through the center of district lands. Operation of the Barnes Butte Pumping Plant requires extra water to be diverted in the Feed Canal to allow continuous pump operation and avoid short cycling or potential pump damage. This extra water is spilled back into Ochoco Creek.

The Ochoco Relift Pumping Plant is located on the Crooked River Distribution Canal at about mile 5 and lifts a portion of the flow to replenish the Ochoco Main Canal that serves lands east and west of McKay Creek. The distribution canal continues in a northwest direction, crossing McKay Creek at Reynolds Dam by siphon, where spills are made into the creek. The Crooked River Distribution Canal terminates at Lytle Creek, where the flows join any remaining spills coming from the Ochoco Main Canal and are routed down Lytle Creek to the Crooked River. In addition to the Barnes Butte and Ochoco Relift Pumping Plants, Reclamation has developed several smaller offstream pumping plants that distribute Project storage water and convey natural flow water (under a water right held by OID) to Crooked River project lands within OID's boundaries. These pumping plants take water from the Crooked River Feed Canal, Distribution Canal, or Ochoco Main Canal as described in the Operations Report on pages 60-62.

OID has strived to modify its diversion operations and facilities to improve fish passage and habitat by enhancing instream fish passage, minimizing diversion of fish into canals, and improving instumentation at existing streamflow gaging sites through partnerships with a wide variety of entities. Some examples include:

- Design and construction of several infiltration galleries,
- Replacement of outdated weirs with advanced inverted weirs to allow fish passage,
- Construction of several siphons which separate the irrigation ditch from the stream to avoid dewatering or chemical contamination of the creek,
- Upgrades on numerous gaging (streamflow monitoring) stations to include temperature monitoring; and
- Construction of year-round fish ladders.

OID has also strived to eliminate virtually all of its diversion dams that have historically blocked fish passage.

2.2.4 Wapinitia Project Operations

The Wapinitia Project consists of approximately 2,100 acres of irrigated lands in the White River subbasin (Figure 2-9). The Wapinitia Project, Juniper Division, is located near the confluence of the White and Deschutes Rivers and adjacent to Maupin in north-central Oregon. Project lands are located on Juniper Flat, a plateau 3- to 6-miles-wide and approximately 17 miles long. The project lands produce pasture, hay, and wheat; storage provides supplemental water supply for about 2,000 acres.

Federally-owned project features included in the proposed action are Wasco Dam and Clear Lake. Wasco Dam is the only storage facility in the Wapinitia Project, with a total active capacity of 11,900 acre-feet. The dam was constructed in 1959 at the outlet of Clear Lake, a natural lake. JFDIC uses storage in Clear Lake to supplement other privately developed water supplies.

The following is a brief summary of project operations included in the proposed action. Refer to pages 91-94 in the Operations Report for a detailed description. The proposed action includes the storage behind and release of water from Wasco Dam for diversion at the Clear Creek Diversion. Storage water is diverted into the privately owned and operated Clear Creek Diversion facilities under water rights held by JFDIC. Diversion of this storage water is interrelated and interdependent to the proposed action.

2.2.4.1 Storage and Delivery of Water

Wasco Dam and Clear Lake Operations

Project water is stored in Clear Lake behind Wasco Dam, about 35 miles west of Maupin, Oregon. The drainage area comprises over 8 square miles and is fed from seasonal precipitation, principally in the form of winter snowfall. Wasco Dam storage is used to supplement the irrigation flows on the project when the natural flows begin to decrease in July during wet years and as early as April in dry years. The total amount of water diverted from natural streamflow and storage for the Wapinitia Project is about 5,000 acre-feet annually. The diversion of the storage water is an interrelated and interdependent action; the diversion of the natural flow is by private facilities and not part of the proposed or interrelated and interdependent actions.

Summer inflows are received from many springs in the immediate reservoir area. In order to refill the reservoir for the irrigation season, the emergency gate is closed every year from October through April, with the regulating gate remaining open to bypass possible flood flows. If the elevation of the lake were to reach 3511 feet during the closure period, flood flows would discharge via the overflow weirs and through the open regulating gate.

Operation of Wasco Dam and Clear Lake are summarized in Table 2-10.

Table 2-10. Summary of Wasco Dam and Clear Lake Operations

Item	Comment
Releases	
Minimum release	None required. Some seepage occurs.
20-45 cfs	Typical peak irrigation release from dam.
50 cfs	Typical maximum diversion into Clear Creek diversion works.
52.9 cfs	JFDIC water right at Clear Creek diversion works.
Rate of change (maximum)	No limits.
Reservoir Content	
Minimum pool	None. The original natural lake volume remains when all storage water is used. Storage is nearly emptied in most drought years.
2,540 acre-feet	Average end-of-October carryover.[1]
11,900 acre-feet	Full pool (active capacity). Refills completely less than 20 percent of the years.
[1] Active capacity that is carried over on an average basis.	

Wapinitia Project, Oregon

Major Facilities

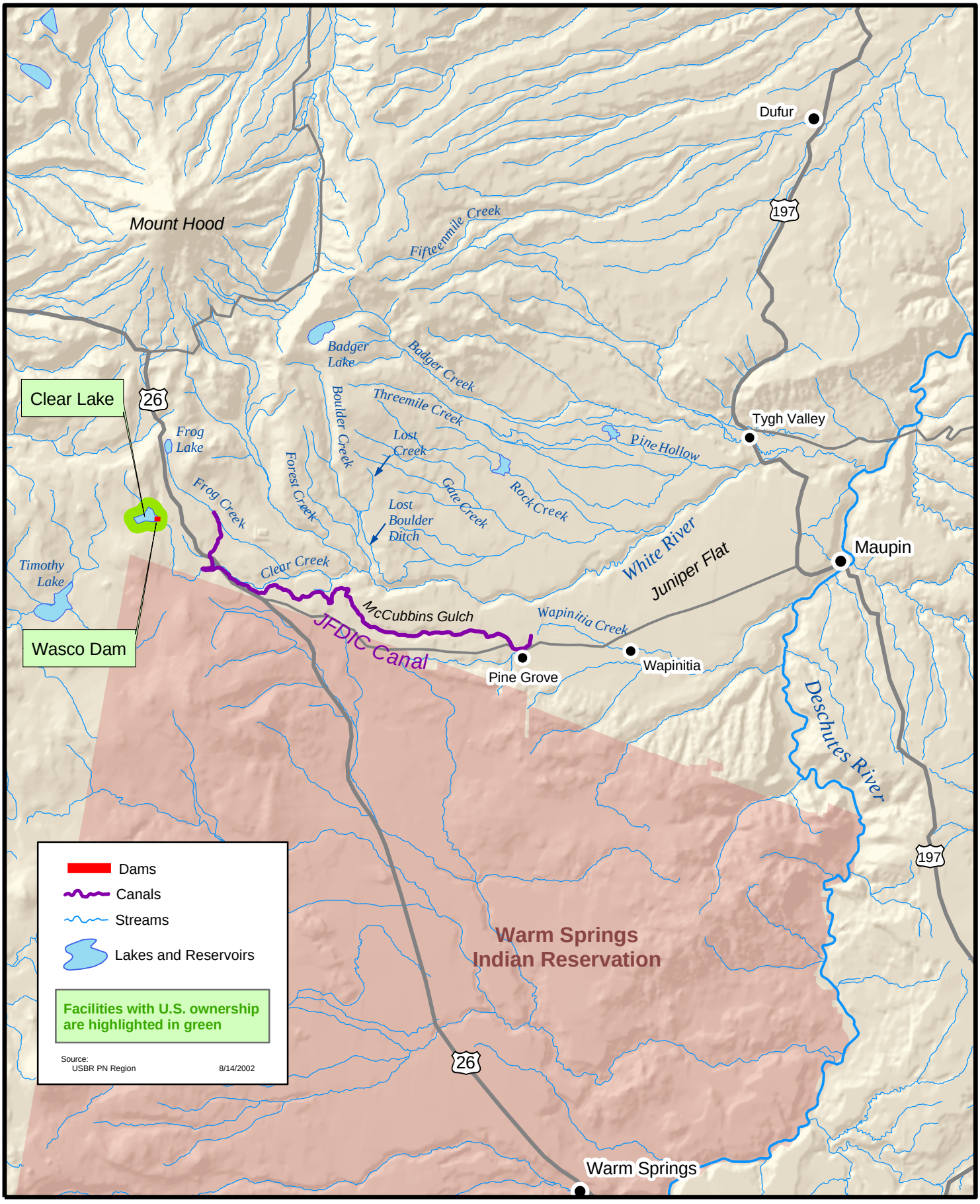

Figure 2-9

2.2.4.2 Diversion of Water

JFDIC has a water right to divert a maximum of 52.9 cfs at the Clear Creek diversion works. In normal years, natural flows from Clear Creek and Frog Creek will typically meet irrigation demands until some time in May or June before releases are needed from Wasco Dam. In wet years, reservoir releases may not be needed until late June or early July; in very dry years releases may be needed in April. Clear Creek is essentially dewatered at the Clear Creek diversion works during the irrigation season (except for early season water in excess of irrigation demand), but some leakage occurs and springs begin to replenish the live flow within about a mile downstream (Reclamation 2003a).

Water is conveyed from the Clear Creek diversion works through the JFDIC Main Ditch to McCubbin's Gulch, a natural watercourse. Water is then carried down McCubbin's Gulch to the extreme western edge of the district where it becomes part of the district's delivery system at Pine Grove. Flows at Pine Grove typically need to be 20 to 25 cfs to meet irrigation demand, with 30 cfs being the maximum capacity.

2.2.5 Facilities Maintenance

Maintaining facilities in good operating condition is important. Failure of features, such as outlet works stuck in the open or closed position or major cavitation/erosion damage, can quickly lead to significant damage to the structure and possible uncontrolled water releases which can be devastating to life, property, and the environment. The purpose of maintenance programs is to maintain facilities in good operating condition and to identify potential problems and repair features before failure occurs. Nonetheless, unexpected failure does occur. These failures can happen at any time and often require emergency repair operations to avoid major damage to the structure.

Federally-owned water conveyance and control facilities and facilities included in Reclamation's Safety of Dams program, require periodic inspection, maintenance, and repair; all major features undergo a major review of operation and maintenance at 3-year intervals. Periodic inspection may require operation of features at specific reservoir water surface elevations to assure continued reliable operation. Times of inspections are generally accomplished near the end of the irrigation season. When underwater dive inspections are required, minimum flows during inspections are coordinated with ODFW. Specific times, duration of flow interruptions, and minimum flow needs are coordinated with the ODFW, OWRD, and USFS. Repairs consist of repairing eroded concrete, recoating or replacing corroded metalwork, repairing cavitation damage to control gates, removing rock and debris from intake and outlet structures, and repairing metal and concrete outlet conduits. Dewatering of various features is often required for inspections, repairs, and other maintenance activities. Reduced or increased riverflow, lowering or

raising the reservoir water surface, installation of bulkheads, and construction of cofferdams for temporary diversion of flows may be required.

Transferred works are routinely inspected jointly by Reclamation and the operating entity under the Review of Operation and Maintenance Program. If required maintenance is identified in an inspection, the operating entity prepares the specifications and is required to submit those specifications to Reclamation for review and approval.

Maintenance activities at one facility in a system may require system operation changes that affect reservoir levels and flows at other facilities. Emergency actions conducted by Reclamation which result in significant changes in flows or pool levels at reservoirs are coordinated with resource management agencies and other parties with major interests in the operation. When damage is identified or appears likely to occur, the risks are evaluated and a decision is made to make repairs immediately (emergency or unscheduled repairs) or, if practical, to delay repairs until the regular maintenance schedule.

The Operations Description report describes routine maintenance activities specific to Reclamation's Deschutes River basin project facilities (pages 49-51, 83, and 95). Work planned is subject to change depending on funding appropriations, additional study, or other unforeseen events. Non-routine maintenance activities potentially affecting ESA-listed species would entail a separate Section 7 consultation.

2.3 LEGAL AND STATUTORY AUTHORITIES

Reclamation's authority in operating and maintaining its projects is determined by numerous legal and statutory authorities and obligations. These include Congressional authorizations, state water law and associated water rights, and contractual obligations with contractors. The proposed action for this consultation is consistent with these authorities. This section elaborates on those authorities, responsibilities, and obligations to explain the rationale and limitations involved in operating Reclamation projects. The Operations Description report provides additional information and will be referenced as appropriate.

2.3.1 Congressional Authorizations

Reclamation must receive authorization from Congress before constructing a project. Authorizing legislation states the authorized purpose of the project or facilities that determines the uses of storage water and the limits within which a Federal facility can be operated. Irrigation is the primary purpose of all authorized projects in the Deschutes River basin. Other incidental uses are sometimes authorized for projects. For example,

general authorizations for recreation and fish and wildlife apply to management of water and land surfaces and the development of facilities for recreation or safety purposes. They do not authorize reallocation of project water supply for these purposes. The following describes authorizing language for each of the Deschutes River basin projects.

2.3.1.1 Deschutes Project

The Deschutes Project was authorized by a finding of feasibility by the Secretary of the Interior on September 24, 1937; it was approved by the President on November 1, 1937 pursuant to the Act of June 25, 1910 (36 Stat. 836) and the Act of December 5, 1924 (43 Stat. 702). Construction of Haystack Dam was authorized by the Congress in Public Law 83-573 dated August 10, 1954. Irrigation is the authorized purpose of the Deschutes Project.

2.3.1.2 Crooked River Project

The Crooked River Project was authorized under the Act of August 6, 1956, specifically to provide irrigation water for lands in the Crooked River Project and other beneficial purposes, including flood control. The Act authorized the construction of minimum basic public recreation (health and safety) facilities and structures to promote the preservation and propagation of fish and wildlife. The authorized fish and wildlife purposes were specifically described as the construction of a fish screen and ladder at the Crooked River Diversion structure and a minimum release of 10 cfs from Bowman Dam to maintain the downstream fishery when releases are not being made for irrigation or flood control. Although no space in Prineville Reservoir is specifically allocated for health and safety facilities or for the minimum 10 cfs release, these purposes are considered during annual planning of reservoir operations.

The authorizing act was amended in 1959 to extend the Crooked River Project by increasing the land area receiving water, and again in 1964 to permit construction of additional irrigation facilities. Both amendments were intended to utilize uncontracted space in Prineville Reservoir for irrigation.

The Act does not authorize the use of the storage space for any purpose other than irrigation and flood control. Natural flow from the upper Crooked River is passed through Prineville Reservoir without being stored and is released from Bowman Dam to meet the minimum 10 cfs release requirement.

2.3.1.3 Wapinitia Project

Congress authorized the Wapinitia Project, Juniper Division, in Public Law 84-559 dated June 4, 1956. The authorized purpose of the project was for the irrigation of about 2,100 acres. Construction of minimum basic recreation facilities to allow public access and maintain health and safety were also authorized.

2.3.2 State Water Law

The western states obtained ownership of streams and control of the water within each state upon admission to the United States. Section 8 of the Reclamation Act of 1902 recognizes this principle by requiring that the acquisition and use of water for Reclamation projects shall proceed in conformity with state law. Reclamation storage and release of water for project purposes has complied and continues to comply with state water law.

State laws regulate the acquisition and the use of water and limit use of water to beneficial purposes determined by the state. Reclamation secures state water rights for its projects that are consistent with the authorized project purposes. Water rights are secured in accordance with state water law, and water rights granted by the state are defined in terms of the type of water use, period of use, the source of the water, the location of the point of diversion and place of use, and the rate and total volume that may be diverted, if applicable (some rights do not involve a diversion). Any changes in water use from those described in the water right definition must generally be authorized by the state through an approval of a transfer of a water right. Watermasters oversee the diversion and use of water to assure compliance with water rights of record.

Federal law provides that Reclamation obtain water rights for its projects and administer its projects pursuant to state law relating to the control, appropriation, use, or distribution of water, unless the state laws are inconsistent with expressed or clearly implied Congressional directives [43 U.S.C. ' 383; *California v. United States*, 438 U.S. 645, 678 (1978); appeal on remand, 694 F.2d 117 (1982)]. Water can only be stored and delivered by a project for authorized purposes for which Reclamation has asserted or obtained a water right in accordance with Section 8 of the Reclamation Act of 1902 and applicable Federal law. Reclamation must operate projects in a manner that does not impair senior or prior water rights. Reclamation has an obligation to deliver water to the project water users in accordance with the project water rights and contracts between Reclamation and the water users (which may be through an irrigation district). Water lawfully stored in project reservoirs can be used for project purposes to the extent the water is applied to beneficial use within the project.

In Oregon, as in most western states, a water right is obtained through application followed by beneficial use proof (see ORS 537.010). Likewise, Oregon law is similar to the laws of most other western states in that actual application of the water to the land is required to perfect a water right for agricultural use. Federal law concerning Reclamation projects, which is consistent with Oregon law, also provides that the use of water acquired under the Reclamation Act of 1902 "shall be appurtenant to the land irrigated, and beneficial use shall be the basis, measure, and the limit of the right" (43 U.S.C. ' 372). Beneficial use is determined in accordance with state law to the extent it is not inconsistent with Congressional directives (see *Alpine Land & Reservoir Co*., 697 F.2d at 853-854; see also *California v. United States*, 438 U.S. at 678). Reclamation has no general authority to reallocate project water without passage of legislation by Congress. These authorities and the contracts with the United States create and define the extent of the water users' rights.

In the Deschutes River basin, water rights to store water behind Reclamation facilities and to divert project storage water are held by the water users, with the exception of the Crooked River Project. Reclamation has water rights for storage of water behind Bowman Dam and also for diversion of Crooked River Project water for irrigation. (Tables 5, 13, and 19 in the Operations Report identify water rights associated with project facilities.)

Reclamation has limited authority to control diversion of storage water released from Reclamation facilities for circumstances where they do not hold the water right or own the diversion facilities, as is the case for Crane Prairie Reservoir and Clear Lake. The OWRD regulates the conveyance of water in the river and it protects flows from illegal diversion to the point where the water is diverted into canals. The proposed action includes storing water in and releasing water from Crane Prairie Reservoir and Clear Lake for diversion, but diversion of this water is an interrelated and interdependent action.

Although Reclamation does not hold the water right to store or divert Wickiup Reservoir storage water, it does own the storage and diversion facilities. The proposed action includes storing water in and releasing water from Wickiup Reservoir and diverting stored water into the North Unit Main Canal.

For the Crooked River Project, Reclamation possesses the water right for storing water behind Bowman Dam, releasing water into the Crooked River, and diverting Prineville Reservoir water. These actions are included in the proposed action for this consultation.

2.3.3 Contracts

Under provisions of the Reclamation Act, specific authorizations for features of the Deschutes Project, and subsequent contractual obligations, project costs were to be repaid by the beneficiaries, i.e., those entities who received project water or whose original irrigation facilities may have been improved or enlarged by the United States. In accordance with Reclamation law, the United States entered into various forms of repayment contracts with entities for reservoir storage, rehabilitation, and/or enlargement of existing facilities (that were privately owned at the time), or for the construction of a new storage and delivery system (e.g., Wickiup Dam and the delivery system for the NUID) in exchange for repayment of the construction costs allocated to irrigation and the allotted operations and maintenance costs.

The use of the water stored in Federal reservoirs is administered in conjunction with water rights and provisions of state water law. Reclamation operates reservoirs according to the contracts so that operations do not negatively affect storage without the permission or direction of the contractors. Repayment and other contracts having implications for the operation of Deschutes River basin project facilities are described in the Operations Report and referenced as appropriate in the section that follows.

2.3.3.1 Deschutes Project

Reclamation has current contracts with COID for operation of Crane Prairie Reservoir and with NUID for operation of Wickiup and Haystack Reservoirs. The Operations Description report at pages 30-32 provides details about these contracts.

The January 4, 1939, repayment contract with COID requires Reclamation to provide 50,000 acre-feet of storage in Crane Prairie Reservoir. The contract has specific language regarding the coordination of storage and releases between Wickiup and Crane Prairie Reservoirs. The contract contains language that allocates storage in the reservoirs according to the January 4, 1938, contract entered into between Arnold ID, COID, Lone Pine ID, and NUID.

Under provisions of the repayment contract between Reclamation and NUID, Reclamation agreed to construct facilities to provide 200,000 acre-feet of storage space to NUID to irrigate 50,000 acres in exchange for repayment by NUID of a portion of construction, operation, and maintenance costs. The contract also notes that project water supply is subject to the terms of the January 4, 1938, inter-district contract (between NUID, COID, Lone Pine, and Arnold ID) referred to earlier and a January 4, 1939, contract between the United States and COID. Table 2-11 summarizes the allocation of storage space in the two Deschutes Project reservoirs as defined by the relevant contracts. Storage in both reservoirs is fully contracted. Haystack Reservoir serves as a reregulating

reservoir for releases made out of Wickiup Reservoir; therefore, it is not included in Table 2-11.

Table 2-11. Water Storage Allocation for Deschutes River Basin Federal Reservoirs

Reservoir	Spaceholder/Contractor	Storage Allocations (acre-feet)
DESCHUTES PROJECT		
Crane Prairie Reservoir	COID	26,000
	Arnold ID	13,500
	Lone Pine	10,500
	TOTAL	50,000
Wickiup Reservoir	NUID	200,000
CROOKED RIVER PROJECT		
Prineville Reservoir	OID	57,899
	Other [1]	10,374
	Uncontracted	80,360
	TOTAL	148,633
WAPINITIA PROJECT		
Clear Lake	JFDIC	11,900
1 Includes 14 other contracts ranging from about 3,500 to 19 acre-feet each		

2.3.3.2 Crooked River Project

Reclamation has repayment contracts with OID and 14 other water users for operation of Bowman Dam and storage water from Prineville Reservoir. The Operations Description report at pages 64-65 provides details about these contracts. Under the contract provisions, Reclamation agreed to construct facilities and provide almost 68,000 acre-feet of irrigation storage space in Prineville Reservoir to spaceholders in exchange for repayment of a portion of construction, operation, and maintenance costs. Almost 53 percent of the storage space in Prineville Reservoir is currently uncontracted. Reclamation has had a moratorium in place since the 1970s for new repayment contracts.

2.3.3.3 Wapinitia Project

Reclamation and JFDIC entered into a repayment contract for provision of 11,900 acre-feet of storage from Clear Lake in exchange for repayment of a portion of construction, operation, and maintenance costs. JFDIC has repaid the construction costs associated with construction of project facilities. Storage in the project is fully contracted. The Operations Description report on page 91 provides details about these contracts.

2.4 SUMMARY

Reclamation proposes to operate the three Federal projects in the Deschutes River basin to store, release, divert, and deliver project water (from storage) consistent with applicable law and historic operation of the recent past. Project operations have evolved over time to the current operations, but have remained fairly stable since the beginning of the 1990s. Irrigation storage from project reservoirs is released from the dams, diverted downstream at diversion dams and pump stations, and delivered through canals to project beneficiaries. Table 2-12 provides a summary of proposed and interrelated and interdependent actions associated with the major facilities connected with current Federal projects in the Deschutes River basin.

Reclamation is not responsible for effects on listed species of all water development and land management activities throughout the basin. For example, Reclamation is not responsible for the streamside rural development, road building, forest management, private water diversions, on-farm applications of pesticides and herbicides, or grazing influences that other state, Federal, and private agencies, organizations, and individuals have implemented in the Deschutes River basin.

Table 2-12. Summary of Proposed and Interrelated and Interdependent Actions

	Proposed Action	Interrelated & Interdependent Actions
Deschutes Basin		
Crane Prairie Dam & Reservoir	✔ storage & release of water	✔ diversion into private facilities
Wickiup Dam & Reservoir	✔ storage & release of water	
North Unit Headworks & Main Canal	✔ diversion of Wickiup Reservoir storage water	✔ diversion of natural flow water
Haystack Dam & Reservoir	✔ storage & release of water	
Arnold Diversion Dam & Canal, Central Oregon Headworks & Canal, North Canal (Pilot Butte)		✔ diversion of Crane Prairie Reservoir storage water only
Crooked River Pumping Plant		✔ diversion of Crooked River water
Crooked River Project		
Bowman Dam & Prineville Reservoir	✔storage & release of water	
Crooked River Diversion Dam and Feed Canal	✔ diversion of Prineville Reservoir storage water	✔ diversion of natural flow water
Crooked River Distribution Canal	✔ delivery of Prineville Reservoir storage water	✔ conveyance of natural flow water
Barnes Butte Pumping Plant & Ochoco Re-lift Plant	✔ delivery of Prineville Reservoir storage water	✔ conveyance of natural flow water
9 small pumping plants	✔ delivery of Prineville Reservoir storage water	✔ conveyance of natural flow water
Ochoco Dam & Reservoir		✔ storage & release of Ochoco Creek water
Ochoco Main Canal, Rye Grass, & other distribution canals		✔ conveyance of Prineville Reservoir storage water
Rice Baldwin, Central Ditch, People's Ditch, Lowline Ditch	✔ diversion of Prineville Reservoir storage water	
Wapinitia Project		
Wasco Dam and Clear Lake	✔ storage & release of water	
Clear Creek Diversion, JFDIC Main Ditch		✔ diversion of Clear Lake storage water