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Report to Congressional Requesters

March 2005

KLAMATH RIVER BASIN

Reclamation Met Its Water Bank Obligations, but Information Provided to Water Bank Stakeholders Could Be Improved

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GAO-05-283

March 2005

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Highlights

Highlights of GAO-05-283, a report to congressional requesters

KLAMATH RIVER BASIN

Reclamation Met Its Water Bank Obligations, but Information Provided to Water Bank Stakeholders Could Be Improved

Why GAO Did This Study

Drought conditions along the Oregon and California border since 2000 have made it difficult for the Bureau of Reclamation (Reclamation) to meet Klamath Project irrigation demands and Klamath River flow requirements for threatened salmon. To augment river flows and avoid jeopardizing the salmon's existence, Reclamation established a multiyear water bank as part of its Klamath Project operations for 2002 through 2011. Water banks facilitate the transfer of water entitlements between users.

This report addresses (1) how Reclamation operated the water bank and its cost from 2002 through 2004, (2) whether Reclamation met its annual water bank obligations each year, (3) the water bank's impact on water availability and use in the Klamath River Basin, and (4) alternative approaches for achieving the water bank's objectives.

What GAO Recommends

GAO recommends that Reclamation improve the information provided to stakeholders by systematically providing public information on management decisions and the water bank's status.

The Departments of Commerce and the Interior reviewed a draft of this report and generally agreed with the findings; Reclamation agreed with the recommendation.

www.gao.gov/cgi-bin/getrpt?GAO-05-283.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Anu K. Mittal at (202) 512-3841 or mittala@gao.gov.

What GAO Found

Reclamation has changed how it operates the Klamath Project water bank, as it has gained more experience, to help it meet its growing obligations and mitigate costs. For example, Reclamation initially obtained most of the water for the water bank by contracting with irrigators to either forego irrigation altogether (crop idling), or use only well water (groundwater substitution). It later added the option to pump well water into the irrigation canals for others to use (groundwater pumping). For the period 2002 through 2004, Reclamation's water bank expenditures totaled over $12 million, and the cumulative cost could exceed $65 million through 2011.

GAO's analysis of water bank contracts and river flow records found that Reclamation met its water bank obligations by acquiring and delivering the required amount of water for 2002 through 2004. However, Reclamation has not provided stakeholders with systematic and clear information concerning the water bank's management and status and its decision to use river flow data that are not publicly available limited stakeholders' ability to monitor water bank activities. This has led to confusion and doubt among stakeholders on whether Reclamation met its water bank obligations.

The water bank appears to have increased the availability of water to enhance river flows by reducing the amount of water diverted for irrigation, but the actual impacts are difficult to quantify because Reclamation lacks flow measurement equipment and monitoring data for the Klamath Project. Reviews by external experts of the impacts of the 2002 and 2003 crop idling contracts indicate that significantly less water may have been obtained from these contracts than Reclamation estimated. Given the uncertainty surrounding how much water can be obtained from crop idling, in 2004 Reclamation officials decided to rely primarily upon metered groundwater wells for the water bank. However, Reclamation has since learned that groundwater aquifers under the Klamath Project, already stressed by drought conditions, have shown significant declines in water levels and are refilling at a slower than normal rate in recent years. As a result, Reclamation is considering lessening its reliance on groundwater for the 2005 water bank but is uncertain if it can meet its water bank obligations, particularly for spring flows, while increasing its reliance on crop idling.

Although several alternative approaches for achieving the water bank's objectives have been identified by Reclamation and other stakeholders, limited information is available regarding their feasibility or costs. Some alternatives to the water bank include permanently retiring Klamath Project land from irrigation or adding new short-term or long-term storage. Each alternative has been considered to varying degrees, but significant analysis is still needed on most alternatives before any implementation decisions can be made. Meanwhile, Reclamation and the National Marine Fisheries Service have an ongoing dialogue regarding the water bank and will likely reconsult on Klamath Project operations, including the water bank, in 2006.

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Abbreviations

BLM	Bureau of Land Management
FWS	Fish and Wildlife Service
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
USGS	U.S. Geological Survey

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United States Government Accountability Office
Washington, D.C. 20548

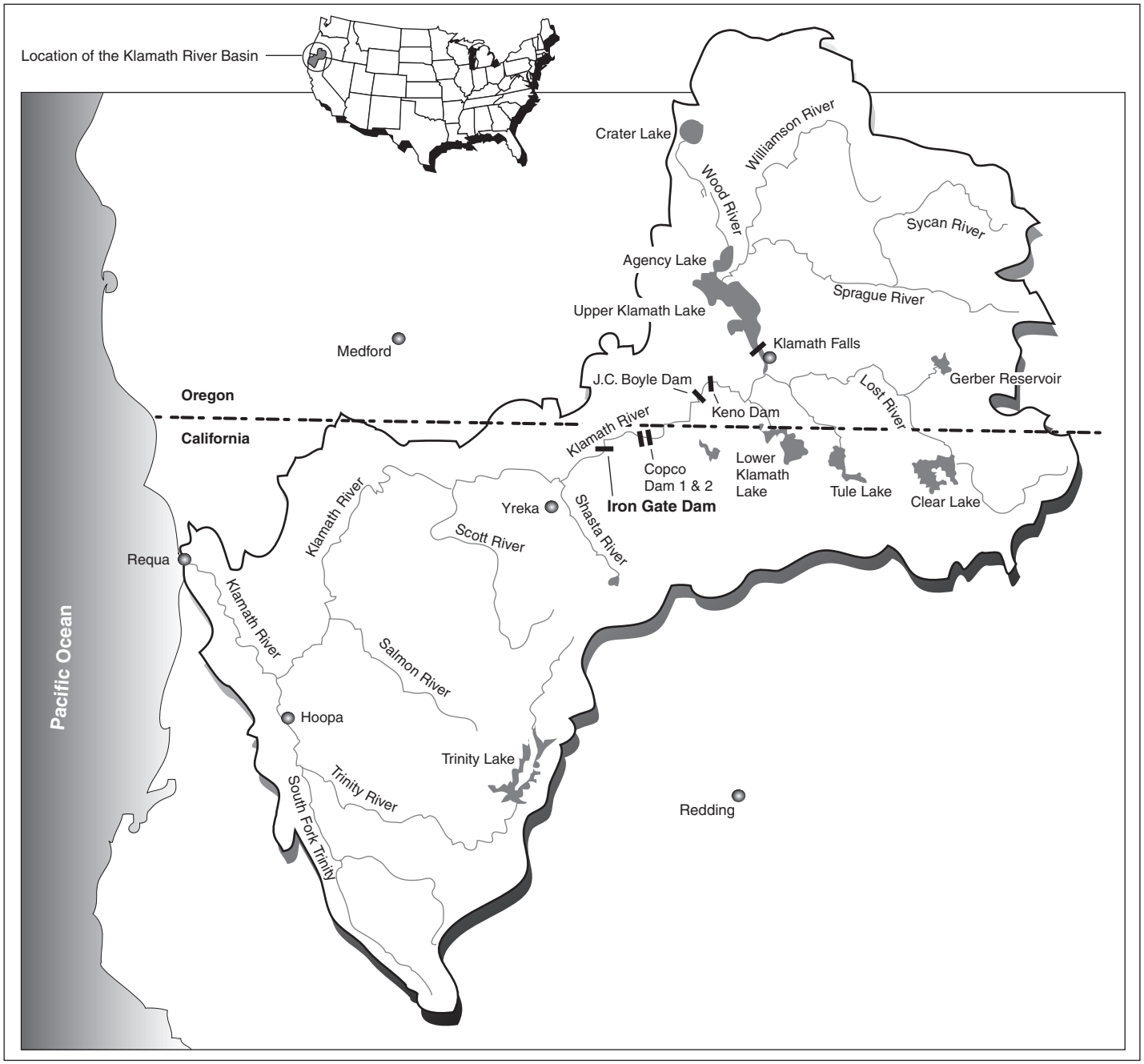
March 28, 2005

The Honorable Henry A. Waxman
Ranking Member
Committee on Government Reform
House of Representatives

The Honorable Mike Thompson
House of Representatives

Located in the Upper Klamath Basin, the Bureau of Reclamation's (Reclamation) Klamath Project (Project) is a federal water project spanning the borders of southern Oregon and northern California. Initiated in 1905, the Project was designed to dam the Upper Klamath Lake to manage Klamath River flows, drain nearby lakes and marshlands to create approximately 200,000 acres of farmland, and provide farmers with irrigation water through an elaborate system of canals and drains. As a result, Project operations largely determine the amount of water flowing in the Klamath River, which subsequently passes through several hydroelectric generating dams before running freely into the Lower Klamath Basin and emptying into the Pacific Ocean, as shown in figure 1. On average, about 1.5 million acre-feet—nearly 500 billion gallons—of water pass from the Upper Basin to the Lower Basin annually.

Figure 1: The Klamath River Basin



Source: Reclamation.

Drought conditions since 2000 have made it difficult for Reclamation to balance the demands for irrigation water by farmers on the Project with the requirements for specific river flows and lake levels for threatened and endangered species. The southern Oregon/northern California coho (coho), a species of salmon native to the river, was listed as threatened under the Endangered Species Act in 1997, and two species of sucker in Upper Klamath Lake were listed as endangered in 1988. Project operations were severely impacted in April 2001 when Reclamation cut off water deliveries to the majority of Project irrigators in order to meet river flow and lake level requirements to protect the coho and suckers under the act. As a result, agricultural production was impaired or eliminated on much of the Project, and some individuals engaged in acts of civil disobedience to protest Reclamation's actions.

To avert future crises similar to 2001, Reclamation proposed a new 10-year Project operations plan for 2002 through 2011. As required under the act and applicable regulations, Reclamation consulted with the National Marine Fisheries Service (NMFS) on its biological assessment of the plan to determine its effect on listed species.[1] NMFS issued a final biological opinion finding that the plan would jeopardize the continued existence of the coho and likely adversely modify its critical habitat.[2] In its opinion, NMFS recommended an alternative plan to protect the coho, which included the establishment of a multiyear water bank to provide additional river flows that would better protect critical habitat. Reclamation incorporated the water bank program into its Project operations plan through 2011. The biological opinion also provides for reinitiation of consultation to modify the plan if, for example, new scientific information on river flow requirements for coho becomes available.

[1]NMFS, within the Department of Commerce's National Oceanic and Atmospheric Administration, is responsible for administering the act with regard to ocean dwelling and anadromous species, such as salmon, which live part of their lives in freshwater and part in saltwater. *See* 50 C.F.R. § 402.01(b)(2004); See GAO, *Endangered Species: Federal Agencies Have Worked to Improve the Consultation Process, but More Management Attention Is Needed*, GAO-04-93 (Washington, D.C.: Mar. 19, 2003).

[2]The biological opinion was the subject of litigation in 2003 when it was challenged as arbitrary and capricious by several environmental groups. The U.S. District Court in California agreed, in part, and remanded the opinion to NMFS with instructions to amend it by addressing certain deficiencies. The court added that the biological opinion would remain in place until NMFS' amendment was issued. *Pacific Coast Federation of Fishermen's Associations v. Bureau of Reclamation*, U.S. Dist. LEXIS 13745 (N.D. Cal. 2003).

To comply with the biological opinion, Reclamation must meet certain river flow requirements and also provide a water bank of 30,000 acre-feet in 2002, 50,000 acre-feet in 2003, 75,000 acre-feet in 2004, and 100,000 acre-feet from 2005 through 2011 to supplement river flows.[3] In broad terms, a water bank is an institutional mechanism that facilitates the transfer of water entitlements between users and/or uses. As such, Reclamation's water bank is not a physical reservoir where water can be deposited and withdrawn as needed but is an administrative process under which Project irrigators who volunteer to participate are paid by Reclamation to forego their contractual entitlement for one irrigation season in order to make more water available for release downstream. Water accrues to the water bank over the course of the year when participants do not use irrigation water for their crops as they normally would. By March 31 each year NMFS and Reclamation will meet to determine a flow schedule, including water bank deliveries. According to Reclamation, the water bank provides a temporary means to augment river flows for threatened species and also allows it to meet its contractual responsibility to deliver water to Project irrigators while long-term, basinwide solutions for balancing water demands are evaluated. To collaboratively develop potential long-term solutions to improve habitat conditions, some of which could increase river flows, the biological opinion also requires Reclamation to initiate a Conservation Implementation Program to bring together stakeholders, including federal agencies, tribes, and the states.

This report addresses (1) how Reclamation operated the water bank and how much it cost from 2002 through 2004, (2) whether Reclamation met its annual water bank obligations each year, (3) the water bank's impact on water availability and use in the basin, and (4) alternative approaches for achieving the water bank's objectives.

To address the objectives of this report, we visited the Klamath Project and met with and collected documentation from Reclamation and NMFS officials, as well as representatives from other stakeholder federal agencies, tribes, irrigators, commercial fishermen, academics, and conservationists. To determine how Reclamation operated the water bank and its costs, we analyzed water bank planning, contracting, and expenditure documentation. To determine whether Reclamation met its annual water bank obligations, we analyzed water bank contracts and

[3]Reclamation identifies the water bank as a pilot program that the agency contends is not subject to the National Environmental Policy Act.

documentation of Klamath River flows. To describe the water bank's impact, we analyzed relevant land, surface water, and groundwater use data; reviewed relevant studies; and met with stakeholders. We did not review the water bank's impact on fish species because the short history of the water bank makes it difficult to obtain reliable information. To describe alternative approaches to the water bank, we met with potential land sellers, reviewed studies of water storage options, and reviewed the status of basinwide efforts to increase flows. We performed our work between May 2004 and February 2005 in accordance with generally accepted government auditing standards.

Results in Brief

Reclamation has modified its water bank operations from year to year as its obligations and costs increased. Reclamation obtained water for the water bank by contracting with irrigators to either (1) forego irrigation altogether (crop idling), (2) irrigate using only well water (groundwater substitution), or (3) pump well water into the irrigation canals for others to use (groundwater pumping). Based on each year's experience, Reclamation modified its water bank operations to better meet its increasing obligations and to mitigate costs. For example, in 2003, Reclamation solicited applications for water bank participation from irrigators to either forego irrigation water or substitute groundwater at fixed rates, while in 2004, Reclamation broadened the program's selection criteria to include contingency contracts for groundwater pumping that could be activated "as needed" to deliver additional water and sought to reduce costs by competitively bidding rates with irrigators. However, as Reclamation's water bank obligation increased each year, the water bank's expenditures also increased. Reclamation's water bank expenditures through 2004 totaled more than $12 million. Based on Reclamation's projected annual costs of about $7.6 million for fiscal years 2005 through 2011, the cumulative cost of the water bank could exceed $65 million through fiscal year 2011.

While Reclamation has met its water bank obligations each year since 2002, its management and accounting practices have created confusion for stakeholders. Our analysis of water bank contracts and river flow records found that Reclamation acquired and delivered the required amount of water for 2002 through 2004. However, the manner in which the agency has managed and accounted for the water bank has caused confusion for stakeholders, such as tribes and irrigators. For example, on issues where the biological opinion is silent—such as how to count any water spilled from dams to prevent flooding and regarding when, or if, Reclamation can

reclassify baseline river flow requirements—Reclamation has not been clear in communicating what actions it took and why it took those actions, resulting in a lack of transparency for stakeholders regarding the operation of the water bank. Furthermore, Reclamation has not provided stakeholders with systematic and clear information concerning the water bank's status or operations and its decision to use river flow data that are not publicly available has limited stakeholders' ability to independently monitor water bank activities. This has led to confusion and doubt among stakeholders on whether Reclamation actually met its water bank obligations. We are recommending that Reclamation take steps to improve its communications regarding the operation of the water bank.

The water bank appears to have increased the availability of water to enhance river flows by reducing the amount of water diverted for irrigation in the Project, but there is uncertainty regarding the extent of its impacts on river diversions and groundwater use. In 2003, when the water bank primarily relied on crop idling to obtain water, 20,335 Project acres were unirrigated, about 60 percent more than 2002. However, because of annual variations in irrigation demand and because Reclamation does not have reliable water flow measurement equipment on the Project and monitoring data for the Project, assessing the precise impact of the water bank on river flows has been an ongoing issue. Moreover, throughout the life of the water bank, Reclamation has used varying assumptions regarding the amount of water that can be saved by crop idling as more research and information has become available about this practice. Because of the uncertainty about how much water crop idling provided in 2003, in 2004, Reclamation officials decided to rely primarily upon metered groundwater sources for the water bank. However, the U.S. Geological Survey (USGS) and Oregon Water Resources Department have found evidence that groundwater aquifers under the Project, already stressed by drought conditions, are refilling at a slower than normal rate in recent years. Many wells have shown significant declines in water levels, and an increasing number of wells have been deepened to reach groundwater in Klamath County in recent years. Reclamation is considering lessening its reliance on groundwater pumping and substitution for the 2005 water bank, but is uncertain whether it can meet its water bank obligations, particularly for spring flows, while increasing its reliance on crop idling.

Although several alternative approaches for achieving the water bank's objectives have been identified by Reclamation and other stakeholders, limited information is available regarding their feasibility or costs. Possible alternatives to the water bank have been studied to various levels of detail,

including permanently retiring Project land from irrigation or adding new short-term or long-term water storage capacity. For example, under the land retirement alternative, at least 50,000 acres of irrigated land would need to be permanently removed from agricultural production to achieve an estimated 100,000 acre-foot reduction in irrigation. However, the feasibility and costs of land purchases and the impacts of this alternative on river flows and the agricultural economy have not been fully assessed. Similarly, there are several options for increasing water storage, either by expanding storage on Upper Klamath Lake or by building a separate reservoir. However, there is little reliable information available regarding the total costs, environmental impacts, and certainty of water availability for storage under these alternatives. Although NMFS' 2002 biological opinion required the collaborative study of the feasibility of alternatives to increase river flows, Reclamation and other stakeholders are still developing the framework for this process. In the interim, Reclamation and NMFS have an ongoing dialogue regarding water bank management and will have the opportunity to consider alternative ways to more effectively manage the water bank when they meet for a planned reconsultation on the biological opinion in 2006. For example, Reclamation officials may consider proposing more flexibility to manage water bank volumes in wet or above average water years, thus preserving funding and resources for dry years.

We are recommending that Reclamation take steps to improve the information provided to stakeholders regarding water bank management and accounting by regularly and systematically providing—through media such as a water bank Web-link or a monthly or biweekly press release—public information on the rationale and effects of management decisions related to forecasted water availability, unexpected spill conditions, or other significant events, as well as regularly updated information regarding the water bank's status, including the amount of water bank deliveries to date. In commenting on a draft of this report, the Departments of Commerce and the Interior generally agreed with our findings. Reclamation concurred with our recommendation, agreeing to add a water bank page to its Internet Web site that will include background information on the water bank, current information that is regularly updated, such as the status of water bank deliveries, and links to other relevant Web resources. Commerce and Interior provided written technical comments which we incorporated as appropriate. We requested comments from the Department of Agriculture but none were provided. Interior's comments appear in appendix III and Commerce's comments appear in appendix IV.

Background

The Klamath River Basin, spanning the southern Oregon and northern California borders, covers over 15,000 square miles. The Klamath River originates in the Upper Basin, fed by Oregon's Upper Klamath Lake, a large, shallow body of water composed of flows from the Sprague, Williamson, and Wood Rivers. The river subsequently flows into the Lower Basin in California, fed by tributaries including the Shasta, Scott, Salmon, and Trinity Rivers, and empties into the Pacific Ocean. River flows and lake levels depend primarily upon snowpack that develops during the winter months, melts in the spring, and flows into the river basin. Rainfall and groundwater from natural springs also contribute to flows. On average, about 1.5 million acre-feet of water pass from the Upper Basin to the Lower Basin annually at Iron Gate Dam.

The Secretary of the Interior authorized construction of the Klamath Project in 1905.[4] Reclamation dammed Upper Klamath Lake, drained and reclaimed Lower Klamath and Tule Lakes, stored the Klamath and Lost Rivers' flows, and provided irrigation diversion and flood control on the reclaimed land. About 85 percent of the Project lands obtain irrigation water from Upper Klamath Lake and the Klamath River, while Gerber Reservoir, Clear Lake, and the Lost River supply the remainder of the Project. Water is delivered to Project lands using an elaborate system of canals, channels, and drains, including diversions directly from the Klamath River. The distribution system is considered highly efficient, ensuring that water that is diverted for use within the Project is reused several times before it returns to the Klamath River. Homesteading of the reclaimed lands began in 1917 and continued through 1948.

As shown in figure 2, the Project is currently composed of about 207,000 acres of irrigable lands. Historically, about 200,000 acres of Project lands have been in agricultural use annually.[5] For example, in 2003, the most recent year for which data is available, about 202,000 acres were considered to be in agricultural use, of which about 180,000 acres were irrigated and harvested. Crops grown and harvested on the Project include alfalfa, barley, oats, wheat, onions, potatoes, and peppermint, and cattle

[4]Interior authorized the Project under provisions of the Reclamation Act of 1902, 32 Stat. 388.

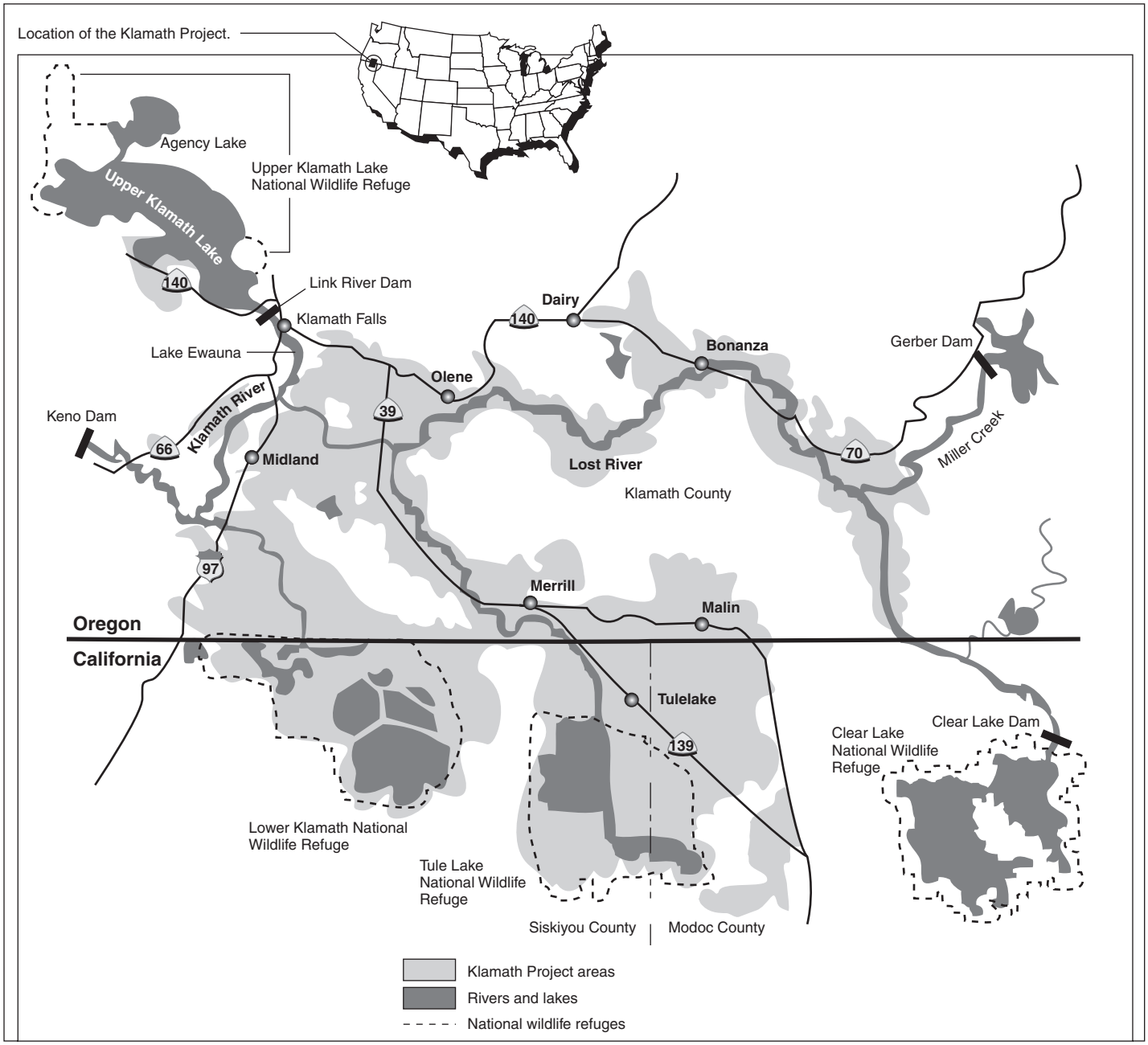
[5]Includes harvested, unharvested, and fallowed land. Fallowing is the practice of not seeding land for one or more seasons, for example, to destroy weeds or conserve soil moisture.

graze on more than 40,000 acres of irrigated pastureland. In addition to farm and pastureland, four national wildlife refuges were set aside by executive orders in conjunction with the construction of the Project.[6] The refuges, managed by Interior's Fish and Wildlife Service (FWS) support many fish and wildlife species and provide suitable habitat and resources for migratory birds of the Pacific Flyway. About 23,000 acres of the two refuges within the Project water delivery area—Tule Lake and Lower Klamath National Wildlife Refuges—are leased for agricultural purposes.[7]

[6]The Lower Klamath Lake Wildlife Refuge was established in 1908; the Clear Lake Wildlife Refuge was established in 1911; the Upper Klamath Lake and Tule Lake Wildlife Refuges were established in 1928.

[7]The Kuchel Act (Pub. L. No. 88-567 (1964)) specifies that refuge lands be leased for agricultural use to the extent consistent with their primary purposes, waterfowl management. Contracts are issued for 5 to 8 years but require annual renewal. These lands are the most productive lands in the Klamath Basin and represent about 10 percent of the land area receiving Project water.

Figure 2: Reclamation's Klamath Project



Source: Reclamation.

Note: Due to space limitations, Upper Klamath Lake is not shown to scale with the Klamath Project.

Reclamation, through contracts, provides water for irrigation and hydropower production and must also provide water for the national wildlife refuges. Reclamation has entered into contracts with numerous irrigation districts and individual irrigators on the Project to provide for the repayment of Project costs and the right to receive Project water. The contracts most commonly specify a land acreage amount to be covered by the contract—not a specific water amount to be delivered. Also by contract with Reclamation, California-Oregon Power Company (now PacifiCorp) obtained the right to use certain amounts of water, after requirements of the Klamath Project are satisfied, for hydropower generation at its privately owned and independently operated dams on the Klamath River downstream of the Project.[8] PacifiCorp's southernmost hydropower dam, Iron Gate Dam, located about 20 miles downriver of the Oregon-California border, is the last control point before Klamath River flows run freely to the Pacific Ocean. Finally, the national wildlife refuges have federally reserved rights for the water necessary to satisfy the refuges' primary purposes, and Reclamation must satisfy refuge water needs after its other obligations are met.

Reclamation is also obligated to protect tribal trust resources, such as water and coho salmon. The Klamath River Basin is home to four federally recognized tribes, identified by Reclamation as the Klamath Tribes in the Upper Basin area of Oregon, and the Hoopa Valley Tribe, Yurok Tribe, and Karuk Tribe in the Lower Basin area of California. Each tribe has long-standing cultural ties to the Klamath River, its tributaries, and native fish species. Furthermore, the Klamath, Hoopa, and Yurok tribes have, either by treaty or executive order, reserved rights to sufficient water quality and flows to support all life stages of fish life in protection of tribal fishing rights.[9] As with all federal agencies, Reclamation has a trust responsibility to protect these tribal resources and to consult with the tribes regarding its actions in a government-to-government relationship.

Reclamation must comply with the Endangered Species Act to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any listed species of plant or animal or adversely modify or destroy designated critical habitat. Interior's FWS and

[8]PacifiCorp's hydroelectric dams are operated under a Federal Energy Regulatory Commission license; relicensing of the power project is scheduled for 2006.

[9]The Karuk Tribe of California did not obtain federal tribal recognition until 1979, and is seeking recognition of a fishing right.

Commerce's NMFS are responsible for administering the act.[10] If FWS or NMFS finds that an agency's proposed activity is likely to jeopardize a threatened or endangered species or destroy or adversely modify its critical habitat, then a "reasonable and prudent alternative" that would avoid such harm must be identified. Three species of fish that are of particular importance to the cultures of the tribes—the threatened southern Oregon/northern California coho, and the endangered Lost River sucker and shortnose sucker—are affected by Project operations. NMFS listed the coho as threatened in 1997, and FWS listed the two species of suckers, which populate Upper Klamath Lake and rivers other than the Klamath, as endangered in 1988.

Drought conditions since 2000 have complicated Reclamation's efforts to balance the irrigation water demands on the Project with the requirements for specific river flows and lake levels for threatened and endangered species. Reclamation operates the Project according to an annual operations plan that helps the agency to meet its various obligations and responsibilities, given varying hydrological conditions. In 2001, responding to Reclamation's biological assessment of its proposed Project operations plan, FWS and NMFS issued biological opinions that suggested[11] Reclamation take numerous actions, including maintaining higher water levels in Upper Klamath Lake and two reservoirs on the Lost River and higher flows of the Klamath River below Iron Gate Dam. Because of the new biological opinions and drought conditions, Reclamation was prohibited from releasing normal amounts of water to most Project irrigators, which impaired or eliminated agricultural production on much of the Project.

Subsequently, Reclamation proposed a new 10-year Project operations plan for 2002 through 2011. NMFS reviewed Reclamation's biological assessment of the plan to determine its effect on listed species, and issued a final biological opinion on May 31, 2002, directing Reclamation to establish a multiyear water bank to provide additional river flows.

[10]Along with NMFS, the FWS administers the act and is responsible for protecting terrestrial, or land-dwelling species, and freshwater animal and plant species, including suckers.

[11]Although the opinion "suggested" that Reclamation implement certain measures, such as a water bank, to prevent harm to the threatened or endangered species, such recommendations were required to be implemented if Reclamation was to be protected under the act from enforcement actions for prohibited "takings," for example, actions that result in harm, harassment, or the killing of protected species. *See* 16 U.S.C. §§ 1532(19), 1536(b)(4), 1536(o)(2), 1538(a)(1)(B).

Reclamation incorporated this water bank into its Project operations plan through 2011. NMFS and Reclamation can reconsult on the requirements of the biological opinion as warranted, for example, if new scientific information on river flow requirements for fish is developed. Reconsultation is likely during 2006, when ongoing studies of Klamath River flows are expected to be completed.

Although NMFS' biological opinion recommended a water bank as an alternative and specified the amounts of water to be provided each year, it provided Reclamation little specific guidance regarding the structure, management, or operation of the water bank. Water banking is broadly defined as an institutional mechanism that facilitates the legal transfer and market exchange of various types of surface water, groundwater, and water storage entitlements. Water banks have been proposed or are operating in almost every western state. However, significant differences exist in the way that each bank operates with respect to market structure, degree of participation, pricing, regulatory oversight, environmental objectives, and other factors.[12]

Under Reclamation's water bank program, participating irrigators would be paid to forego their contractual entitlement to water for one irrigation season in order to make more water available for release into the river. Water acquired by Reclamation would accrue to the water bank over the course of the year as participants did not divert water for irrigation purposes as they normally would. A schedule for delivery of additional flows is determined by NMFS and Reclamation by March 31 each year, with the majority of the water bank provided in the spring and early summer when the water is most needed by the coho. According to Reclamation, the water bank would enable the agency to augment river flows for threatened species and also meet its contractual responsibility to deliver water to Project irrigators until other solutions for balancing water demands were identified. Reclamation was also required to initiate a Conservation Implementation Program that would bring together basin stakeholders, including federal agencies, tribes, and the states, to collaboratively develop

[12]California's state administered Drought Water Bank, operating since 1991, is a 1-year leasing program to reallocate water between users during drought conditions and acts as a clearinghouse that pools water and allocates supplies to critical demands in the state. In contrast, Oregon's Deschutes Water Exchange Groundwater Mitigation Bank, administered by the Deschutes Resources Conservancy, facilitates surface water leases and time-limited transfers to create mitigation credits for groundwater pumping in the Deschutes Basin.

long-term solutions, some of which would increase flows, such as surface water storage and groundwater resource development.

Reclamation Modified Its Water Bank Operations from Year to Year as Its Obligations and Costs Increased

Reclamation modified its water bank operations from year to year as its obligations and costs increased. Reclamation acquired water for the water bank by contracting with irrigators for the water needed to augment Klamath River flows as required by the biological opinion. As it gained more experience each year, Reclamation modified its water bank operations to better meet the increasing obligations and to mitigate costs. As its annual obligations increased, Reclamation's annual water bank expenditures also increased, totaling more than $12 million through 2004. Based on Reclamation's estimated annual cost of about $7.6 million for fiscal year 2005 and onward, the cumulative cost of the water bank could exceed $65 million through fiscal year 2011.

Reclamation Modified Its Water Bank Operations from Year to Year to Meet Increasing Obligations

Reclamation initiated the Klamath Project water bank program in 2002, as recommended under NMFS' biological opinion, with the objective of purchasing irrigators' water entitlement for one irrigation season so that this water could be used to provide additional Klamath River flows for threatened coho salmon. The water bank is not a physical reservoir of stored water but an administrative mechanism through which Reclamation contracts with irrigators both on and off the Klamath Project. Through these contracts irrigators agreed to either (1) forego irrigation altogether (crop idling), (2) irrigate using only well water (groundwater substitution), or (3) pump well water into the irrigation canals for others to use (groundwater pumping), thus making water available to augment river flows. Water accrues to the water bank over the course of the irrigation season as water bank contractors forego irrigating their land by crop idling or groundwater substitution and as groundwater is pumped into canals under water bank contracts. However, because Reclamation is required to provide large amounts of water in spring and early summer before sufficient water has accrued to the water bank, it actually "borrows" water for the bank from short-term storage supplies. This water is later replaced by foregone irrigation water over the course of the year.

Reclamation modified its water bank operations each year, changing its composition, selection process, contracting process, and program rules as it gained experience to meet its increasing obligations. In 2002 when the obligation was 30,000 acre-feet, the water bank sources included crop

idling off-Project and groundwater pumping; in 2003 when the obligation was 50,000 acre-feet, sources included crop idling on-Project and groundwater substitution; and in 2004 when the obligation was 75,000 acre-feet, all three sources of water were included in the water bank. Reclamation modified the selection process from relying on only two irrigators in 2002—without a public application process[13]—to soliciting applications from any qualified irrigator in both 2003 and 2004. In 2004, Reclamation solicited water bank applicants earlier in the year than it had in 2003, in part, to allow successful applicants more lead time in planning their irrigation.[14] Reclamation also modified the contracting process to obtain more flexibility by competitively bidding contract rates in 2004 rather than paying a fixed rate as in 2003 and entering into contingency contracts for groundwater pumping that could be activated "as needed" to deliver additional water to meet its increasing water bank obligation and uncertain delivery schedule. These contingency contracts allowed Reclamation to acquire only the amount of water it needed to meet the agreed upon delivery schedule. Finally, Reclamation expanded its program rules to make participation in the water bank more practical and attractive to potential applicants. For example, Reclamation changed the rules for the 2004 water bank to allow harvesting of crops on land under crop idling contracts, reflecting the fact that some crops such as alfalfa can grow with water from subsurface moisture alone.

Similarly, Reclamation modified its monitoring process for the water bank over time. For example, in 2003, Reclamation monitored every participant for compliance with the program rules. Enforcement staff examined and tested each crop idling parcel of land at least once over the course of 2003's water bank to ensure that no intentional irrigation occurred. In addition, Reclamation relied on self-policing by irrigators who called in tips identifying potential cheaters. A Reclamation official estimated a greater than 95 percent compliance rate in 2003 and only terminated the contract of one participant who intentionally irrigated fields after deciding to withdraw from water bank participation without notifying Reclamation. In

[13]While NMFS wanted Reclamation to operate a water bank in the spring of 2002, the final biological opinion was not released until May 31, 2002. Nevertheless, NMFS and Reclamation agreed to operate the water bank from May 1 to May 31, before the biological opinion was finalized and released.

[14]Those participating in the water bank do not have to forego irrigating all of the land they own in a given year, but they must forego irrigation entirely for the year on those lands accepted into the water bank.

contrast, during 2004 Reclamation sought to reduce enforcement costs and increase efficiency by examining and testing crop idling parcels of land only toward the end of the year while following up on tips identifying potential cheaters throughout the year. In 2004, Reclamation found no intentional violations.

Water Bank Costs Could Exceed $65 Million through Fiscal Year 2011

Reclamation's water bank expenditures through fiscal year 2004 exceeded $12 million and could total more than $65 million through 2011. As shown in table 1, Reclamation's total expenditures have increased annually as the water bank obligation has grown from 30,000 acre-feet in 2002 to 75,000 acre-feet in 2004.

Table 1: Reclamation's Water Bank Expenditures, Fiscal Years 2002 to 2004

	Fiscal year			
Expenditures	**2002**	**2003**	**2004**	**Total**
Groundwater substitution or pumping contracts	$1,000,000	$1,788,711	$4,009,451	**$6,798,162**
Crop idling contracts	0	2,700,789	637,258	**3,338,047**
Klamath Basin Rangeland Trust contracts for off-Project crop idling	948,300	0	690,221	**1,638,521**
Administration	2,479	175,233	255,119	**432,831**
Other	10,215	22,213	144,785	**177,213**
Total	**$1,960,994**	**$4,686,946**	**$5,736,834**	**$12,384,774**

Source: Reclamation, Klamath Basin Area Office.

Note: Dollar amounts are not adjusted for inflation.

Reclamation attributes the increasing costs of the water bank to the increasing annual volume of water purchases, as well as increasing administrative costs due to the large increase from 2002 to 2003 in the number of contracts to manage and the addition of the groundwater pumping program in 2004 and its associated contract negotiations. Reclamation estimates that the 100,000 acre-foot water bank requirements for fiscal years 2005 through 2011 will cost at least $7.6 million annually, bringing the total water bank costs to more than $65 million. For 2005 and onward, according to Reclamation, the water bank will be a specific budget

item in its budget request.[15] Accordingly, Reclamation requested $7.626 million for fiscal year 2005 and plans to gradually increase annual budget requests to about $7.660 million by 2011.

Reclamation's expenditures fall into five categories: groundwater contract costs, crop idling contract costs, Klamath Basin Rangeland Trust contract costs, administrative costs, and other costs. Reclamation's largest water bank expenditures were for groundwater contracts with irrigators—for both substitution and pumping—totaling nearly $7 million, or 55 percent of total expenditures from 2002 through 2004. Reclamation's second largest water bank expenditures were for crop idling contracts with Project irrigators, totaling about $3.3 million, or 27 percent of total expenditures. Reclamation's contracts with the Klamath Basin Rangeland Trust to forego irrigation of pastureland outside of the Klamath Project totaled more than $1.6 million, or about 13 percent of total water bank expenditures through 2004. Reclamation's administrative costs—mainly payroll and overhead—for planning and implementing the water bank comprised about 3 percent of total water bank expenditures. Reclamation also incurred other costs related to the operation of the water bank, such as water quality analysis, contract compliance monitoring, and a contract for assistance from the Oregon Water Resources Department.

Reclamation Met Its Water Bank Obligations, but Information Provided to Stakeholders Could Be Improved

Reclamation met its water bank obligations to provide additional water to supplement Klamath River flows each year since 2002. However, the manner in which the agency has managed and accounted for the water bank has caused confusion for some stakeholders, such as tribes and irrigators, and has reduced the transparency of the water bank's status and operation.

[15]The 2002 through 2004 water banks were unanticipated and thus not included in Reclamation's budget requests nor specifically provided for in agency appropriations. Instead, funds appropriated for feasibility studies under the Klamath Basin Water Supply Enhancement Act of 2000 were used, as well as other budget sources such as the Central Valley Project and the El Paso Water Reclamation and Reuse Program.

Reclamation Met Its Water Bank Obligations Each Year

According to NMFS and Reclamation officials, Reclamation's obligation is to both *acquire* the amount of water required in the biological opinion each year and *deliver* the water—some of it or all of it—in accordance with the schedule mutually agreed to by both agencies. Regarding the acquisition of water, NMFS concluded, and our analysis of Reclamation contract records verified, that Reclamation met its obligation to acquire 30,000 acre-feet in 2002, 50,000 acre-feet in 2003, and 75,000 acre-feet in 2004, by contracting for about 47,000; 59,000; and 111,000 acre-feet, respectively. Appendix II provides detailed information on water bank applications and contracts. According to Reclamation officials, they contracted to acquire more water than required, in part to serve as a buffer against unexpected changes in water conditions and as insurance against uncertainty about how much water is actually obtained from crop idling.

Regarding the delivery of water to augment flows, NMFS concluded, and our analysis of USGS river flow records verified, that Reclamation met its obligation each year as established in the schedule agreed upon with NMFS. We found that, in total, Reclamation augmented Klamath River flows by approximately 30,000 acre-feet within the brief 2002 water bank time frame—meeting its 30,000 acre-feet schedule requirement; by more than 71,000 acre-feet in 2003—surpassing its 50,000 acre-feet schedule requirement; and by more than 95,000 acre-feet in 2004—surpassing its 74,373 acre-feet schedule requirement. According to Reclamation officials, these augmented flows represent water provided per water bank requirements plus additional releases of water purchased and stored to meet tribal trust obligations. Because the water bank is not a physical pool of water allowing the constant measurement and monitoring of deposits and withdrawals, estimating the status of water bank accruals or deliveries and differentiating water bank deliveries from tribal trust deliveries during the year is neither precise nor easy. Reclamation views water bank deliveries as simultaneously meeting both its requirement to augment river flows under the biological opinion and its tribal trust responsibilities. However, to account for its annual deliveries, Reclamation officials have generally counted augmented flows as first satisfying the water bank requirement and consider excess flows, such as the approximately 20,000 acre-feet delivered above the water bank requirement in 2003 and 2004, as tribal trust deliveries.

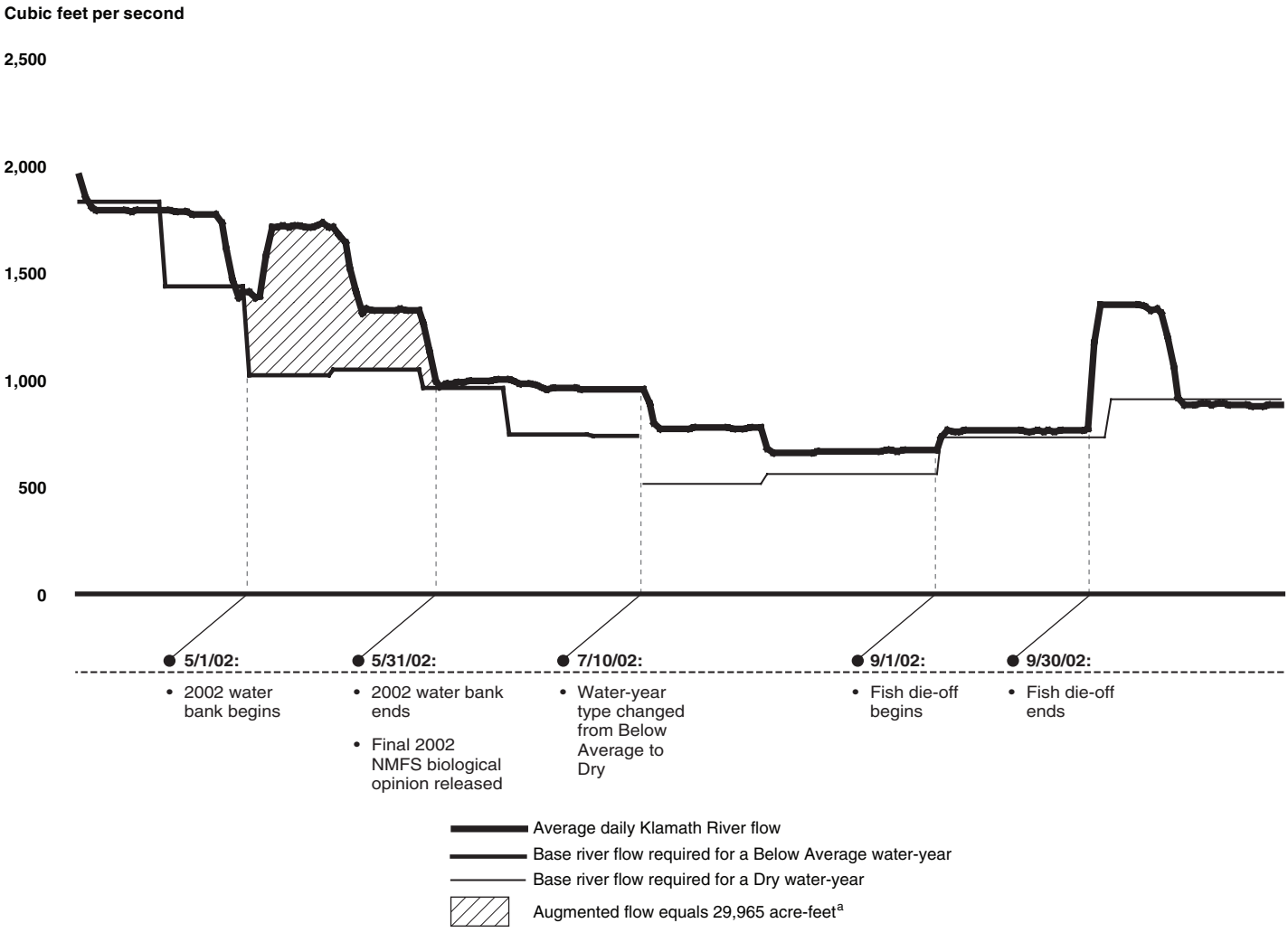
Augmented flow is defined as the volume of water in excess of base flows measured at Iron Gate Dam.[16] Klamath River base flows are determined according to "water-year types." Based on an April 1 forecast of snowpack and runoff, Reclamation initially classifies each year as Wet, Above Average, Average, Below Average, and Dry in accordance with the biological opinion.[17] Each classification requires a specific base flow of water at Iron Gate Dam. Forecasts are updated at least monthly, incorporating actual water conditions as the year progresses, and providing Reclamation with increasingly accurate data with which to determine if the water-year type needs to be reclassified during the year.

In 2002, the water bank operated from May 1 to May 31, during which Reclamation met its water bank delivery obligation by augmenting flows by approximately 30,000 acre-feet, as shown in figure 3. NMFS released its final biological opinion on May 31 directing Reclamation to operate a water bank through 2011.

[16]Klamath River flows—actual and base—are calculated by taking the average daily flow rates measured in cubic feet per second (1 cubic foot per second per day equals 1.9835 acre-feet).

[17]The Department of Agriculture's Natural Resources Conservation Service provides the forecasts.

Figure 3: 2002 Augmented Klamath River Flows and Key Dates



Sources: GAO analysis of USGS river flow data and Reclamation water bank and water-year type data.

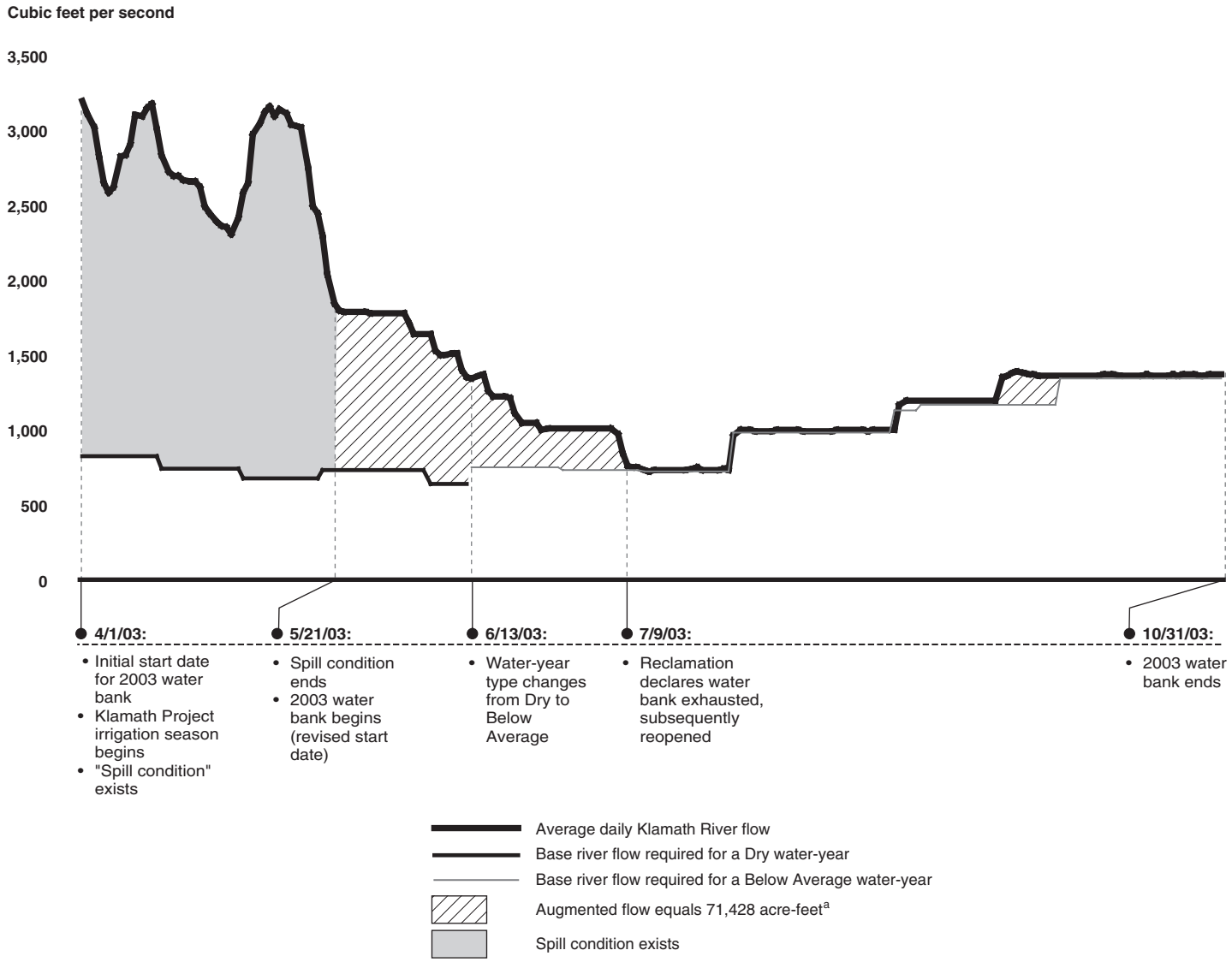
[a]The augmented flow during May 2002 consists of water bank deliveries only.

Note: Klamath River flows are measured at Iron Gate Dam.

In 2003, Reclamation met its water bank delivery obligation by augmenting flows by at least 50,000 acre-feet as agreed in its schedule with NMFS. Heavier than expected rainfall in early spring prompted Reclamation to move the official start of the water bank from April 1 to May 21, as shown in figure 4. The water bank operated between May 21 and October 31,

during which time Reclamation reclassified the water-year type from Dry to Below Average due to better than expected water conditions.

Figure 4: 2003 Augmented Klamath River Flows and Key Dates



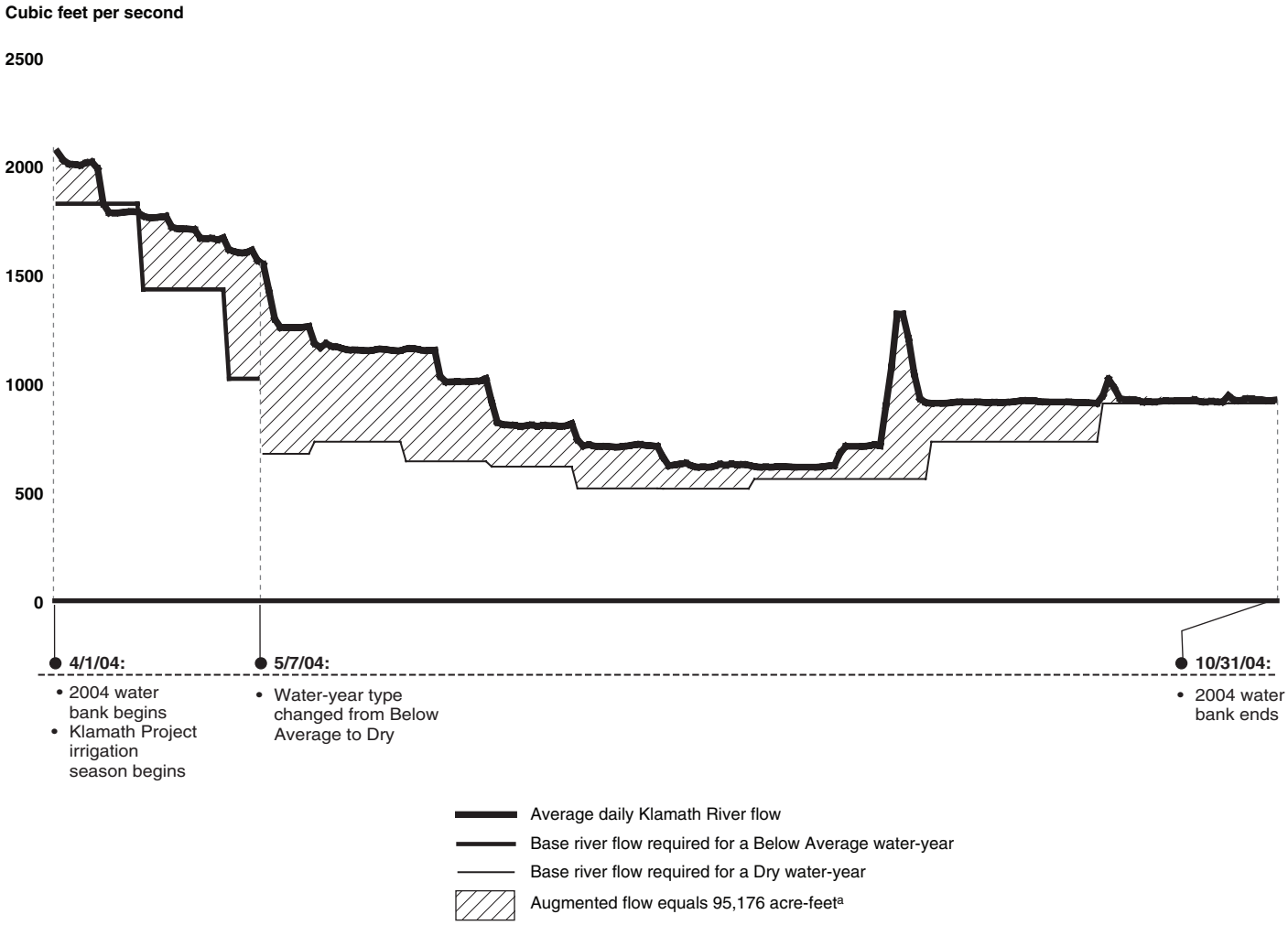
Sources: GAO analysis of USGS river flow data and Reclamation water bank and water-year type data.

[a]The augmented flow between May 21 and October 31 consists of both water bank and tribal trust deliveries.

Note: Klamath River flows are measured at Iron Gate Dam.

In 2004, Reclamation met its water bank delivery obligation by augmenting flows by at least 74,373 acre-feet as agreed in its schedule with NMFS. As shown in figure 5, the 2004 water bank started on April 1 and ended on October 31, as planned. The water-year type was reclassified from Below Average to Dry on May 7, shortly after the water bank began due to a smaller than expected water supply.

Figure 5: 2004 Augmented Klamath River Flows and Key Dates



Sources: GAO analysis of USGS river flow data and Reclamation Water Bank and water-year type data.

[a]The augmented flow during 2004 consists of both water bank and tribal trust deliveries.

Note: Klamath River flows are measured at Iron Gate Dam. Average daily flow data for October 11, 2004, is missing. Therefore, the 2004 augmented flow calculation does not include data for that date.

Reclamation's Management and Accounting Practices Confused Stakeholders

Although Reclamation met its annual water bank obligations each year, the manner in which the agency managed and accounted for the water bank confused stakeholders. Specifically, for two issues where the biological opinion is silent—how to count spill water released to prevent flooding, and whether Reclamation can reclassify the water-year type designation midyear due to changing water conditions—Reclamation has not been clear in communicating related management and accounting decisions. Furthermore, Reclamation has not provided stakeholders with systematic and clear information concerning the water bank's status or operations, and its decision to use river flow data unavailable to stakeholders limited stakeholders' ability to independently monitor water bank activities. This has led to confusion and doubts among stakeholders on whether Reclamation actually met its water bank obligations.

Reclamation's management of the water bank during 2003's spill condition—when water was released by dams to prevent overflow or flooding—and its lack of clear communication with stakeholders, caused significant confusion. Heavier than expected rainfall in early spring of 2003 caused a "spill condition" to exist on April 1 when the water bank was set to begin. However, the biological opinion does not specify how much, if any, spill water can be counted as a water bank delivery. In the absence of specific guidance from NMFS, Reclamation could have counted spill toward water bank deliveries in one of three ways: (1) up to the amount already scheduled for delivery during the spill; (2) in its entirety, including water above the scheduled amount; or (3) not at all. According to Reclamation officials, they eventually decided to reset the water bank's start to May 21—when the spill condition ended—and started counting augmented flows as of that date. However, Reclamation did not clearly communicate its decisions to stakeholders leading to confusion among stakeholders on how, or if, Reclamation was meeting its water bank obligations. For example, according to some tribal representatives, Reclamation provided a preliminary status report in July stating that over 20 percent of the water bank—over 11,000 acre-feet—was delivered during the spill. This contradicted a Reclamation official's statement that the agency had retroactively reset the water bank's start date to after the spill conditions ceased. Reclamation officials concede that stakeholder confusion as a result of these actions was understandable. Subsequently,

NMFS and Reclamation agreed that, beginning in 2004, spill water will be counted only up to the amount already scheduled for delivery by the water bank.

Similarly, Reclamation's reclassification of the water-year type—which determines the base river flow requirement—has also caused confusion for stakeholders. Like spill conditions, the biological opinion is silent on whether the water-year type can be reclassified midyear after its initial determination in April. NMFS and Reclamation officials contend that reclassifying the water year type to reflect changing water conditions is necessary to reflect the most current and accurate data available. However, some stakeholders, such as the tribes, contend that midyear reclassification is not allowed under the biological opinion and could lead to the improper manipulation of water bank delivery schedules. While Reclamation issued a press release informing the public of its reclassification of the water-year type in 2003, the impact of such changes on the water bank was not clearly articulated. For example, Reclamation did not mention that it would also change its estimate of year-to-date water bank deliveries as a result of the midyear reclassification in water-year type, leading to stakeholder concerns that water deliveries were being manipulated to benefit irrigators at the expense of fish. Reclamation officials believe that reclassifying water-year types is in compliance with the biological opinion and that the confusion related to reclassifying the water-year type stems from Reclamation's attempt to incorporate the most recent and accurate data on water conditions in their water bank delivery schedules.

Reclamation also has not clearly or systematically communicated the water bank's status and operations, further increasing stakeholder confusion. Specifically, Reclamation does not have a systematic mechanism to communicate information regarding the water bank to all stakeholders. Rather than regularly providing updated calculations of year-to-date deliveries to all stakeholders simultaneously through a single mechanism, such as a Web site or regularly scheduled press releases, Reclamation provides information on the water bank and its status "upon request" and through occasional press releases. Consequently, different stakeholders receive different information at different times. According to Reclamation officials, they meet regularly with the tribes and discuss the water bank's status. However, Reclamation does not systematically seek feedback on the operation of the water bank from all stakeholders, limiting the opportunities to clarify misunderstandings. As a result, after several years of operation, questions continue to persist among stakeholders, including

some Project irrigators and tribes, on basic topics such as the purpose of the water bank. Reclamation placed some information about the water bank application process on its Web site; however, Reclamation has not made other water bank information—such as the year-to-date status—available since that time, in part, because Reclamation has been reluctant to release status information that will almost certainly require revision later in the year.

Finally, Reclamation's use of river flow data generated by PacifiCorp to estimate the water bank's river flow augmentation has reduced the transparency of the water bank and limited the ability of stakeholders to independently monitor the operation of the water bank. The PacifiCorp data used by Reclamation to calculate actual Klamath River flows is not available to the public. Therefore, interested stakeholders must use a different source—the publicly available USGS data on actual Klamath River flows—to calculate year-to-date water bank deliveries. The PacifiCorp and USGS flow data differ because each uses a different formula to calculate the average daily flow. Thus, Reclamation and stakeholders will arrive at different augmented flow calculations, depending upon which data source they use. For example, we found that, in 2003, augmented flows appeared to be about 2,500 acre-feet greater when using USGS data than when using PacifiCorp data. Furthermore, Reclamation, using PacifiCorp data, would calculate that it had met its water bank obligation on a different date than a stakeholder would using USGS data, creating the potential for stakeholder confusion and doubt regarding the status of water bank deliveries. Reclamation officials told us that as of October 2004 they began using the publicly available USGS data to calculate and communicate the water bank's status.

The Water Bank Appears to Have Increased the Availability of Water for River Flows by Reducing Irrigation Use, but the Extent of Its Impacts is Unclear

Reclamation's water bank appears to have increased the availability of water to enhance river flows by reducing irrigation water use on the Project, but there is uncertainty regarding the extent of its impacts on river diversions and groundwater resources. In 2003, when the water bank primarily relied on crop idling to obtain water, there was a significant increase in the amount of land not using irrigation water compared with recent years. While it was likely that a reduction in river and lake diversions for Project irrigation resulted, a university study funded by Reclamation found that the reduction attributable to the water bank alone was highly uncertain due to the lack of effective flow measurement equipment and monitoring data for the Project. Because Reclamation was uncertain about how much water crop idling actually provided to the water

bank, Reclamation shifted to groundwater substitution and pumping as the primary sources for the 2004 water bank. However, USGS and Oregon state officials have since found evidence that groundwater aquifers under the Project, already stressed by drought conditions, are being pumped by an increasing number of wells and refilling at a slower than normal rate, prompting Reclamation to consider lessening its future reliance on groundwater substitution and pumping.

Crop Idling under the Water Bank Has Reduced the Amount of Irrigated Land, but the Extent of Its Impacts on River Diversions Is Unclear

In 2003, Reclamation obtained about 60 percent of its water bank acquisitions by contracting with irrigators for crop idling on nearly 14,500 acres of land, based on the assumption that water foregone from irrigation on those lands would be available to enhance river flows. Crop idling contributed to a significant increase in the amount of land not irrigated in 2003, compared with recent years. For example, according to Reclamation's 2003 crop report, a total of 20,335 Project acres were not irrigated, which is about a 60 percent increase over 2002 when 12,546 acres of land were not irrigated, and well exceeds the average of 7,665 acres of Project land not irrigated due to agricultural fallowing practices from 1998 through 2000—the three years preceding Reclamation's restriction of irrigation water in 2001.

Although the number of acres of crop land idled is a useful indication of the water bank's impacts, it does not provide a reliable estimate of the true extent to which irrigation water has been made available for river flows. According to Reclamation officials, the precise impact of the water bank cannot be determined because of year-to-year variation in irrigation demand and its determining factors such as temperature, precipitation, and crop types. Moreover, throughout the life of the water bank, Reclamation has used varying assumptions about the amount of water that can be saved by crop idling as more research and information has become available about this practice. Specifically, in 2002, Reclamation assumed that it could obtain about 5 acre-feet of irrigation water per acre of crop idling, in 2003 and 2004 assumed 2.5 acre-feet, and is currently assuming that it can obtain 2 acre-feet per acre through crop idling. To help it quantify the actual results of the water bank, Reclamation has turned to other organizations for assistance. For example, after the 2002 water bank was completed, Reclamation engaged USGS to review the assumptions and results for its off-Project crop idling. In February 2004, USGS reported to Reclamation that, based on the available data, the amount of water actually obtained per acre of crop land idled during the 2002 water bank was most likely in the range of .9 to 1.3 acre-feet of water per acre.

Similarly, in 2003, Reclamation was again unable to obtain precise information on the measurable impacts of the water bank for the year, so it contracted with California Polytechnic State University to study this issue. This study concluded that without effective flow measurement equipment and monitoring data for the Project it could not precisely estimate the impact of the water bank in reducing Upper Klamath Lake and Klamath River diversions to the Project. According to the study, in 2003 the reduction in diversions compared with 2000 may have ranged from 11,000 to 71,000 acre-feet and, moreover, this reduction may have been attributable to numerous other factors in addition to the water bank, such as heavy rainfall, a large amount of groundwater pumping, changes in irrigation district operations, and awareness among Project irrigators of the need to reduce water use. Based on subsequent university analysis, Reclamation now estimates that it actually obtained about 2 acre-feet of water per acre from crop idling in 2003 and 2004.

Despite the ongoing uncertainty regarding the impact that reducing the amount of irrigated land has on the availability of water for river flows, Reclamation officials told us they must continue to rely on crop idling for a significant portion of the water bank. While some stakeholders favor taking farmland out of irrigation, they are also uncertain of the extent to which crop idling reduces diversions for irrigation. For example, both tribal and fishing industry representatives told us that they doubt that Reclamation can accurately estimate how much additional water is actually made available to the river. Some irrigators question the effectiveness and accountability of crop idling as a strategy for the water bank, and also are concerned about the economic impacts to taking farmland out of production.

Groundwater Pumping for the Water Bank under Drought Conditions Raises Concerns about the Impacts on Aquifers

Because of the uncertainty regarding the measurable impact of crop idling, Reclamation shifted to groundwater for most of its water bank acquisitions in 2004; however, the impact of groundwater pumping on basin aquifers during ongoing drought conditions is largely unknown and continued reliance may not be sustainable. Reclamation obtained over 70 percent of the 2004 water bank deliveries by pumping nearly 60,000 acre-feet of water, either to substitute for irrigation water or to fill canals for use by others. Figure 6 below shows a groundwater pump delivering water into a canal for the water bank. According to Reclamation officials, in the absence of stored water, groundwater pumping is the only way to meet required flows in the spring and early summer because land idling provides little water in the April through June time period. An advantage of groundwater pumping

for the water bank is that, unlike crop idling, flow meters on pumps and wells allow the exact measurement of the amount of groundwater being used in place of river diversions for irrigation.

Figure 6: Groundwater Pumping for the Klamath Water Bank

Source: GAO.

The impact of groundwater pumping on Upper Basin aquifers, however, is not well understood, and its use during drought conditions is a matter of growing concern for Reclamation and others. The basin has suffered drought conditions since 2000, resulting in less rain and snowmelt to fill lakes, rivers, and aquifers. Recognizing that water demand would cause more users to turn to groundwater but that there is little reliable information on the groundwater hydrology of the Upper Klamath Basin, USGS and the Oregon Water Resources Department initiated a cooperative study in 1998 to study and quantify the Upper Basin's previously unknown groundwater flow system. The study, funded in part by Reclamation, is expected to be substantially completed in 2005.

Nevertheless, USGS and Oregon Water Resources Department officials have found evidence that groundwater aquifers in the Upper Basin, already

stressed by drought conditions, are being pumped by an increasing number of newly drilled wells and refilling at slower than normal rates in recent years. According to state officials, well drilling sharply increased after 2000, and an increasing number of domestic wells have needed to be deepened—a symptom of dropping water levels—in Klamath County during that same time frame. According to state records for Klamath County, Oregon, from 1998 to 2000, 14 irrigation wells were drilled; from 2001—when Project deliveries were restricted—through 2003, 124 irrigation wells were drilled. From 1998 to 2000, 21 domestic wells were deepened; from 2001 to 2003, 30 domestic wells were deepened; and in 2004, another 13 were deepened. Furthermore, USGS officials have identified wells in various parts of the Upper Basin, within and outside the Project boundaries, which have shown significant water level declines. For example, wells outside the Project have shown declines of up to 10 feet since 2000, thought to be primarily attributable to climatic conditions. Wells within the Project have shown a variety of responses to pumping—some wells seem to decline during irrigation season and then recover substantially during winter months, while other wells have shown steady year-to-year declines, some dropping more than 15 feet.

Reclamation engaged USGS in May 2004 to conduct an assessment of their current water bank strategies and any potential strategies that could help the agency meet its obligations. Specifically, Reclamation asked USGS to (1) document current and planned water bank activities, (2) assess the effectiveness of the 2003 and 2004 water banks, (3) determine if sufficient information is available to assess the impact of the water bank on Klamath River flows, and (4) develop a matrix of water bank management options, including their potential positive or negative consequences. In December 2004, USGS officials briefed Reclamation officials on their assessment, presenting the pros and cons of various management options to assist Reclamation's 2005 water bank planning. Reclamation officials are considering lessening their reliance on groundwater pumping and substitution for the 2005 water bank but are uncertain whether they can meet their water bank obligations, particularly for spring flows, while significantly increasing their reliance on crop idling.

Limited Information Is Available Regarding Alternative Approaches for Achieving Water Bank Objectives

While several alternative approaches for achieving the water bank's objectives have been identified by Reclamation and other stakeholders, limited information is available with which to reliably judge the feasibility or costs of these alternatives. Possible alternatives to the water bank include permanently retiring Project land from irrigation, expanding Upper Klamath Lake storage, or building a new reservoir separate from the lake. A large amount of Project land was offered for retirement by willing sellers in 2001, and a number of storage options have been evaluated to some extent, but implementation is not imminent for any of these alternatives. Although one of the objectives of the Conservation Implementation Program, required under NMFS' 2002 biological opinion, is the collaborative study of the feasibility of water storage and groundwater development alternatives, Reclamation and other stakeholders are still developing the framework for that process. In the interim, Reclamation and NMFS have an ongoing dialogue regarding water bank management and will likely reconsult on Klamath Project operations, including the water bank, in 2006.

A Significant Amount of Irrigated Land Would Need to Be Retired to Adequately Enhance River Flows, with Unknown Costs and Impacts

As an alternative to the water bank, permanently retiring a large area of irrigated Project land could provide 100,000 acre-feet of water to enhance Klamath River flows, but little reliable information is available to comprehensively assess this option. It is not known with any certainty the amount of irrigated land that would need to be retired to replace the water bank, how much irrigated land for retirement could actually be obtained from sellers, or the price at which it could be obtained. Furthermore, while this option is viewed positively by some Klamath River stakeholders, the potential impacts on the agricultural economy from retiring a large portion of Project lands is cause for concern in the farming community.

The amount of irrigated land that would need to be retired to reduce irrigation and enhance river flows by 100,000 acre-feet can be roughly estimated at about 50,000 acres but is not precisely known. As discussed earlier in this report, estimates of forgone irrigation water can prove to be much less than expected, and the lack of reliable water flow information on the Project makes it difficult to accurately determine the specific effects of crop idling—which is the short-term equivalent of permanent land retirement—and other strategies for reducing river diversions. Reclamation, irrigators, and tribal representatives told us that they believe that retiring irrigated land would reduce river diversions, but none are certain as to precisely by how much. Nevertheless, Reclamation, based on its most recent estimate of the amount of irrigation water obtained from

crop idling for the water bank, assumes that irrigation is reduced by about 2 acre-feet of water per acre idled. Using this assumption, Reclamation estimates that at least 50,000 irrigated acres—about 30 percent of the acreage currently irrigated by water from Upper Klamath Lake and the Klamath River—would need to be retired to reduce irrigation by 100,000 acre-feet. However, according to Reclamation officials, because crop idling provides little water from April to June, such land retirement by itself will not provide sufficient water to meet spring river flow requirements under the biological opinion. Furthermore, the actual reduction in irrigation would depend upon factors such as the extent of irrigation on the land before it was retired and how it is used after retirement.

Although there may be a fairly large number of potential willing land sellers on the Project, the amount of irrigated land actually available for purchase and permanent retirement is not known. In 2001, the American Land Conservancy (Conservancy)—a national, nonprofit organization involved in land conservation efforts—obtained 1-year agreements with 78 different landowners to purchase over 25,000 acres of irrigated land for the purpose of land retirement. The Conservancy made agreements with willing sellers—who, according to Conservancy officials, were generally aging and fearful of future drops in property values—expecting that the federal government would purchase the land for retirement. However, according to the Conservancy, Reclamation was not interested because the land was not in a single block. Moreover, according to Reclamation officials, the federal government is not interested in acquiring more land in the Klamath Basin. Subsequently, the Conservancy's agreements with the sellers lapsed. Whether a coalition of willing sellers could be put together again is unknown. An incentive to potential sellers could come from an expected increase in power rates in 2006. According to a recent Oregon State University economic study, an increase in power rates could raise agricultural production costs by an average of $40 per sprinkler-irrigated acre, potentially making agriculture unprofitable on as much as 90,000 acres of Project land. This scenario could potentially make more land available for sale and might even result in some voluntary land retirement due to lack of profitability, thus increasing river flows.

Additionally, the price at which land might be obtained for retirement is unknown. According to the Conservancy, the appraised value of the potential willing sellers' land in 2001 was $3,000 per acre. However, based on 2001 estimates from an Oregon State University and University of California economic study, the market value for Project irrigated land can range from $300 per acre for Class V soils—the lowest quality for

agricultural purposes—to $2,600 for Class II soils— some of the better agricultural soil on the Project. In addition, Project landowners are concerned that property values may have decreased due to the uncertainty of water deliveries for irrigation after the 2001 water restriction. Using the 2001 price estimates from the universities' study, the total cost to retire 50,000 acres, assuming the land is available from willing sellers, could range from $15 to $130 million, depending upon the mixture of low and high valued land offered for sale.

Finally, while tribal representatives and others favor significant irrigated land retirement as a means to reduce demands on the river, the extent of impacts on the agricultural economy is cause for concern in the Project farming community. Tribal representatives and downstream fishing representatives told us that irrigated land retirement is essential to restoring the balance between the supply of and demand for water in the basin. However, according to Klamath irrigators, the Klamath agricultural economy is fragile and must maintain close to current levels of agricultural acreage in production to sustain its infrastructure. Irrigators argue that retiring large amounts of irrigated farmland on the Project could eliminate or adversely impact key aspects of agricultural infrastructure, such as fuel, transportation, equipment and fertilizer suppliers, and affect a whole host of other dynamics of the agricultural community. However, retiring land with the lowest agricultural value could help minimize the potential negative effect on the region's agricultural economy. According to the study by Oregon State University and the University of California, retiring lands with the least productive soils and, therefore, lowest agricultural value, would have the smallest potential negative effect on the region's agricultural economy.

Expanding Upper Klamath Lake or Building a Separate Reservoir Are under Consideration, but Costs and Impacts Have Not Been Extensively Evaluated

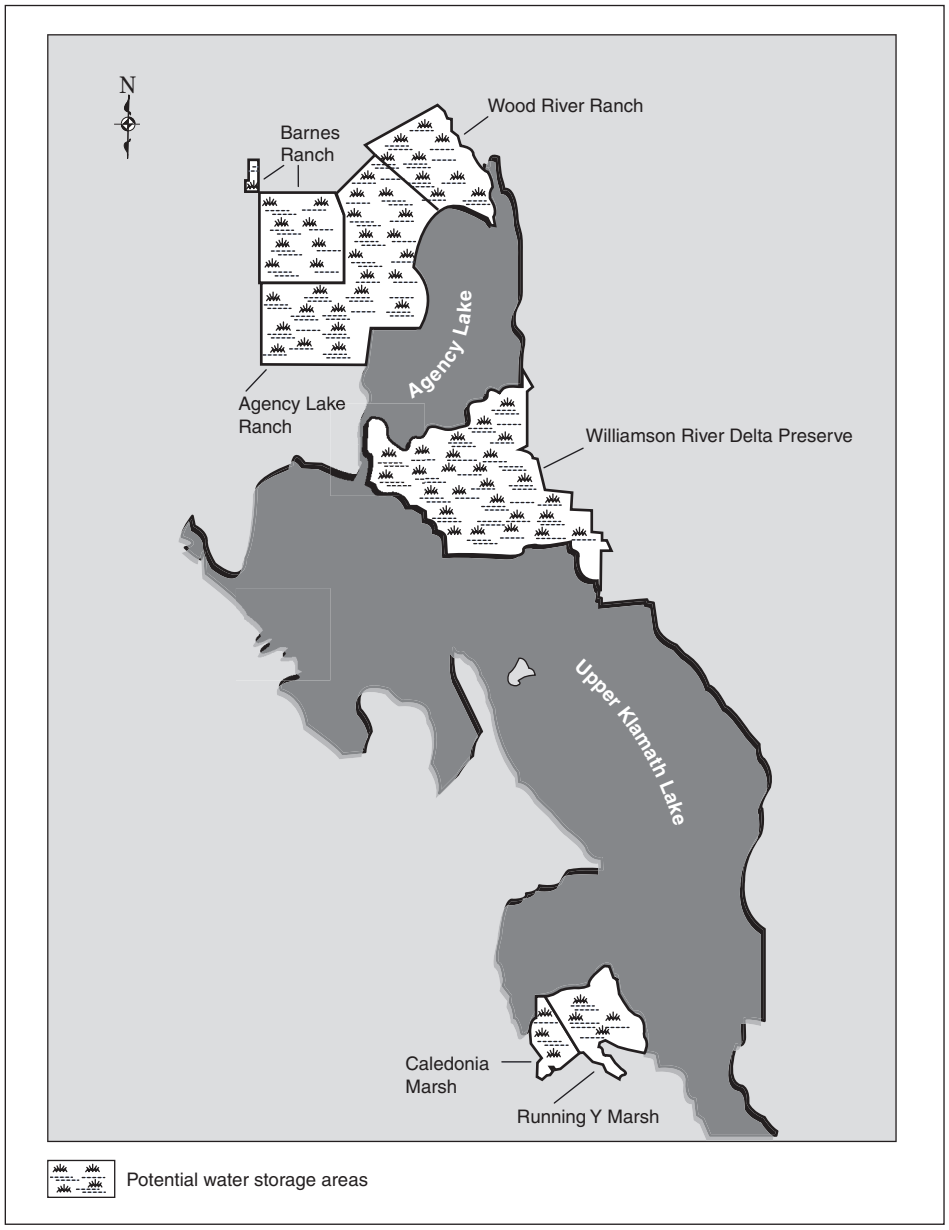
Adding water storage capacity in the Klamath River Basin could provide an alternative to the water bank for river flow augmentation, and several options to either expand Upper Klamath Lake or build a separate reservoir have been considered or pursued to various extents. In general, Klamath River stakeholders—irrigators, tribes, federal entities, and others—view either option favorably as a potential solution to help balance competing water demands. However, the extent and reliability of information regarding the total cost for each water storage option, the amount of water potentially provided, the certainty and sustainability of water storage, and the environmental impacts are largely unknown.

Upper Klamath Lake Expansion

Upper Klamath Lake (including adjoining Agency Lake) is the primary source of water for the Project and the Klamath River. To satisfy the water contracts of irrigators, as well as river flow and lake level requirements, Upper Klamath Lake must be full at the start of the irrigation season. However, when the lake exceeds its maximum storage capacity—generally due to heavy runoff before the irrigation season begins—the lake goes into "spill condition," releasing water into the Klamath River (and eventually into the Pacific Ocean) to avoid flooding the surrounding area. Expanding the lake's capacity by purchasing and flooding adjoining properties with water that would otherwise be spilled would enable Reclamation to preserve this water for peak demand periods—late spring to early fall—for both fish and irrigators. It would also reduce irrigation demand from these lands, leaving more water in the lake for Project and other uses.

In 1998, Reclamation prepared a report identifying numerous options for expanding the lake, but only six options were evaluated regarding their feasibility for water storage development. Collectively the six options have the potential to provide approximately 100,000 gross acre-feet of water, however, according to Reclamation officials, evaporation losses would reduce the net usable water storage to about half that amount. As shown in figure 7, the six water storage options—listed roughly from north to south and by proximity to each other—include Agency Lake Ranch, Barnes Ranch, Wood River Ranch, the Williamson River Delta Preserve, Caledonia Marsh, and Running Y Marsh.

Figure 7: Upper Klamath Lake Expansion Options



Source: Reclamation.

- Agency Lake Ranch is a 7,125-acre, Reclamation-owned marshland located on the west side of Agency Lake. Reclamation purchased the

land in 1998 to store spill water during periods of high inflow to the lake. Agency Lake Ranch currently has the capacity to store about 13,000 gross acre-feet without flooding neighboring properties. However, it has the potential to store up to 35,000 gross acre-feet of water if the existing levees surrounding the land are raised, at an unknown cost.

- Barnes Ranch is a privately owned 2,671-acre pasture bordering the west side of Agency Lake Ranch with the capacity to store 15,000 gross acre-feet of water if the levees surrounding the property are improved. If the Barnes Ranch is acquired and Reclamation removed the levees bordering Agency Lake Ranch and Agency Lake, a combined total of approximately 40,000 gross acre-feet of water could be stored and would potentially fill to this capacity in most years. In January 2004, Reclamation had Barnes Ranch appraised for $5.9 million, but the owners and Reclamation have not yet agreed on a purchase price.

- Wood River Ranch is an approximately 3,000-acre site on the north end of Agency Lake, adjacent to Agency Lake Ranch. The Bureau of Land Management (BLM) purchased Wood River Ranch in 1994 to restore as a wetland, among other objectives. Because of its proximity to Agency Lake Ranch and Barnes Ranch, Reclamation officials would like to convert the land to store approximately 7,500 gross acre-feet of water. However, local BLM managers feel that this would not be compatible with the existing goals and objectives of the Klamath Resource Management Plan, telling us that converting the land to water storage would destroy wildlife habitat and reverse a 10-year, multimillion dollar restoration effort accomplished with many private contributors.

- The Williamson River Delta Preserve is a 7,440-acre site, located at the southern end of Agency Lake, that was converted from wetland to farmland in the 1930s and 1940s. The Nature Conservancy purchased two properties—Tulana Farms in 1996 and Goose Bay Farms in 1999—and is developing a restoration plan for the combined site. With the encouragement and financial support of Reclamation, the Nature Conservancy has considered the option of returning the properties to Upper Klamath Lake. Reclamation estimates that the preserve would add 35,000 gross acre-feet of water storage capacity, at relatively low cost with the Nature Conservancy's collaboration.

- Caledonia Marsh is a privately owned 794-acre farm on the southern end of Upper Klamath Lake with the potential capacity to store nearly 5,000 gross acre-feet of water. According to Reclamation, the owner has

expressed interest in selling; however, the surrounding levees would need to be improved and the Highway 140 road bed raised to protect the neighboring property, Running Y Marsh. The cost of these improvements has not been determined.

- Running Y Marsh is a privately owned 1,674-acre farm and wetland area adjacent to Caledonia Marsh with the potential to store about 10,000 gross acre-feet of water if converted to lake storage. However, because of the high value crops grown there, the owner is not currently interested in selling the property to Reclamation.

For all of these options, while it would be relatively easy to determine the amount of additional water storage provided by measuring changes in the lake surface area, there are a number of associated uncertainties and constraints. For example, since these storage areas are essentially extensions of the lake itself, filling the additional capacity is dependent upon adequate flows into the lake—if the lake does not fill to capacity, the storage areas would not be filled to their capacity. In addition, use of the additional stored water in these areas would be constrained by the minimum lake level requirements set out by the FWS biological opinion for Upper Klamath Lake to protect the two species of sucker. As an extension of the lake, the new storage areas could not be drained below these minimum levels. Finally, the environmental impacts of developing water storage areas vary and would need to be addressed by Reclamation as part of the water storage development process.

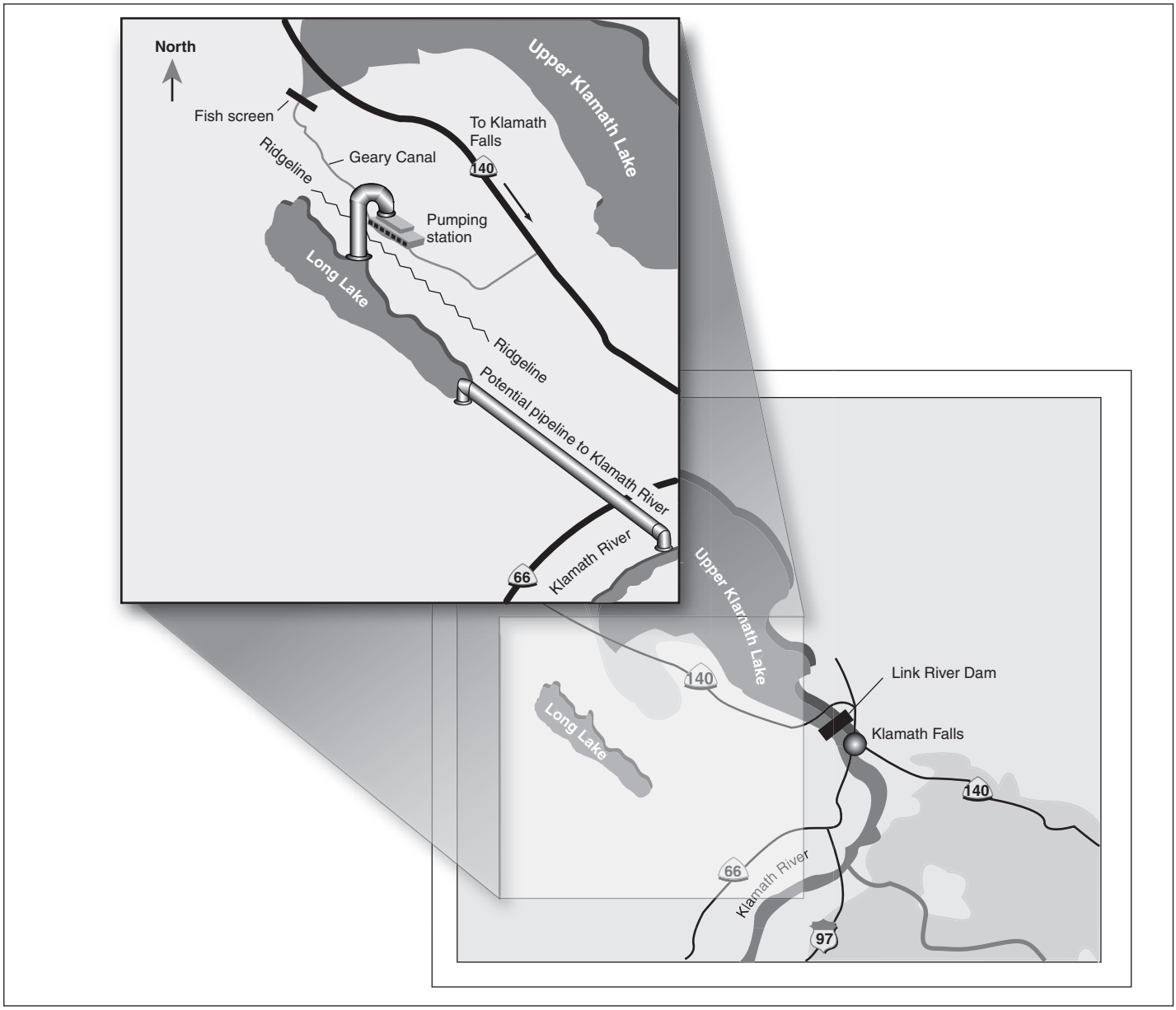
Separate Reservoir Development

The development of a separate reservoir would create a long-term storage area in the Klamath Basin that could far surpass the capacity of the water bank as a source of flows for the river, potentially benefiting all Klamath River stakeholders and protected species. Evaluation of such potential water storage areas has focused on Long Lake Valley, located southwest of Upper Klamath Lake. Developing Long Lake Valley into a reservoir would enable water to be stored that would otherwise be spilled into the Klamath River when Upper Klamath Lake's water level exceeds the maximum lake elevation. Reclamation, irrigators, and others generally agree that Long Lake Valley is the most viable option currently available for new reservoir development.

According to Reclamation, converting Long Lake Valley into a reservoir could yield up to 250,000 acre-feet of water, with a depth of 250 to 300 feet when full. Thus, Long Lake represents "deep" water storage, which generally contains colder water—beneficial to fish—than shallow Upper

Klamath Lake can provide. Reclamation indicated that the reservoir's 250,000 acre-foot capacity would be filled by pumping water from Upper Klamath Lake to Long Lake between March and June, using the piping system shown in figure 8. However, much like the Upper Klamath Lake expansion options, the certainty of Long Lake's water supply depends entirely upon the availability of spill water to fill it and, according to NMFS officials, the impacts on the river of diverting these flows to a reservoir need to be studied. Once filled, Long Lake could provide a sustainable supply of water to supplement river flows. In addition, the amount of water stored by Long Lake and delivered to enhance river flows could easily be measured by metering water flow in the pipeline to and from the lake or, potentially, in a pipeline emptying directly into the Klamath River.

Figure 8: Long Lake Storage Option



Source: Reclamation.

Reclamation completed an initial study of the geology of Long Lake Valley in March 2004, which determined that Long Lake Valley's floor would

provide a good barrier to prevent water leakage. Geologic investigations of Long Lake Valley are continuing in 2005. To date, Reclamation has not conducted a full feasibility study for Long Lake development, and it will not do so until a funding plan has been established. Reclamation estimates that a feasibility study would take three years to complete and would cost approximately $12 million. Subsequently, reservoir construction funds would need to be obtained. There are no reliable estimates available, but Reclamation's most recent projection of construction costs is about $350 million, not including real estate acquisition costs. The Long Lake development project would take at least 10 years to complete, which means that Long Lake would not address any immediate water demand issues in the Klamath Basin. Based on Reclamation's initial study, if Reclamation can address funding, technical, and environmental impact requirements, Long Lake may offer a promising long-term storage option for the Klamath Basin.

Reclamation's Conservation Implementation Program Is Still Being Developed

Storage options and other potential long-term solutions to water quantity, quality, and wildlife resource issues are expected to receive greater attention in coming years under Reclamation's Conservation Implementation Program. In addition to the water bank, NMFS' 2002 biological opinion required Reclamation to establish such a program, and Reclamation and other stakeholders began developing the framework for future collaboration in 2003. One of the objectives of the program is the development and implementation of feasibility studies to identify opportunities for increased water storage and groundwater development alternatives. The Governors of the states of California and Oregon and heads of the Departments of the Interior, Agriculture, and Commerce, as well as the Environmental Protection Agency, signed an agreement in October 2004 to coordinate their efforts to achieve program objectives, and Reclamation is currently preparing a third draft program document for stakeholder review.

The Water Bank Could Be Modified in 2006

Reclamation and NMFS will have the opportunity to discuss revising some elements of the biological opinion, including the water bank, when they meet for an expected reconsultation in 2006. Reconsultation could address the following potential changes to the biological opinion, affecting Reclamation's responsibility for river flows, its water bank obligation, and how it operates the water bank:

- Adjusting Reclamation's level of responsibility for ensuring Klamath River flows to reflect information currently being developed regarding the water quality and quantity requirements of Klamath River fish, as well as historic natural flows of the Klamath River. Based on a recent USGS study of irrigated acreage in the Upper Basin, Reclamation—currently held responsible for ensuring 57 percent of needed flows—may suggest reducing that number to about 40 percent. Such an adjustment would not directly alter Reclamation's water bank obligations; however, it would decrease Reclamation's overall responsibility for ensuring Klamath River base flows by increasing the responsibilities of other basin stakeholders, such as the states and other federal agencies. According to NMFS, such a change would need to be considered within the context of the U.S. District Court's 2003 criticism of the allocation of responsibility for providing flows.

- Not requiring a water bank in Above Average or Wet water years, thus eliminating the cost and effort of obtaining and managing the water bank when natural flows are abundant.

- Changing the method for determining water-year types from a five-tier system to a more incrementally adjustable method that would cause less dramatic changes in flow requirements, thus addressing one of the concerns raised by stakeholders. Currently being piloted by Reclamation with FWS for managing Upper Klamath Lake levels, this method would reduce the magnitude of changes and the need for significant water bank delivery recalculations.

Conclusions

Water shortages in the Klamath River Basin have created serious conflicts and placed Reclamation in the difficult position of balancing competing demands for water among numerous stakeholders. Over the last three years, Reclamation has demonstrated commitment and resourcefulness in this task, particularly under drought conditions, by implementing and meeting the obligations of the temporary water bank. However, whether Reclamation can continue meeting its water bank obligation using current methods is unclear, given the uncertain results of crop idling and the unknown sustainability of groundwater pumping. This uncertainty adds urgency to Reclamation and stakeholder efforts to collaboratively identify and evaluate long-term solutions. In the mean time, because the water bank acts as the primary mechanism for balancing competing demands for water, Reclamation must be able to clearly communicate to stakeholders how the water bank is managed and how water is accounted for. This

information will make the management and accountability for this public resource more transparent to all those that rely on and are affected by the water bank.

Recommendation for Executive Action

We are recommending that Reclamation take steps to improve the information provided to stakeholders regarding water bank management and accounting by regularly and systematically providing—through media such as a water bank Web-link or a monthly or biweekly press release—public information on the rationale and effects of management decisions related to forecasted water availability, unexpected spill conditions, or other significant events, as well as regularly updated information regarding the water bank's status, including the amount of water bank deliveries to date.

Agency Comments and Our Evaluation

We provided copies of our draft report to the Departments of Agriculture, Commerce, and the Interior for their review and comment. We received a written response from the Under Secretary of Commerce for Oceans and Atmosphere that includes comments from the National Oceanic and Atmospheric Administration (NOAA) and from Interior's Assistant Secretary, Policy, Management and Budget that includes comments from Reclamation and BLM. Overall, NOAA stated that the report accurately reflects the history of the water bank, and Reclamation expressed appreciation for GAO's efforts to report on the complex Klamath River Basin situation. We requested comments from Agriculture, but none were provided.

Reclamation agreed with our recommendation to improve the information provided to stakeholders regarding water bank management and accounting. Reclamation agreed to implement steps to enhance water bank communications through systematic feedback to stakeholders with information regarding the water bank. Reclamation said that it would add a new page to its Web site exclusively for the water bank, which will include background information, new information as it becomes available, links to relevant Web resources such as USGS' Klamath River gauge at Iron Gate Dam, and graphics showing the status of water bank flow augmentation. This information will be updated at least biweekly, with notices posted to direct stakeholders to updated information. Reclamation plans to complete these changes to its Web site by June 30, 2005.

NOAA, Reclamation, and BLM provided comments of a factual and technical nature, which we have incorporated throughout the report as appropriate. Because of the length of the technical comments provided by Reclamation and BLM, we did not reproduce them in the report. Interior's transmittal letter and response to our recommendation are presented in appendix III, and NOAA's comments are presented in appendix IV.

We are sending copies of this report to the Secretaries of Agriculture, Commerce and the Interior, appropriate congressional committees, and other interested Members of Congress. We also will make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov.

If you or your staffs have any questions about this report, please contact me at (202) 512-3841 or mittala@gao.gov. Key contributors to this report are listed in appendix V.

Anu K. Mittal
Director, Natural Resources
and Environment

Scope and Methodology

To determine how the Bureau of Reclamation (Reclamation) operated the water bank and how much it cost, we analyzed Reclamation's water bank planning, contracting, and expenditure documentation. We researched and analyzed laws, regulations, the National Marine Fisheries Service's (NMFS) biological opinion, and related court cases pertinent to the water bank and how it operates. For each year of the water bank, we reviewed and analyzed data on applications and contracts in comparison with the biological opinion requirements. We reviewed and analyzed expenditures for contracts and program administration, as well as future budget request estimates, for total costs incurred to date and expected future costs of the water bank. Finally, we interviewed staff from Reclamation, NMFS, and other relevant agencies, as well as stakeholders—including representatives from tribal, commercial fisheries, and irrigator groups—on water bank program obligations, operations, and monitoring.

For each year of the water bank program, we reviewed and analyzed data on water bank contracts to determine whether Reclamation met its water bank acquisition obligations, and we reviewed and analyzed scheduled base Klamath River flows, as well as the daily average Klamath River flows, using both U.S. Geological Survey (USGS) and PacifiCorp-generated data to calculate the augmented flows to determine whether Reclamation met its water bank delivery obligations. We interviewed staff from Reclamation and other relevant agencies, as well as stakeholders— including representatives from tribal, commercial fisheries, and irrigator groups—on water bank program obligations, operations, and monitoring.

To describe the water bank's impact on water availability and use in the Klamath River Basin, we interviewed staff from Reclamation, USGS, the Oregon Water Resources Department, California Polytechnic State University, and the Klamath Basin Rangeland Trust. We gathered and analyzed Reclamation crop reports, a USGS study of irrigation water use, and a California Polytechnic State University study of the 2003 water bank to describe the impact of crop idling on river flows. To describe the impacts of groundwater use, we collected and analyzed Oregon Water Resources Department information on groundwater pumping, well drilling, and well deepening in Klamath County, Oregon, and USGS information on well levels in the Upper Basin. We also collected descriptions of the joint USGS/Oregon Water Resources Department study of Upper Basin groundwater and the USGS study of Reclamation's water bank. In addition, we interviewed and obtained relevant documentation from stakeholders including irrigators, tribes, and commercial fisheries. We did not review the

water bank's impact on fish species because the short history of the water bank makes it difficult to obtain reliable information.

To describe alternative approaches to the water bank, we collected information and interviewed staff from Reclamation and the Bureau of Land Management, as well as potential land sellers, irrigators, irrigation experts, economists, and conservationists. We also toured the Klamath Project area by plane and car to visit and observe potential irrigated land retirement options and water storage areas. In addition, we collected and analyzed documentation of potential water storage locations, a study of options for increasing water storage, as well as a Reclamation study of a potential new reservoir. Finally, we reviewed the requirements for coordinated efforts among stakeholders in NMFS' biological opinion and the status of basinwide planning to increase river flows.

To assess the reliability of the noncomputerized data we received, we interviewed officials most knowledgeable about the collection and management of each data set. We assessed the relevant general and application controls and found them adequate. In addition, we reviewed the methodology of the economic and water use studies and interviewed the authors to discuss their scope, data quality, and results. Finally, we conducted tests of the reliability of computerized data. On the basis of these interviews, tests, and reviews, we concluded that the data from the various sources and studies were sufficiently reliable for the purposes of this report.

We performed our work between May 2004 and February 2005 in accordance with generally accepted government auditing standards.

Information on Water Bank Applications and Contracts

As shown in table 2, the total numbers of applications from irrigators seeking participation in the water bank decreased from 2003 to 2004; Reclamation did not solicit applications in 2002. The total number of contracts for participation has fluctuated up and down since the inception of the water bank.

Table 2: Number of Water Bank Applications and Contracts by Type and by Year

	2002	2003	2004
Total water bank applications	[a, b]	**521**	**449**
Crop idling	[a]	335	277
Groundwater substitution	[a]	186	172
Groundwater pumping	[b]	[b]	[b]
Total water bank contracts	**2**	**315**	**141**
Crop idling	1	223	53
Groundwater substitution	0	92	41
Groundwater pumping	1	0	47

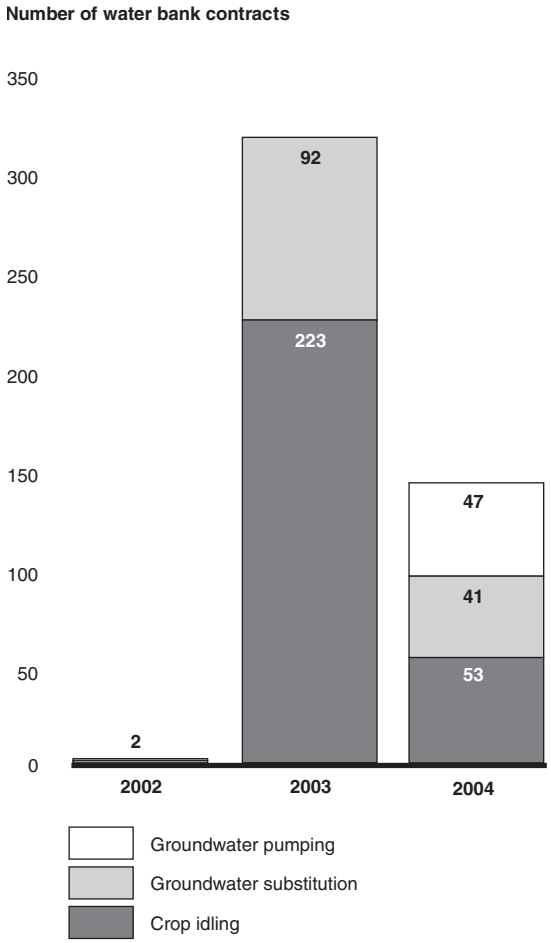
Source: GAO analysis of Reclamation data.

[a]Due to the timing of the water bank in 2002, Reclamation negotiated contracts without a formal application process.

[b]Reclamation negotiated contracts for groundwater pumping outside of the formal application process.

Reclamation shifted its contracting emphasis from primarily crop idling in 2003 to primarily groundwater contracts in 2004. As such, the number of groundwater contracts (groundwater pumping plus groundwater substitution) has grown to represent a larger proportion of all contracts as Reclamation's water bank obligation increased, as shown in figure 9.

Figure 9: Proportion and Number of Water Bank Contracts by Type, 2002 to 2004



Source: GAO analysis of Reclamation data.

Note: In 2002, there were two water bank contracts—one for crop idling and one for groundwater pumping.

The volume of water (acre-feet) offered in water bank applications increased by almost 50 percent from 2003 to 2004. The volume of water Reclamation acquired through contracts more than doubled since the water bank's inception, as shown in table 3.

Table 3: Volume Represented by Water Bank Applications and Contracts by Type and Year

	2002	2003	2004
Total volume represented by applications[a]	[b, c]	**104,151**	**154,908**
Crop idling	[b]	49,274	75,637
Groundwater substitution	[b]	54,877	79,271
Groundwater pumping	[c]	[c]	[c]
Total volume acquired through contracts[a]	**47,072**	**59,332[d]**	**110,877[e]**
Crop idling	27,072	35,389 [d]	22,582
Groundwater substitution	0	23,943 [d]	16,656
Groundwater pumping	20,000	0	71,639[e]

Source: GAO analysis of Reclamation data.

[a]Acre-feet of water.

[b]Due to the need to establish the water bank expeditiously in 2002, Reclamation negotiated contracts without a formal application process.

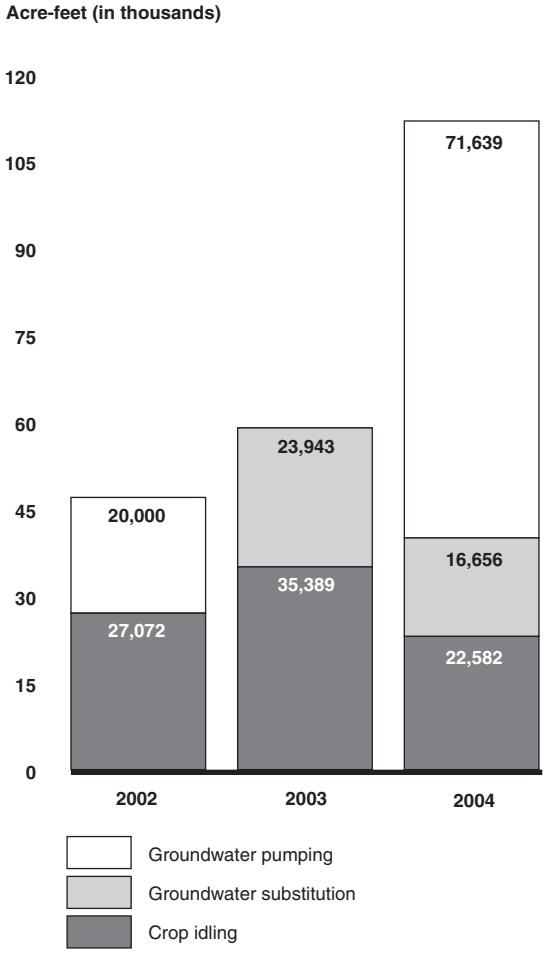
[c]Reclamation negotiated contracts for groundwater pumping outside of the formal application process.

[d]Reclamation voided two of these 2003 water bank contracts—one crop idling contract for 64.45 acre-feet and one groundwater substitution contract for 254.29 acre-feet.

[e]Reclamation only purchased 82,257 of the 110,877 acre-feet it acquired through contracts in 2004, as it did not need to exercise the options on all of its contingency groundwater pumping contracts in order to meet the delivery schedule.

As shown in figure 10, from 2002 to 2004, Reclamation has increased the volume of groundwater as a proportion of the total water bank acquired by contract.

Figure 10: Proportion and Volume of Water Acquired for the Water Bank by Contract Type, 2002 to 2004



Source: GAO analysis of Reclamation data.

Note: Reclamation was able to meet the water delivery schedule without exercising the options on all of its contingency groundwater pumping contracts, purchasing only 82,257 of the 110,877 acre-feet it acquired in 2004. Of this 82,257 acre-feet of water actually purchased, 43,019 acre-feet (52 percent) is attributable to groundwater pumping alone, while 73 percent of actual purchases is attributable to groundwater sources overall.

As shown in table 4, the total irrigated land acreage offered in water bank applications and accepted under contracts has increased since the inception of the water bank.

Table 4: Acres of Land Offered in Applications and Accepted under Contracts by Type and Year

	2002	2003	2004
Total acreage offered in applications	[a,b]	**47,215**	**67,508**
Crop idling	[a]	23,093	33,841
Groundwater substitution	[a]	24,122	33,667
Groundwater pumping	[b, d]	[b, d]	[b, d]
Total acreage accepted under contracts	**3,161**	**25,469**	**22,371**
Crop idling	3,161[c]	14,430	15,497[c]
Groundwater substitution	0	11,039	6,874
Groundwater pumping	[b]	[b]	[b]

Source: GAO analysis of Reclamation data.

[a]Due to the need to establish the water bank expeditiously in 2002, Reclamation negotiated contracts without a formal application process.

[b]Because groundwater pumping does not represent water foregone from a particular area of land, the amount of land represented by the pumping is not applicable.

[c]Crop idling included an off-Project contract with the Klamath Basin Rangeland Trust that accounted for all 3,161 acres of crop idling in 2002 and 11,133 acres in 2004.

[d]Reclamation negotiated contracts for groundwater pumping outside of the formal application process.

Comments from the Department of the Interior

Note: Because of the length of the technical comments provided by Interior, we are not including them here. We have incorporated suggested changes into the report as appropriate.

United States Department of the Interior

OFFICE OF THE ASSISTANT SECRETARY
POLICY, MANAGEMENT AND BUDGET
Washington, DC 20240

TAKE PRIDE IN AMERICA

MAR 0 1 2005

Ms. Anu K. Mittal
Director, Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, D.C. 20548

Dear Ms. Mittal:

Thank you for providing the Department of the Interior the opportunity to review and comment on the draft United States Government Accountability Office report entitled, "Klamath River Basin: Reclamation Met Its Water Bank Obligations, But Information Provided to Water Bank Stakeholders Could Be Improved," (GAO-PUB No. 05-283), transmitted to the Secretary of the Interior on February 4, 2005.

The enclosure provides comments and suggestions from the Bureau of Reclamation and the Bureau of Land Management. We hope our comments will assist you in preparing the final report.

Sincerely,

P. Lynn Scarlett
Assistant Secretary
Policy, Management and Budget

Enclosure

U. S. Government Accountability Office (GAO) Draft Report
"KLAMATH RIVER BASIN: Reclamation Met Its Water Bank Obligations, But Information Provided to Water Bank Stakeholders Could Be Improved"
GAO-PUB No. 05-283
February 2005

Reclamation's Response to the Draft Audit Recommendation

Recommendation 1:

We are recommending that Reclamation take steps to improve the information provided to stakeholders regarding water bank management and accounting by regularly and systematically providing-through media such as water bank web-link or a monthly or bi-weekly press release-public information on the rationale and effects of management decisions related to forecasted water availability, unexpected spill conditions, or other significant events, as well as regularly updated information regarding the water bank's status, including the amount of water bank deliveries to date.

Reclamation's Response: Concur. Reclamation will implement the following steps to enhance Water Bank communications through systematic feedback for stakeholders on water bank information.

Reclamation will add a new page to our internet website exclusively for the Water Bank. The web page will include changing information as it becomes available. There will be a link to the USGS gauge at Iron Gate for down stream data. It will include a base flow chart, with a clear explanation and graphic that will show how much water the water bank will add to the base flow. As this information changes through the water year, but at least every 2 weeks, Reclamation will update the data. There will be a notice posted on the site about checking back to get updated information.

The website will include a primer, explaining the what, why, and how of the Water Bank. The website will also have a button to link the user to the current Operations Plan, to obtain more data if they so desire.

Additionally, Reclamation will continue formal notification of the Tribes by fax and letter of changes or impending changes, including year-type changes, as they are recognized by Reclamation.

The completion of an updated website, as described above, to enhanced Water Bank communications is scheduled for June 30, 2005.

10

Comments from the Department of Commerce

UNITED STATES DEPARTMENT OF COMMERCE
The Under Secretary of Commerce
for Oceans and Atmosphere
Washington, D.C. 20230

MAR - 2 2005

Ms. Anu K. Mittal
Director, Natural Resources
and Environment
United States Government Accountability Office
Washington, DC 20548

Dear Ms. Mittal:

Thank you for the opportunity to review and comment on the Government Accountability Office's draft report entitled *Klamath River Basin: Reclamation Met Its Water Bank Obligations, But Information Provided to Water Bank Stakeholders Could Be Improved* (GAO-05-283). Enclosed are the National Oceanic and Atmospheric Administration's comments to this draft report.

Sincerely,

Conrad C. Lautenbacher, Jr.
Vice Admiral, U.S. Navy (Ret.)
Under Secretary of Commerce for
Oceans and Atmosphere

Enclosure

THE ADMINISTRATOR

Printed on Recycled Paper

NOAA Comments on the Draft GAO Report Entitled "Klamath River Basin: Reclamation Met Its Water Bank Obligations, But Information Provided to Water Bank Stakeholders Could Be Improved" (GAO-05-283/April 2005)

General Comments

The report accurately reflects the history of the water bank. GAO acknowledges that the Bureau of Reclamation (Reclamation) and NOAA's National Marine Fisheries Service (NMFS) are making modifications to the mechanisms for administration of the water bank in response to new information. The report should emphasize that predicting water supply in the Klamath River Basin is difficult, and agencies have encountered unusual events not anticipated in the early development of the water bank. The one important issue not clearly addressed or reviewed that is the coho salmon needs supplemental water mainly in the spring period, while the water in the bank accrues through the irrigation season as foregone diversions are saved to the lake. For this reason, Reclamation has had to "borrow against" the Upper Klamath Lake (i.e., spend more water bank water than has accrued to the bank) to meet the spring fish flows. This results in tension in the spring of drier water years between keeping the lake high enough to meet endangered sucker needs, meeting coho salmon needs, and meeting demands for agriculture. This issue is addressed in footnote 12 of the report. We recommend GAO expand on this problem in the narrative because it is a complicated issue in disclosing how the water bank is being used on a day to day basis.

Recommended Changes for Factual/Technical Information

GAO Highlights, What GAO Found, last sentence:
The discussions planned for 2006 are contingent upon the Department of the Interior completing studies on unimpaired flow and instream fish requirements (Hardy Phase II Study). We suggest changing this sentence to read: "Meanwhile Reclamation and the National Marine Fisheries Service will have the opportunity to explore alternative ways to more effectively manage the water bank when they review new information on instream flow and fish habitat relationships that is expected in spring 2005."

Page 5, second paragraph, third sentence:
This sentence should be revised to read: "NMFS issued a final biological opinion finding that the plan would jeopardize the continued existence of Southern Oregon/Northern California coastal coho and adversely modify its critical habitat."

Page 40:
This discussion of the Long Lake Valley Reservoir should identify the concern that the diversion of large volumes of water from the Upper Klamath Lake necessary to fill and maintain such a large reservoir may have adverse effects on the river below the project. Loss of high winter flows could reduce the occurrence of geomorphic events necessary to maintain healthy riparian zones, adequate spawning gravels, and good juvenile rearing habitat. While such a large reservoir would provide a good mechanism for operation of a water bank, its effect on the health of the river would need to be evaluated before it could be implemented as a viable option.

1

Page 43, first bullet:
This section should indicate the court that reviewed the biological opinion was critical of the allocation of responsibility for providing flows. The mechanism for acquiring water from other responsible parties was not certain to produce the water necessary to ensure the fish needs were met, and absence of this contribution, the continued existence of the fish may be jeopardized. The agencies will have to consider the court's criticism when they reinitiate consultation to address information on the unimpaired flow study and the Hardy Phase II Study, which we anticipate will be available in spring 2005.

Editorial Comments

Page 4, line 4:
Insert "coastal" between California and coho.

Page 5, footnote 2:
In the citation to the court case, change "LELIS" to "LEXIS."

Page 13, line 12:
Delete "of the Yurok Reservation." Singling out the Yurok Reservation creates confusion and is not necessary.

Page 13, end of second paragraph:
Add the following sentence: "The Karuk Tribe is seeking federal recognition of a fishing right."

Page 13, line 23:
Change "will" to "is likely to."

Page 13, line 24:
Insert "destroy or adversely modify" before "its critical habitat."

Page 13, line 25:
Change "must" to "shall."

Page 14, line 11:
Delete the word "to" before the word "take."

Page 14, line 19:
Include May 31, 2002, as the date for issuance of the final biological opinion.

Page 34, line 25:
Providing an explanation for the expected rate of increase in power rates in 2006 would give a more informative discussion.

NOAA Response to GAO Recommendations

The report did not have recommendations specific to NOAA.

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In addition to those individuals named above, Brad C. Dobbins, David A. Noguera, and Tama R. Weinberg made key contributions to this report. Also contributing to the report were John W. Delicath, Philip G. Farah, Curtis L. Groves, Julian P. Klazkin, Kim M. Raheb, and Monica L. Wolford.

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