

# RECLAMATION

*Managing Water in the West*

## Windy Gap Firing Project Final Environmental Impact Statement

### Executive Summary FES 11-29



U.S. Department of the Interior  
Bureau of Reclamation  
Great Plains Region  
Eastern Colorado Area Office  
Loveland, Colorado

*Cooperating Agencies:*

- U.S. Army Corps of Engineers
- U.S. Department of Energy,  
Western Area Power Administration DOE/EIS-0370
- Grand County

November 2011

# **EXECUTIVE SUMMARY**

## **FINAL ENVIRONMENTAL IMPACT STATEMENT**

### **WINDY GAP FIRING PROJECT**

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#### **INTRODUCTION**

The Windy Gap Firing Project (WGFP) is a proposed water supply project that would provide more reliable water deliveries to Colorado's Front Range and West Slope communities and industries. The Municipal Subdistrict, Northern Colorado Water Conservancy District (Northern Water) acting by and through the Windy Gap Firing Project Water Activity Enterprise (Subdistrict), on behalf of WGFP Participants, is seeking approval from the U.S. Bureau of Reclamation (Reclamation) for additional physical connections to Colorado-Big Thompson (C-BT) Project facilities in order to implement the proposed project. Reclamation's decision on the WGFP is a major federal action requiring

preparation of an Environmental Impact Statement (EIS). This Executive Summary summarizes the alternatives analyzed in detail and their anticipated environmental effects. The reader is referred to the entire Final EIS for a more complete description and analysis.

Due to limitations and constraints with the existing system, the current Windy Gap Project facilities, which were completed in 1985, are unable to deliver the anticipated firm yield of water. Water deliveries from the West Slope currently are limited by storage capacity in Granby Reservoir and by the delivery capacity of the Adams Tunnel, which delivers water from Grand Lake to the East Slope. The WGFP would add water storage and related facilities to the existing Windy Gap operations capable of delivering a firm annual yield of about 30,000 acre-feet (AF) to Project Participants. The intent of the WGFP is to improve the yield from an existing project and existing Windy Gap water rights.

Project Participants in the WGFP include municipalities, rural domestic water districts, and an industrial water user. Project Participants on the East Slope are the City and County of Broomfield, Central Weld County Water District, Town of Erie, City of Evans, City of Fort Lupton, City of Greeley, City of Lafayette, Little Thompson Water District, City of Longmont, City of Louisville, City of Loveland, Platte River Power Authority, and the Town of Superior. In addition, the project seeks to firm the water supply for the Middle Park Water Conservancy District (MPWCD), which is a wholesale water supplier that allocates Windy Gap water to about 67 water providers, including towns, water districts, agricultural water suppliers, consumers,



**Existing Windy Gap Reservoir, Grand County, Colorado**

and ski areas in Grand and Summit counties on the West Slope. WGFP Participants determined that a cooperative project was the most efficient means to firm Windy Gap water deliveries rather than each entity developing storage for its own share of Windy Gap water.

## **COOPERATING AGENCIES**

In addition to Reclamation (the lead agency), the U.S. Army Corps of Engineers (Corps), Western Area Power Administration (Western), and Grand County are cooperating agencies. The Corps has regulatory authority under the Clean Water Act for actions that require the placement of dredge or fill material in a water of the United States. Western is participating as a cooperating agency because it has jurisdiction over the transmission line that would be relocated if Chimney Hollow Reservoir is constructed. Western would need to acquire a new easement for the relocated line as well as construct, operate, and maintain the line. Western also has responsibilities for marketing additional power that may be generated as a result of the WGFP. Grand County has an interest in the project because Colorado River diversions and several alternative reservoir sites are located in the county.

## **REVISIONS SINCE THE DRAFT EIS**

The Draft EIS was released for public review in August 2008. Reclamation held two open house/public hearings during the comment period to give the public an opportunity to learn more about the alternatives and impacts, and to formally comment on the Draft EIS. Notice of the public hearings was included with the Federal Register notification; distribution of the Draft EIS; and publication in newspapers, Internet message boards and blogs, and by e-mail. The public hearings were held at the McKee Conference Center in Loveland, Colorado on October 7, 2008 and at the Inn at Silver Creek in the Town of Granby, Colorado on October 9, 2008.

The comment period on the Draft EIS ended on December 29, 2008. Reclamation received approximately 1,150 letters, comment forms, and recorded written and oral comments (including 714 form letters) on the proposed project from the public, businesses, environmental groups, and federal, state, and local agencies. In response to these comments and additional information available since completion of the Draft EIS, Reclamation has revised portions of the Final EIS. This includes additional analyses, incorporation of new information, and revision of the discussion for some resources to better define and explain potential impacts. Significant changes included in the Final EIS are summarized below with locations where more detailed information is available. In addition, Volume 2 of the Final EIS includes a response to the substantive comments received on the Draft EIS.

## **Change in Firming Storage Request**

The amount of firming storage requested by Platte River Power Authority (Platte River) and the City of Loveland (Loveland) changed after the modeling was completed for the Draft EIS. Platte River decreased their firming storage request by 1,000 AF from 13,000 AF to 12,000 AF and Loveland increased their firming storage request by 1,000 AF from 6,000 AF to 7,000 AF. The total firming storage requested by all



Participants (not including MPWCD) remains at 87,180 AF; however, 1,000 AF of storage has been shifted from Platte River to Loveland. Because there is no change in the total storage requested by the Participants, the effects of this change on model results including Windy Gap diversions and streamflow on the East and West slopes was negligible.

## **Mitigation**

Substantial effort has gone into developing mitigation measures to offset or reduce identified impacts from implementation of the WGFP. A major component of the new mitigation is contained in the *Fish and Wildlife Mitigation Plan* (FWMP) that was developed by the Subdistrict in cooperation with the Colorado Division of Parks and Wildlife (CDPW). The FWMP was adopted by the Colorado Wildlife Commission on June 9, 2011 and by the Colorado Water Conservation Board on July 13, 2011 (Appendix E). On October 6, 2011, Reclamation was notified by the State of Colorado that the FWMP incorporated into and made a part of this Final EIS, comprehensively addresses impacts to Colorado's fish and wildlife resource and is the official position of the State with regard to mitigation of impacts from this project. Key components of the FWMP and other mitigation measures are listed in the *Mitigation* section on page ES-24 and in Section 3.25 of the FEIS.

## **Colorado River Temperature Modeling**

Since completion of the Draft EIS, additional stream temperature data for the Colorado River became available, which allowed the development of a dynamic temperature model to better predict the effects of alternative actions on river temperature. Thus, the previous analysis using the QUAL2K model for temperature analysis was replaced by the results from the dynamic temperature model as discussed in *Surface Water Quality* (Section 3.8 of the Final EIS).

## **Granby Reservoir, Shadow Mountain Reservoir, and Grand Lake Nutrient Loading**

Nutrient loadings to Granby Reservoir, Shadow Mountain Reservoir, and Grand Lake (Three Lakes) were recalculated for the Final EIS after it was discovered that historic water quality data from an incorrect location on Willow Creek were used for the analysis upstream of Windy Gap Reservoir in the Draft EIS. Revised total nitrogen and phosphorus loadings to the Three Lakes are found in Tables 3-68, 3-69, and 3-70 of the Final EIS.

## **Recreation**

To clarify potential impacts to recreational rafting and kayaking on the Colorado River, the preferred flow ranges were simplified to indicate that the preferred flow range for boating in Big Gore Canyon is 850 to 1,250 cfs and that flows of 1,100 to 2,200 cfs are preferred for the Pumphouse Reach. An analysis of a change in frequency of flows in these ranges is found in *Recreation* (Section 3.19.2 of the Final EIS). The socioeconomic effect of the revised impact analysis for recreational boating is found in *Socioeconomics* (Section 3.22.2.4 of the Final EIS).

## **Aquatic Resources**

The discussion of aquatic resources was revised with new tables and graphics to better illustrate modeled changes in rainbow trout and brown trout habitat associated with projected changes in streamflow. New tables and figures are in *Aquatic Resources* (Section 3.9.2 of the Final EIS).

## **Reasonably Foreseeable Future Actions**

Since completion of the Draft EIS, additional information or new actions were identified that are likely to occur in the future and would contribute to cumulative effects as described below:

**Climate Change.** Climate change is an evolving science and while it is still difficult to predict the specific impacts of climate change on the Proposed Action, new information on the latest potential changes in temperature, precipitation, and runoff for the upper Colorado River basin was added to the Final EIS as described in Section 2.8.2 of the Final EIS. The effects associated with climate change are discussed in the cumulative effects section for relevant resources including *Surface Water Hydrology*, *Stream Morphology*, *Surface Water Quality*, and *Aquatic Resources*.

**10825 Project.** This project would permanently supply 10,825 AF of water per year during the late summer months to assist with the recovery of endangered fish in the “15-Mile Reach” of the Colorado River near Grand Junction per the Upper Colorado River Endangered Fish Recovery Program. The proposed project includes release of 5,412.5 AF of water from Granby Reservoir to the Colorado River each year during the late summer and fall. This action was considered in the evaluation of impacts to stream temperature in the cumulative effects section of *Surface Water Quality* (Section 3.8.3.1 of the Final EIS).

**Windy Gap Firing Project and Moffat Collection System Project Fish and Wildlife Enhancement Plans.** In addition to the Fish and Wildlife Mitigation Plans developed by the Subdistrict as a component of mitigation for the WGFP and by Denver Water for the proposed Moffat Collection System Project (Moffat Project) pursuant to regulations implementing CRS 37-60-122.2(2), both the Subdistrict and Denver Water cooperatively developed separate enhancement plans to further improve existing fish and wildlife resources. These enhancement plans are intended to enhance fish and wildlife resources over and above the levels existing without the WGFP and Moffat Project and were endorsed by the Colorado Wildlife Commission on June 9, 2011 and by the Colorado Water Conservation Board on July 13, 2011. The cumulative effects of the enhancements are discussed in *Surface Water Quality* (Section 3.8.3.1) and *Aquatic Resources* (Section 3.9.3.1) in the Final EIS.

**Colorado River Cooperative Agreement.** As part of negotiations between West Slope parties and Denver Water, Grand County and Denver Water have reached a proposed agreement that addresses some of the issues related to Denver Water’s existing operations in Grand County. In the Proposed Colorado River Cooperative Agreement, Denver Water has committed to the Learning By Doing Cooperative Effort and additional resource commitments to provide environmental enhancements to benefit the aquatic environment in the Fraser, Williams Fork, and upper Colorado rivers. These commitments are contingent upon the issuance and acceptance by Denver Water of the permits necessary for construction of the Moffat Project.

## PROJECT NEED

Windy Gap Project water is currently diverted from the Colorado River just downstream of the confluence of the Colorado and Fraser rivers into the Windy Gap Reservoir (Figure ES-1). From the reservoir the water is pumped to Granby Reservoir for storage and conveyance through C-BT Project facilities and ultimate delivery to Windy Gap Project allottees on the East Slope. MPWCD's Windy Gap water is stored in Granby Reservoir and released to replace stream diversions or ground water use by contract holders at various locations in Grand and Summit counties.

The original Windy Gap Project was estimated to deliver about 48,000 acre-feet (AF) of firm annual deliveries to Windy Gap allottees and the MPWCD; however, Project Participants have not been able to rely on Windy Gap water for water deliveries for two primary reasons:

- In dry years, the Windy Gap Project has not been able to divert water because more senior water rights upstream and downstream have a higher priority to divert water and “call out” the more junior Windy Gap Project water right. In addition, the Windy Gap Project is required to bypass water to maintain certain minimum streamflows downstream of the Windy Gap diversion dam.
- Granby Reservoir, a component of the C-BT Project, is currently the only storage available for Windy Gap water prior to delivery to Participants. Water conveyed and stored for the C-BT Project has priority over water conveyed and stored for the Windy Gap Project. Thus in wet years, when the C-BT system is full, there is no conveyance or storage capacity for Windy Gap Project water. This prevents the Windy Gap Project from storing water in some wet years for use in subsequent dry years.

Because the Windy Gap Project is unable to provide reliable yields in both wet and dry years, the current firm yield is zero. Firm yield is typically defined as the amount of water that can be delivered on a reliable basis in all years and is typically determined by yield in dry years. For the Windy Gap Project, lack of available storage space in wet years also affects yield.

### Purpose and Need

The purpose of the Windy Gap Firing Project is to deliver a firm annual yield of about 30,000 AF of water from the existing Windy Gap Project to meet a portion of the water deliveries anticipated from the original Windy Gap Project and to provide up to 3,000 AF of storage to firm water deliveries for the Middle Park Water Conservancy District. Firm water deliveries from the Windy Gap Project are needed to meet a portion of the existing and future demands of the Project Participants.

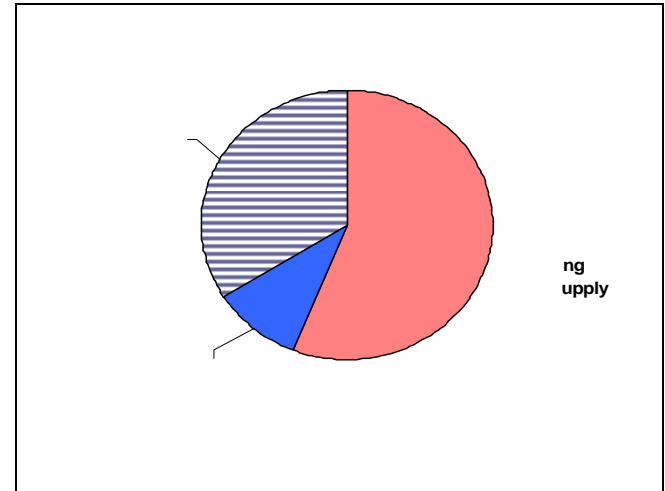
Figure ES-1. Windy Gap Reservoir facilities.



Participants in the proposed project have a need to firm Windy Gap water deliveries to meet existing and future water demands. In 2005, WGFP Participants had a firm water supply of about 141,000 AF and a demand of about 120,000 AF. Water demand for East Slope Participants is projected to increase to about 251,000 AF by 2050 and shortages in firm yield at that time would increase to more than 110,000 AF (Table ES-1). Water demand is projected to increase 17,000 AF by 2030 for Grand and Summit county water users partially served by the MPWCD. While water conservation is an important strategy used by all the Participants to improve the efficiency of water use, extend supplies, and reduce overall demand, conservation measures alone will not be sufficient to meet projected water demands.

The WGFP would collectively supply about 10 percent of the projected 2050 East Slope Participant water supply needs (Figure ES-2) and would contribute to meeting the future demands of Grand and Summit counties. The source for about 34 percent of future water supplies is still unknown. It is anticipated that some portion of this future supply will be realized by increased water conservation, but additional water supplies will still be needed.

**Figure ES-2. Summary of projected 2050 Participant water supply sources.**



**Table ES-1. WGFP Participant water supply, demand, and estimated shortage.**

Participant	Firm Supply from All Sources (2005)	Projected 2050 Water Demand	Estimated 2050 Water Shortage	Estimated Firm Yield under the Proposed Action**
Broomfield	13,739	24,400	10,661	5,600
Central Weld County Water District	2,786	5,900	3,114	93
Erie	2,145	8,900	6,755	1,840
Evans	9,298	13,300	4,002	455
Fort Lupton	3,538	6,800	3,262	265
Greeley	43,850	78,500	34,650	2,230
Lafayette	4,534	8,600	4,066	610
Longmont	30,963	42,300	11,337	4,515
Louisville	5,063	6,900	1,837	825
Loveland	17,792	28,300	10,508	2,075
Little Thompson Water District	5,510	19,100	13,590	1,200
MPWCD	NA	*	NA	429
Platte River Power Authority	0	5,150	5,150	5,050
Superior	1,544	3,300	1,756	1,380
TOTAL	140,762	251,450	110,688	26,567

\*Grand and Summit counties project an increase in water demand of 17,000 AF by 2030, with a total build-out demand of about 32,000 AF.

\*\*Values rounded.

## ALTERNATIVES

Following extensive screening of more than 170 different alternatives using National Environmental Policy Act (NEPA) criteria and Clean Water Act Section 404(b)(1) guidelines, in cooperation with the Corps, five alternatives were included for evaluation in the EIS. The No Action Alternative and four action alternatives are described below.

- **Alternative 1 (No Action):** Continuation of operations under existing agreements between Reclamation and the Subdistrict for conveyance of Windy Gap water through C-BT facilities and the enlargement of Ralph Price Reservoir by the City of Longmont.
- **Alternative 2 (Proposed Action):** Chimney Hollow Reservoir (90,000 AF) with prepositioning.
- **Alternative 3:** Chimney Hollow Reservoir (70,000 AF) and Jasper East Reservoir (20,000 AF).
- **Alternative 4:** Chimney Hollow Reservoir (70,000 AF) and Rockwell/Mueller Creek Reservoir (20,000 AF).
- **Alternative 5:** Dry Creek Reservoir (60,000 AF) and Rockwell/Mueller Creek Reservoir (30,000 AF).

The Municipal Subdistrict's Proposed Action is to construct a new 90,000 AF Chimney Hollow Reservoir on the East Slope near Carter Lake and to allow the storage of C-BT Project water in the new reservoir to improve Windy Gap yield.

Alternative 2, construction of Chimney Hollow Reservoir with prepositioning, along with associated operational changes developed as part of mitigation, is the Bureau of Reclamation's preferred alternative.

### Alternative 1 (No Action)

The No Action Alternative defines what Participants would do if Reclamation does not approve a new connection of WGFP facilities to C-BT facilities as required for the action alternatives. Under this alternative, Participants would maximize delivery of Windy Gap water according to their demand, water rights, availability of storage in Granby Reservoir, and existing Adams Tunnel conveyance constraints. The City of Longmont would evaluate the enlargement of Ralph Price Reservoir by raising the dam and increasing storage capacity by 13,000 AF (Figure ES-3). Participants that do not have a currently defined storage option would take delivery of Windy Gap water whenever it is available within the capacity of their existing water systems and delivery points under the terms of the existing contract between Reclamation and the Subdistrict. Windy Gap diversions will increase in the future regardless of whether one of the action alternatives is implemented because of increased demand.

### Alternative 2 (Proposed Action)

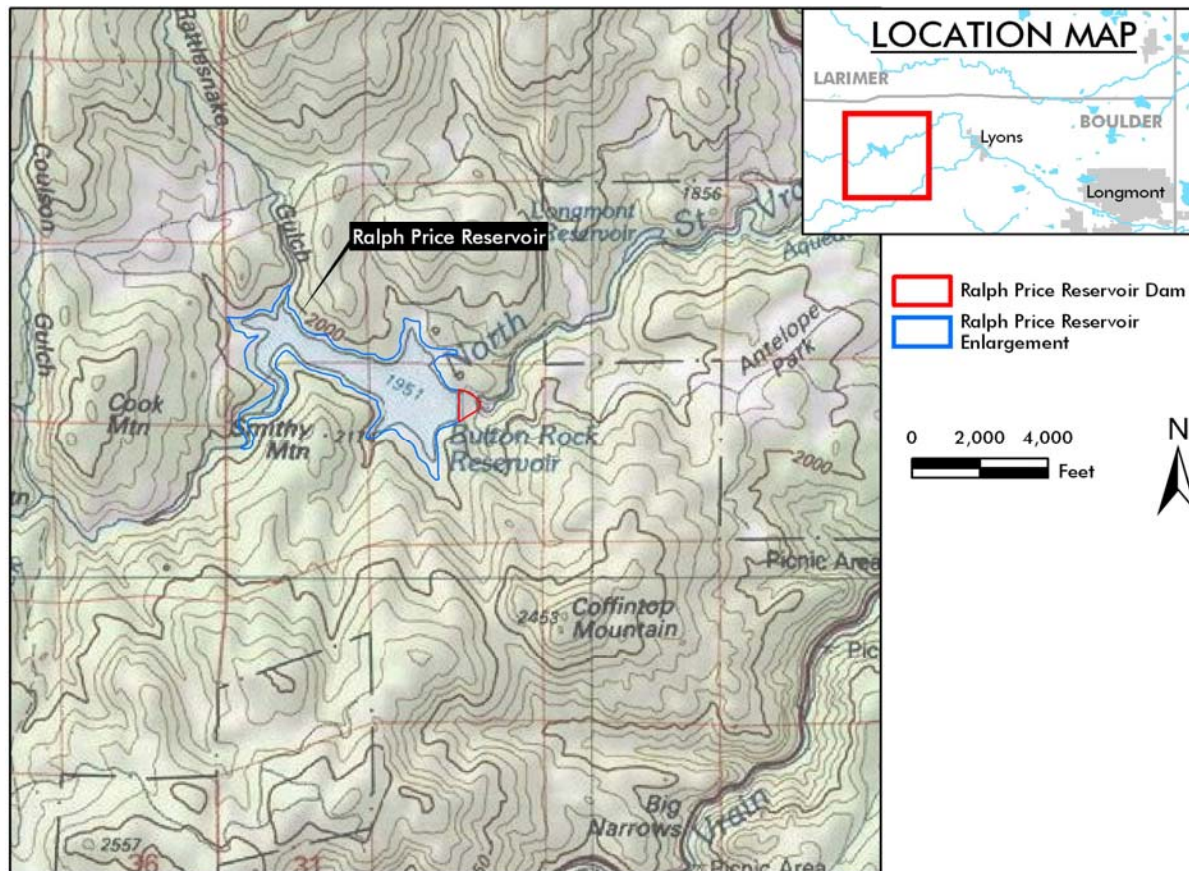
The Proposed Action includes construction of a 90,000 AF Chimney Hollow Reservoir, along with the ability to store, or preposition, C-BT water in the new reservoir (Figure ES-4). Water would be conveyed to Chimney Hollow Reservoir via a new pipeline connection to existing East Slope C-BT facilities.



Chimney Hollow Reservoir Site



**Figure ES-3. Ralph Price Reservoir enlargement under the No Action Alternative.**



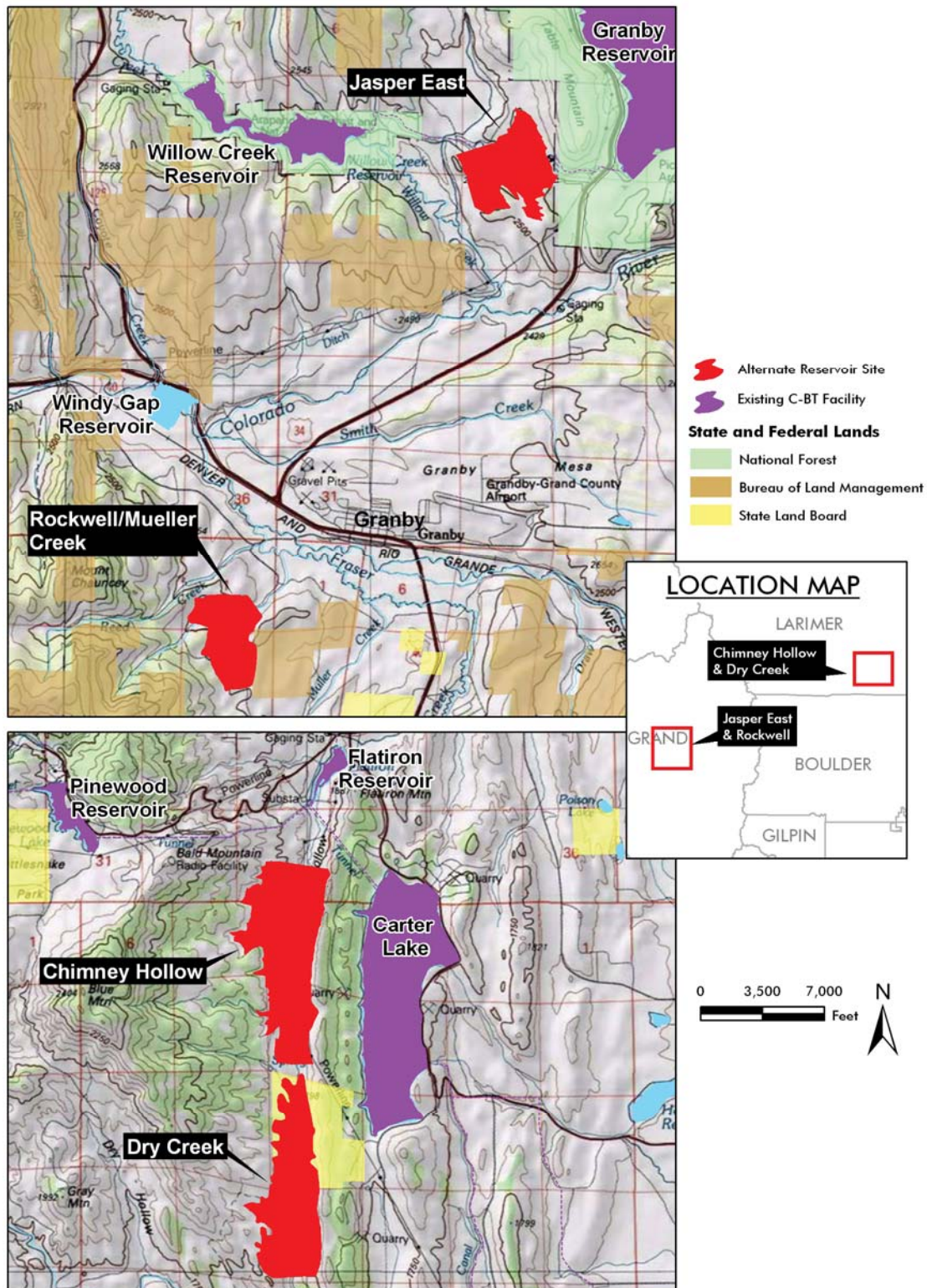
New connections between Chimney Hollow Reservoir and Carter Lake would allow delivery of water to Participants using existing infrastructure. No new West Slope infrastructure would be needed to divert or convey water to the East Slope.

Prepositioning would involve the use of available Adams Tunnel capacity to deliver C-BT water into Chimney Hollow Reservoir to occupy storage space that is not occupied by Windy Gap water. The delivery of C-BT water from Granby Reservoir into Chimney Hollow Reservoir would create space for Windy Gap water in Granby Reservoir. When Windy Gap water is diverted into Granby Reservoir, the C-BT water in Chimney Hollow Reservoir would be exchanged for a like amount of Windy Gap water in Granby Reservoir. Total allowable C-BT storage would not change and the existing C-BT diversions would not be expanded. If operated in this manner, Chimney Hollow Reservoir would be nearly full most of the time.

### **Alternative 3**

Alternative 3 is a combination of a 70,000 AF Chimney Hollow Reservoir on the East Slope and a 20,000 AF Jasper East Reservoir on the West Slope (Figure ES-4). A new 1-mile-long pipeline would connect Jasper East Reservoir to the existing Windy Gap pipeline that delivers water to Granby Reservoir. The Willow Creek Pump Station, forebay, and portions of the canal and pipeline would be relocated. The availability of a

Figure ES-4. Alternative new reservoir sites.





new West Slope reservoir would allow water diversions from the existing Windy Gap Reservoir to be delivered to either Jasper East Reservoir or Granby Reservoir. Thus, when Granby Reservoir is full or the Adams Tunnel is at capacity, Windy Gap water would be diverted and stored in Jasper East Reservoir until there is sufficient capacity to transfer water to Chimney Hollow Reservoir.

#### **Alternative 4**

Alternative 4 is a combination of a 70,000 AF Chimney Hollow Reservoir on the East Slope and a 20,000 AF Rockwell/Mueller Creek Reservoir (Rockwell Reservoir) on the West Slope (Figure ES-4). Deliveries to and from Rockwell Reservoir would require a new connection to the existing Windy Gap pump station and a new 3.3-mile-long pipeline to Rockwell Reservoir. As with the Jasper East Reservoir site, the availability of a new West Slope reservoir would allow water diversions from the existing Windy Gap Reservoir to be delivered to either Rockwell Reservoir or Granby Reservoir. When Granby Reservoir is full or the Adams Tunnel is at capacity, Windy Gap water would be diverted and stored in Rockwell Reservoir until there is sufficient capacity to transfer water to Chimney Hollow Reservoir.

#### **Alternative 5**

Alternative 5 is a combination of a 60,000 AF Dry Creek Reservoir on the East Slope and a 30,000 AF Rockwell Reservoir on the West Slope (Figure ES-4). Water deliveries to and from Rockwell Reservoir would require a new pipeline and connection to the existing Windy Gap pump station. A new 3.4-mile-long pipeline connection to C-BT facilities would convey Windy Gap water to Dry Creek Reservoir. A new 2.1-mile-long pipeline also would be needed to deliver water from Dry Creek Reservoir to Carter Lake. As with Alternatives 3 and 4, the availability of a new West Slope reservoir would allow water diversions from the existing Windy Gap Reservoir to be delivered to either Rockwell Reservoir or Granby Reservoir. When Granby Reservoir is full or the Adams Tunnel is at capacity, Windy Gap water would be diverted and stored in Rockwell Reservoir until there is sufficient capacity to transfer water to Dry Creek Reservoir.

### **ENVIRONMENTAL EFFECTS**

The WGFP would result in environmental effects to a number of resources. The effects of all of the action alternatives related to increased water diversions would be similar because similar amounts of water would be diverted from the Colorado River. The No Action Alternative would result in similar, but smaller, effects because Windy Gap diversions would increase in the future with a higher water demand even though the enlargement of Ralph Price Reservoir would only increase storage for Windy Gap water by 13,000 AF. This summary focuses on those resources with the greatest potential impacts. Effects on ground water, geology, soils, air quality, noise, cultural resources, and visual quality are expected to be minimal and are not discussed in this summary. However, impacts to these resources are discussed in detail in the Final EIS. The following sections summarize the effects to key resources of concern. It should be noted that the effects presented in the following sections are based on an analysis of the alternatives without any mitigation. Proposed mitigation, which is discussed at the end of this summary, would reduce the effects in many cases.

## Surface Water Hydrology

The WGFP would result in increased diversions and reduced flows in the Colorado River below Windy Gap Reservoir. In many years, the flows would be unchanged, but in wetter years, diversions would increase, with a corresponding decrease in Colorado River flows. Estimated average annual flow changes based on hydrologic modeling are described below.

- Windy Gap diversions would increase about 7,000 AF per year on average from existing conditions under the No Action Alternative compared to an increase of about 9,500 AF for the Proposed Action, and an increase of 12,000 AF for the other alternatives (Table ES-2).

**Table ES-2. Average annual changes in Colorado River flow and diversions by alternative.**

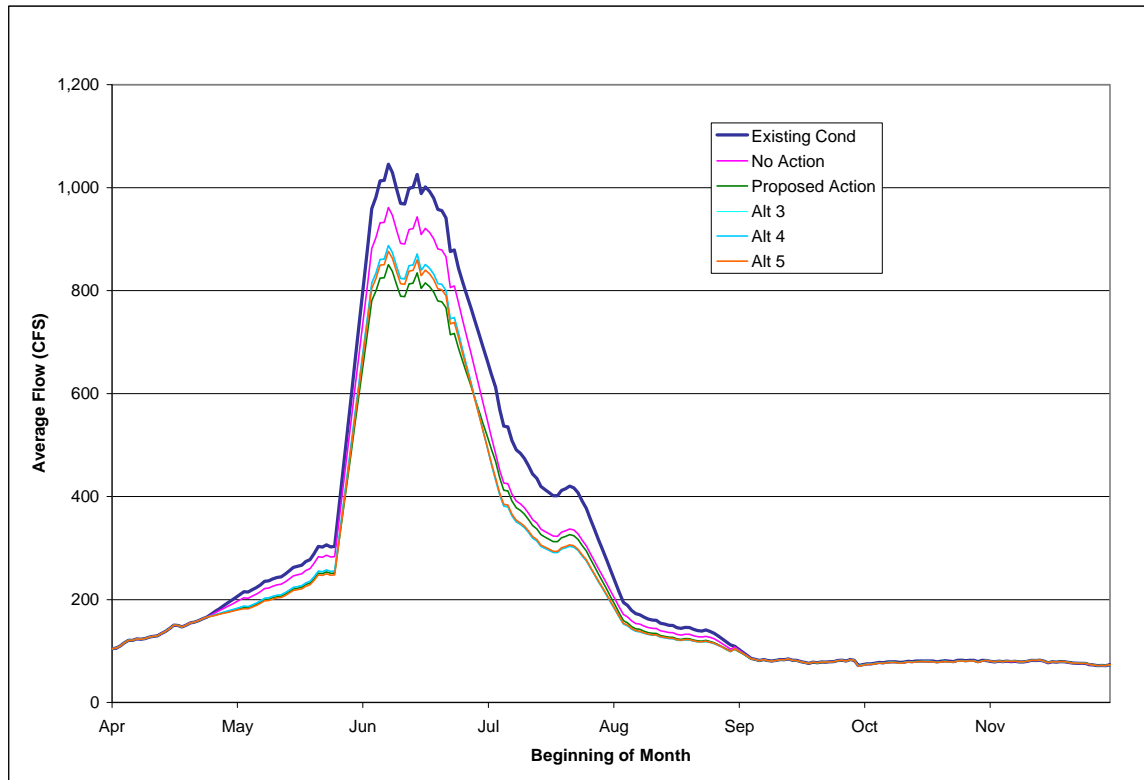
Alternative	Colorado River below Granby Reservoir		Windy Gap Diversions		Colorado River below Windy Gap		Colorado River below Kremmling	
	AF	%	AF	%	AF	%	AF	%
Existing Conditions	59,385	—	36,532	—	151,358	—	701,801	—
Alt 1 – No Action	55,345	-7	43,573	+19	138,914	-8	689,357	-2
Alt 2 – Proposed Action	50,220	-15	46,084	+26	130,075	-14	680,512	-3
Alt 3	52,071	-12	48,052	+32	130,370	-14	680,807	-3
Alt 4	52,091	-12	47,997	+31	130,453	-14	680,890	-3
Alt 5	51,903	-13	48,483	+33	129,681	-14	680,118	-3

- Colorado River average annual flow below Granby Reservoir would decrease about 7 percent (4,000 AF) under the No Action Alternative, 15 percent (9,000 AF) under the Proposed Action, and 12 to 13 percent for the other alternatives as a result of the availability of additional Windy Gap storage and fewer reservoir spills (Table ES-2). This effect would occur primarily during spill years, when flows are higher than normal.
- Colorado River average annual flow below the Windy Gap Reservoir would decrease by 8 percent (12,000 AF) under the No Action Alternative compared to a 14 percent (21,000 AF) decrease for the action alternatives (Table ES-2). The majority of WGFP diversions would occur in May and June, but in some years, diversion would occur between April and August (Figure ES-5). Although WGFP diversions in July are generally lower than May and June, the greatest percentage reduction in Colorado River flows would occur in July. Average monthly flow reductions up to 20 percent for the No Action Alternative, 23 percent for the Proposed Action, and 28 percent for Alternatives 3 to 5 are predicted for July. In wet years, WGFP diversions as a percent of existing flow would be greater. In dry years, there would be no change in flow from existing conditions.
- Colorado River average annual streamflow reductions below the confluence with the Blue River would be about 2 percent (12,000 AF) under the No Action Alternative and 3 percent (21,000 AF) for the action alternatives (Table ES-2).
- Average annual Willow Creek streamflow below Willow Creek Reservoir would decrease by 7 percent (1,400 AF) under the No Action Alternative, 14 percent (2,600 AF) for the Proposed Action, and 12 percent (2,200 AF) for the other alternatives due to changes in Willow Creek Feeder Canal



deliveries to Granby Reservoir. This effect would occur primarily during spill years, when flows are higher than normal.

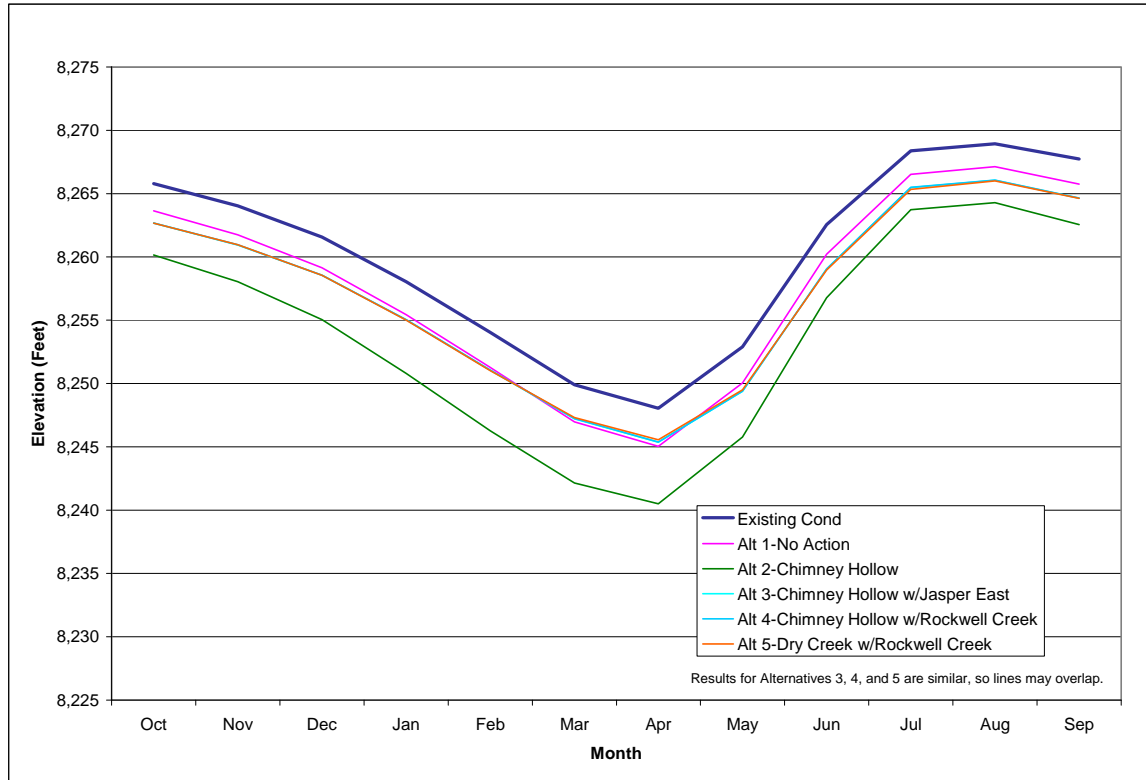
**Figure ES-5. Average daily flow in the Colorado River below Windy Gap Reservoir by alternative.**



- Big Thompson River flows below Lake Estes would increase about 1 percent (450 AF) on average under the No Action Alternative compared to a 5 percent increase (3,200 AF) for the Proposed Action, and less than a 2 percent increase (1,000 AF) for the other alternatives as a result of the additional Windy Gap water imports and lower diversions for power generation in the C-BT system.
- Streamflow below Participant wastewater treatment plants (WWTPs) would increase from the discharge of Windy Gap return flows to the Big Thompson River, St. Vrain Creek, Big Dry Creek, and Coal Creek.
- Water levels in Grand Lake or Shadow Mountain Reservoir would not change under any of the alternatives.
- Granby Reservoir average monthly water levels would decrease from 2 to 3 feet under the No Action Alternative, 5 to 8 feet under the Proposed Action, and 3 to 4 feet under the other alternatives (Figure ES-6). A series of dry years could lower water levels up to 23 feet under the Proposed Action. Mitigation Measure #3 at the end of this section would address this impact.
- Water levels in Carter Lake would decrease less than 1 foot under all of the alternatives.
- Average monthly water levels in Horsetooth Reservoir would not change under the No Action Alternative, but would decrease 2 to 6 feet under the Proposed Action and would decrease 0 to 2 feet

under the other action alternatives. Mitigation Measure #3 at the end of this section would address this impact.

**Figure ES-6. Granby Reservoir estimated average monthly surface elevation by alternative.**



- Windy Gap firm yield would increase from zero under existing conditions to about 26,000 AF under the Proposed Action and other action alternatives (Table ES-3). Firm yield under the No Action Alternative would be about 1,200 AF, which does not meet the applicant's purpose and need.

### Stream Morphology and Floodplains

Stream morphology refers to the form and structure of a stream, including its channel, banks, floodplain and drainage area, which could be altered as a result of changes in flow. The upper Colorado River is a morphologically stable stream and the changes in flow predicted from the WGFP are not expected to substantially affect stream morphology or sediment transport and deposition in the Colorado River below Windy Gap Reservoir.

**Table ES-3. Windy Gap Firing Project firm yield.**

Condition/Alternative	Firm Yield (AF)
Existing Conditions	0
Alt. 1 – No Action	1,229
Alt. 2 – Proposed Action	26,559
Alt. 3	25,849
Alt. 4	25,849
Alt. 5	26,629

Channel maintenance flows are considered necessary to maintain the physical characteristics of a stream channel and are critical to ensuring unimpaired flow and sediment conveyance. A range of channel maintenance flows provide the benefits of conveying water and eroded materials from tributaries without aggradation or degradation, preventing vegetation encroachment and narrowing of the channel, sustaining aquatic ecosystems, temporarily storing flood flows on the floodplain, and maintaining healthy streambank and floodplain vegetation. The range of channel maintenance flows is generally defined as bankfull discharge, which is the peak flow that occurs every 1.5 to 2 years, to higher flows that occur about every 25 years. The lower limit is the flow rate at which coarse sediment transport begins and the upper limit is the flow above which valley rather than channel maintenance occurs and when property damage may occur.

- Under all alternatives, the percentage of years that channel maintenance flows occur on the Colorado River at the Hot Sulphur Springs gage below the Windy Gap diversion would be less than under existing conditions. The decrease in channel maintenance flows is predicted to range from 4 percent less years for 2- to 5-year flows up to a 13 percent decrease for 5- to 10-year flows. The duration of channel maintenance flows would decrease by 2 to 4 days for the lower range of such flows (510 to 1,240 cfs) and increase by 1 to 3 days for greater flows. The projected reduction in the frequency of peak discharges and channel maintenance flows is unlikely to substantially affect stream morphology or change sediment transport or deposition.
- Flushing flows in the Colorado River equal to or greater than 450 cfs, which occur about 28 days per year on average under existing conditions, would decrease to 23 days per year under the No Action Alternative, and 20 to 21 days under the Proposed Action and the other alternatives. The reduction in the frequency of flushing flows would remain adequate to transport sediment and prevent deposition. Mitigation Measure #2 at the end of this section would address this impact.
- Increased flows in East Slope streams below the Participants WWTPs would have minimal effect on stream morphology.
- The potential for flooding along the Colorado River and Willow Creek would decrease and the potential for flooding along East Slope streams below the Participants WWTPs would increase slightly.

## **Surface Water Quality**

Water quality impacts from the WGFP would occur as a result of changes in Colorado River flow below Granby Reservoir; in Willow Creek below Willow Creek Reservoir; and in several East Slope streams, including the Big Thompson River, St. Vrain Creek, North St. Vrain Creek, Coal Creek, Big Dry Creek, and the Cache la Poudre River. Potential effects to water quality also were evaluated for the Three Lakes system (Granby Reservoir, Shadow Mountain Reservoir, and Grand Lake), Carter Lake, and Horsetooth Reservoir, as well as the predicted water quality for new reservoirs. Stream and reservoir water quality models were used to estimate the following water quality effects.

- Dynamic temperature modeling indicates that the chronic maximum weekly average temperature (MWAT) standard, and occasionally the acute daily maximum (DM) temperature standard, would be exceeded more frequently than existing conditions under all of the alternatives in the 24-mile reach of the Colorado River below Windy Gap Reservoir to the confluence with the Williams Fork. Mitigation Measure #1 at the end of this section would address these impacts.

- Ammonia and inorganic phosphorus concentrations in the Colorado River are predicted to increase and dissolved oxygen (DO) concentrations decrease under all alternatives. Water quality standards would not be exceeded under average flow conditions, but when Windy Gap diversions reduce flow to the 90 cfs minimum flow, the DO concentration is predicted to be less than the spawning standard for a few miles upstream of the Williams Fork, although this would occur outside of the spawning season. Mitigation Measure #4 at the end of this section would address this impact.
- Ammonia and some metal concentrations in Willow Creek would increase slightly for all alternatives, but water quality standards are not expected to be exceeded. Mitigation Measure #4 at the end of this section would address this impact.
- **Granby Reservoir:** Total phosphorus concentrations are predicted to increase under all alternatives and total nitrogen concentrations would increase under the No Action Alternative and Proposed Action (Table ES-4). Alternatives 3 to 5 would have lower nitrogen levels due to the effects of storage in a West Slope Reservoir prior to delivery to Granby Reservoir. Chlorophyll *a* concentrations (algae) are predicted to increase under the Proposed Action, but there would be no change in water clarity as measured by the Secchi-disk depth for any of the alternatives. Mitigation Measures #4 and #7 at the end of this section would address these impacts.

**Table ES-4. Granby Reservoir predicted water quality changes (on an average annual basis) by alternative compared to existing conditions.**

Parameter	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4	Alternative 5
Total phosphorus (µg/L)	+6.3%	+12.7%	+4.0%	+3.2%	+1.6%
Total nitrogen (µg/L)	+0.3%	+0.7%	-2.1%	-2.8%	-3.5%
Chlorophyll <i>a</i> (µg/L)	No Change	+2.4%	No Change	No Change	No Change
Peak chlorophyll <i>a</i> (µg/L)	No Change	-1.5%	No Change	No Change	No Change
Secchi-disk depth (m)	No Change	No Change	No Change	No Change	No Change
Trophic state	No Change	No Change	No Change	No Change	No Change
Minimum DO (mg/L)	-2.2%	-4.4%	No Change	No Change	No Change
TSS (mg/L)	No Change	+4.3%	+4.3%	+4.3%	+4.3%

- **Shadow Mountain Reservoir:** All alternatives would increase phosphorus concentrations and total nitrogen would increase in Alternatives 1 to 3 and decrease in Alternatives 4 and 5 (Table ES-5). Chlorophyll *a* concentrations would increase in Alternatives 1 to 3. Water clarity would not change in any alternative. Dissolved oxygen would decrease under the Proposed Action and would not change in other alternatives. Mitigation Measures #4 and #7 at the end of this section would address these impacts.



**Table ES-5. Shadow Mountain Reservoir predicted water quality changes (on an average annual basis) by alternative compared to existing conditions.**

Parameter	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4	Alternative 5
Total phosphorus (µg/L)	+5.6%	+11.3%	+8.1%	+4.8%	+3.2%
Total nitrogen (µg/L)	+1.1%	+1.8%	+0.4%	-0.7%	-1.1%
Chlorophyll <i>a</i> (µg/L)	+1.8%	+1.8%	+1.8%	No Change	No Change
Peak chlorophyll <i>a</i> (µg/L)	+3.4%	+6.8%	+1.1%	No Change	-1.1%
Secchi-disk depth (m)	No Change	No Change	No Change	No Change	No Change
Trophic state	No Change	No Change	No Change	No Change	No Change
Minimum DO (mg/L)	No Change	-1.4%	No Change	No Change	No Change
TSS (mg/L)	+5.0%	+5.0%	+5.0%	+5.0%	+5.0%

- **Grand Lake:** Total phosphorus concentrations are predicted to increase under all alternatives (Table ES-6) and total nitrogen is predicted to increase under the No Action Alternative and Proposed Action. Chlorophyll *a* concentrations would increase under all alternatives and Secchi-disk depth would decrease under all alternatives except Alternative 5. Dissolved oxygen concentrations would decrease under all alternatives. Mitigation Measures #4 and #7 at the end of this section would address these impacts.

**Table ES-6. Grand Lake predicted water quality changes (on an average annual basis) by alternative compared to existing conditions.**

Parameter	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4	Alternative 5
Total phosphorus (µg/L)	+6.0%	+12.0%	+6.0%	+6.0%	+4.8%
Total nitrogen (µg/L)	+0.4%	+1.6%	-0.4%	-0.4%	-0.8%
Chlorophyll <i>a</i> (µg/L)	+4.2%	+6.1%	+4.2%	+2.0%	+2.0%
Peak chlorophyll <i>a</i> (µg/L)	+4.1%	+5.4%	+1.4%	+1.4%	No Change
Secchi-disk depth (m)	-3.8%	-3.8%	-3.8%	-3.8%	No Change
Trophic state	No Change	No Change	No Change	No Change	No Change
Minimum DO (mg/L)	-11.1%	-7.4%	-5.6%	-5.6%	-5.6%
TSS (mg/L)	No Change	+5.6%	+5.6%	+5.6%	No Change

- No additional water quality standards would be exceeded at the Three Lakes. Lower DO levels would contribute to continued exceedance of the manganese standard in the Three Lakes.
- Ammonia concentrations in St. Vrain Creek, Big Dry Creek, and Coal Creek would increase under all of the alternatives. The potential for exceedance of the water quality standard is possible for some locations.
- In Carter Lake and Horsetooth Reservoir, total phosphorus, total nitrogen, and chlorophyll *a* concentrations would increase, and DO concentrations would decrease. Lower DO concentrations in Horsetooth Reservoir would contribute to continued exceedance of the manganese standard. Mitigation Measure #4 at the end of this section would address these impacts.

## Aquatic Resources

The assessment of effects to fish habitat along the Colorado River was modeled following the concepts of the Instream Flow Incremental Methodology (IFIM). This approach combines stream hydraulics, habitat use criteria, and hydrology to predict fish habitat as a function of streamflow. Fish community and fish populations were assessed based on changes in physical habitat, as well as projected water quality changes within those systems in rivers and reservoirs. The changes were compared to the existing conditions to determine if there would be factors that affect fish populations at the acute or chronic level. Major effects are summarized below:

- Aquatic habitat modeling of the Colorado River for the alternatives indicate the greatest decrease in fish habitat would occur from Windy Gap Reservoir downstream to the Williams Fork. Reductions in fish habitat are generally greatest in July and August. Adult rainbow trout habitat would decrease up to 34 percent in August, while adult brown trout habitat would decrease less than 8 percent. The hydrologic model indicates WGFP diversions of more than 100 AF in August would increase from 6 times in the 47-year hydrologic modeling period to 15 times. Actual WGFP pumping in August is likely to be less because a new reservoir(s) would typically be close to full in years when the WGFP diversions are in priority in August and the cost of pumping is high for the limited available water. WGFP diversions in June often results in an increase in fish habitat by lowering high flows. Adult rainbow trout habitat increases by approximately 20 percent in average years downstream of Windy Gap Reservoir.
- In the Colorado River below the Williams Fork, decrease in rainbow or brown trout habitat for juveniles or adults would be less than 15 percent.
- No adverse impacts to spring spawning rainbow trout or fall spawning brown trout are predicted for any of the alternatives.
- The predicted flow regime in the Colorado River as a result of the No Action Alternative and action alternatives would still include the components for stream health, but at lower levels than existing conditions.
- Projected increases in the exceedance of the aquatic life chronic and acute stream temperature standards for the Colorado River under all alternatives would increase the stress on fish populations, although predicted exceedances as a result of the WGFP would occur only in about 4 out of 15 years, assuming very warm July and August air temperatures. Increased stream temperature, particularly the acute daily maximum temperatures, has the greatest potential for affecting trout species in the Colorado River between Windy Gap Reservoir and the Williams Fork. Mitigation Measure #1 at the end of this section would address this impact.
- The amount and frequency of available habitat for adult brown trout in Willow Creek would decrease up to 25 percent under the action alternatives.
- Lower water levels and predicted changes in water quality in Granby Reservoir, Carter Lake, and Horsetooth Reservoir are unlikely to impact fish because lake productivity is expected to remain within the range observed under existing conditions. No change in fish population dynamics are expected from changes in the physical environment at Grand Lake, Shadow Mountain Reservoir, Granby Reservoir, Carter Lake, or Horsetooth Reservoir.
- Increased East Slope streamflows would slightly enhance fish habitat in the Big Thompson River, St. Vrain Creek, Big Dry Creek, and Coal Creek.

- Flow changes in North St. Vrain Creek under the No Action Alternative would affect fish habitat both positively and negatively depending on storage and release from Ralph Price Reservoir.

## Vegetation and Wetlands

Permanent effects to vegetation and wetland resources would occur in areas that would be inundated by a reservoir or located within the footprint of dams, roads, relocated transmission line, or other facilities.

Temporary effects to vegetation and wetlands from construction of pipelines, staging areas, and other short-term disturbances would be revegetated following construction.

- The enlargement of Ralph Price Reservoir under the No Action Alternative would result in a loss of about 77 acres of forest vegetation. Construction of Chimney Hollow Reservoir would permanently impact about 790 acres of shrublands, grasslands, and forest vegetation. The other alternatives would impact about 1,000 to 1,100 acres of mixed vegetation types.
- All of the alternatives would result in permanent and temporary impacts to wetlands and other waters (Table ES-7). Of the action alternatives, the Proposed Action would have the least impact to wetlands and waters. Mitigation Measure #8 at the end of this section would address this impact.

**Table ES-7. Summary of effects to wetlands and other waters by alternative.**

Wetlands and Other Waters	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4*	Alternative 5*
	Acres				
Permanent	0.4	2.9	30.3	9.4 – 20.0	15.7 – 28.3
Temporary	—	0.2	5.2	3.9 – 6.9	4.3 – 7.3
TOTAL	0.4	3.1	35.5	13.3 – 26.9	20.0 – 35.6

\*The range in wetland impacts is due to uncertainty about the wetlands present at the Rockwell/Mueller Creek Reservoir site. Access to this site for field survey was denied by the landowners.

## Wildlife

The potential effects on wildlife resources were assessed using information on known populations or suitable habitat. Permanent impacts to wildlife habitat could occur in areas that would be inundated or permanently disturbed by project features such as the dam, access roads, and pump stations. Temporary impacts to habitat from pipelines and staging areas would be reclaimed following construction. Effects to waterbirds and aquatic and riverine mammals from changes in hydrology were based on potential effects to riparian vegetation.

- Enlargement of Ralph Price Reservoir would result in the loss of 77 acres of elk and mule deer winter range and habitat for other terrestrial wildlife species.
- Construction of Chimney Hollow Reservoir under the Proposed Action would result in the loss of 810 acres of elk winter range, mule deer winter range and concentration area, and black bear foraging area. A slightly smaller Chimney Hollow Reservoir under Alternatives 3 and 4 would impact similar habitats on about 675 acres. Habitat for migratory birds, northern leopard frog, common garter snake, and other species would be impacted at Chimney Hollow Reservoir. This impact is addressed in the FWMP, Appendix E.

- Construction of Jasper East Reservoir would impact about 480 acres of moose and mule deer summer range and 24 acres of elk winter range. Elk movement in the area could shift as a result of the new reservoir.
- Construction of Rockwell Reservoir would affect about 312 acres of summer range for moose and mule deer and 73 acres of elk winter range. About 300 acres of greater sage grouse habitat would be lost.
- Construction of Dry Creek Reservoir would result in the loss of about 650 acres of elk and mule deer winter range.

### **Threatened and Endangered Species**

Federally threatened and endangered species are protected under the Endangered Species Act. Potential direct and indirect effects to threatened or endangered species were evaluated for each alternative.

- All of the alternatives would result in depletions that affect Colorado River endangered fish downstream of the Windy Gap diversion. Reclamation reinitiated consultation with the U.S. Fish and Wildlife Service (Service) because the stream depletions associated with the Proposed Action would adversely impact bonytail chub, Colorado pikeminnow humpback chub, and razorback sucker. The Service issued a biological opinion on February 12, 2010 for the Preferred Alternative (Appendix D of the Final EIS). The biological opinion determined that the Windy Gap Project meets the criteria for coverage under the existing “Programmatic Biological Opinion” because a Recovery Agreement was previously signed by the Subdistrict in 2000. The Subdistrict would need to make a monetary contribution for water depletions to help fund their share of the costs of recovery actions as part of Mitigation Measure #5.
- Construction of Rockwell Reservoir would result in the loss of less than 10 acres of potential lynx habitat.

### **Land Use and Ownership**

Potential effects to existing land ownership were evaluated by overlaying proposed project facilities for each alternative on land ownership maps. Potential conflicts with local land use regulations were also evaluated for each of the alternative reservoir sites. Predicted construction traffic volumes and visitor estimates were used to evaluate short and long-term effects to local traffic.

- Enlargement of Ralph Price Reservoir would occur entirely on City of Longmont property. Traffic would increase on U.S. 36 and County Road 80 during construction.
- Construction of Chimney Hollow Reservoir would require acquisition or easements on private and Reclamation land, and relocation of 3.8 miles of Western’s transmission line. Traffic would increase on County Road 18E and County Road 31 during construction. Recreation traffic on County Road 18E would increase when the reservoir is complete to access Chimney Hollow open space, which would be managed by Larimer County.
- Construction of Jasper East Reservoir would require acquisition of Reclamation managed land and relocation of the Willow Creek Pump station and a portion of the canal (facilities that are part of the C-BT Project). County Road 40 to Willow Creek would need to be relocated and a right-of-way through private land would have to be obtained.



- Construction of Rockwell Reservoir would require acquisition of private land, including four residences. Bureau of Land Management property would also be affected and realignment of County Road 57 would be required. Traffic would increase on these county roads and U.S. 40 during construction.
- Private, state, and Reclamation-managed property would be affected by construction of Dry Creek Reservoir. Three private residences and a llama operation would be impacted. Traffic on County Road 31 would increase during construction.
- No elements associated with the construction of alternative reservoirs and facilities were identified that would directly conflict with local land use plans or other regulations. The review process in Larimer, Grand, and Boulder counties, to the extent applicable, would further evaluate the effects of the actions and any conditions for approval.

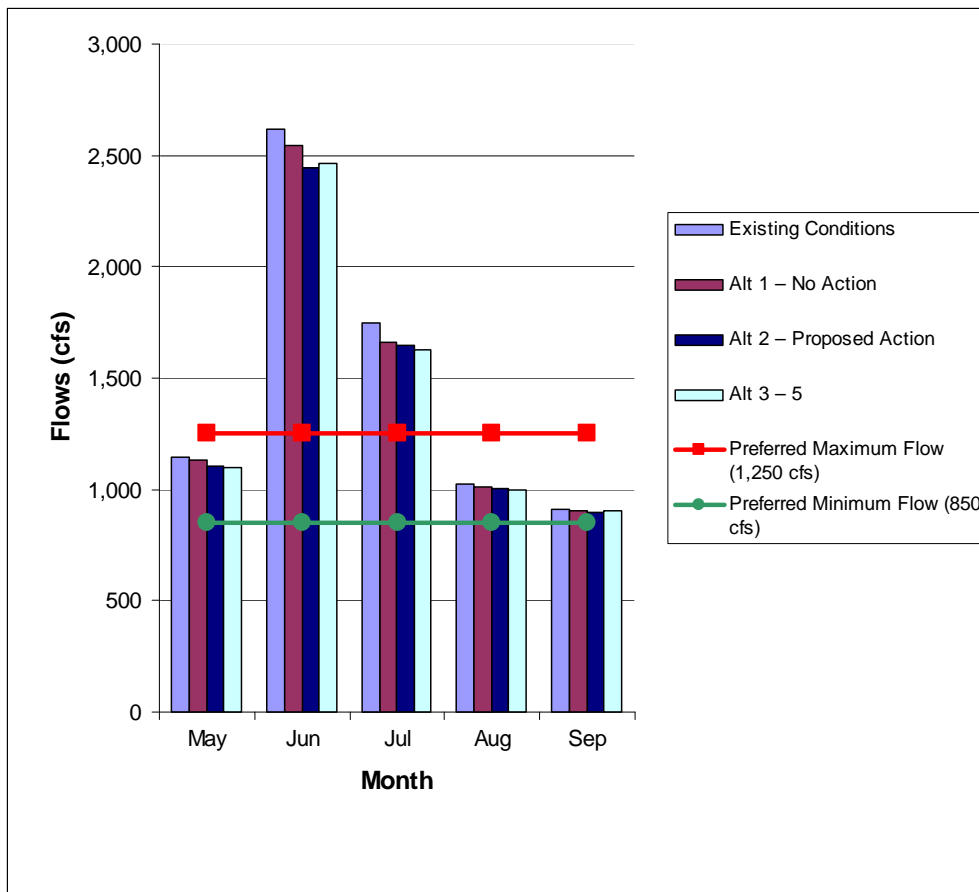
## Recreation

Potential recreation effects were based primarily on changes in hydrologic conditions at reservoirs and streams in the study area. Changes in preferred flows for rafting and kayaking in the Colorado River were used to evaluate the effect on river recreation. Potential effects to rafting and kayaking on the Colorado River were evaluated for Byers Canyon below Hot Sulphur Springs, and in the Big Gore Canyon and Pumphouse reaches of the Colorado River below Kremmling. Daily hydrologic data from 1950 to 1996 were used to estimate the change in the number of days when preferred rafting and kayaking flows would occur in those reaches of the river.

- There would be no change in the number of days that flows are above the preferred minimum kayaking flows in Byers Canyon (400 cfs) in 29 years of the 47-year study period. In the remaining 18 years, the No Action Alternative would result in 8 fewer days per year where flows were less than preferred, while the action alternatives would result in 12 fewer days.
- For Big Gore Canyon, there would be no change from existing conditions in the number of days that preferred rafting flows of 850 to 1,250 cfs occur for any of the alternatives in 37 years of the 47-year study period. Under the No Action Alternative and Proposed Action, there would be about 2.3 days per year, on average, with fewer preferred rafting flows during the 10 years when flows fall outside of the preferred range. The greatest decrease in the number of days with preferred flows for rafting in the driest year would be 11 days under all of the alternatives. Average monthly flows and preferred flows for rafting are shown in Figure ES-7. Mitigation Measure #6 at the end of this section would address this impact.
- The number of days preferred kayaking flows between 1,100 and 2,200 cfs occur in Big Gore Canyon and the Pumphouse reach would not change in 32 years of the 47-year study period for any of the alternatives. Over the 47-year study period, there would be about 1 more day of preferred kayaking flows under the No Action Alternative and Alternative 4 compared to existing conditions. The greatest change in the number of days with preferred kayaking flows in the driest year would be 15 days fewer under all of the alternatives, with an increase of up to 7 days with preferred kayaking flows under the No Action Alternative and 6 more days under the Proposed Action.
- No measurable effect to angler user days on the Colorado River or associated economic effects were identified for any of the alternatives.

- Granby Reservoir boat ramps would remain accessible in the summer under all alternatives, except in dry years when access to the Arapaho Bay boat ramp would be diminished due to lower water levels. Mitigation Measure #3 at the end of this section would address this impact.
- Kayaking opportunities in North St. Vrain Creek would be reduced in July under the No Action Alternative.
- Access to the South Bay-South boat ramp in Horsetooth Reservoir could be impacted under the Proposed Action in September and by all alternatives in dry years. Mitigation Measure #3 at the end of this section would help address this impact.
- The new Chimney Hollow Reservoir would provide nonmotorized boating, fishing, and hiking opportunities under Larimer County management, with 50,000 visitors estimated annually.
- No managing agency has been identified for other potential new reservoirs, but recreation development is possible if a managing entity is found.

**Figure ES-7. Average monthly streamflows on the Colorado River through Big Gore Canyon for rafting.**



## Socioeconomics

Socioeconomic effects evaluated include the cost of alternatives, impact of construction and operation on employment and spending, and the effects of hydrologic changes to recreation resources, such as boating and fishing.

- Enlargement of Ralph Price Reservoir under the No Action Alternative would cost about \$31 million (Table ES-8). The cost of the action alternatives in 2005 dollars, ranges from \$223 million for the Proposed Action to \$288 million for Alternative 5.

**Table ES-8. Project, direct labor, and operation and maintenance costs by alternative.**

Alternative	Total Project Costs	Direct Labor	Annual O&M Costs
	Millions of 2005 dollars		
Alternative 1 – No Action	\$31	\$8	No change
Alternative 2 – Proposed Action	\$223*	\$47	\$0.79
Alternative 3	\$240	\$49	\$1.37
Alternative 4	\$252	\$52	\$1.73
Alternative 5	\$288	\$60	\$2.24

\*Cost for Chimney Hollow Reservoir in 2007 dollars increased 17 percent to \$261 million.

- All of the alternatives would increase local and regional employment and construction-related spending.
- The alternatives would generate additional hydropower revenues ranging from \$850,000 for the No Action Alternative to \$1.4 million for Alternative 5. Western would use this energy to fill existing contracts entered into following original construction of the Windy Gap Project.
- Hydrologic changes that reduce or increase the number of days that preferred flows for boating in the Colorado River occur, could impact recreation-associated spending. Assuming a decrease in the number of days of preferred flows results in a total loss in recreation user days, the annualized cost or benefit to recreational boating based on changes in flow preferences over the 47-year study period is shown in Table ES-9.
- The economic effect for the worst-case individual year (based on the 47-year study period) when preferred flows would not be available, could result in a loss of about 429 visitor days for commercial rafting in Big Gore Canyon with a value of about \$31,000. In the Pumphouse reach, a maximum loss of 15 boating days in a single year under all of the alternatives would result in a loss of 6,705 visitor days with a value of \$492,750. This analysis makes the conservative assumption that no boating occurs when flows are outside of the preferred flow range.
- Some years would have an increase in boating days within the preferred ranges from WGFP diversions. This would result in 2,700 to 4,500 additional visitor days with a value of \$197,000 to \$329,000.

**Table ES-9. Annualized cost (-) or benefit (+) from recreational boating on the Colorado River by alternative.**

Alternative	Byers Canyon (Kayaking)	Big Gore Canyon (Rafting and Kayaking)	Pumphouse (Rafting and Kayaking)
Alt 1 – No Action	Minor	-\$2,423	-\$132,798
Alt 2 – Proposed Action	Minor	-\$3,392	-\$144,680
Alt 3 – 5	Minor	-\$3,756	-\$139,787

## CUMULATIVE EFFECTS

Several reasonably foreseeable actions are anticipated to occur regardless of the implementation of any of the action alternatives or the No Action Alternative. Reasonably foreseeable future actions, when combined with past and present actions and the alternatives evaluated in this Final EIS, may result in cumulative effects. Reasonably foreseeable effects were classified as either water-based or land-based actions that might have effects overlapping those of the WGFP.

### Water-based Reasonably Foreseeable Actions

- Denver Water Moffat Collection System Project
- Increased water use from population growth in Grand and Summit counties
- Reduction of Xcel Energy's Shoshone Power Plant call
- Elimination of releases from Williams Fork and Woford Mountain reservoirs to meet flow recommendations (10,825 AF of water) for endangered fish
- Increase in Woford Mountain Reservoir contract demand
- Expiration of Denver Water's contract with Big Lake Ditch in 2013
- Climatic change (not quantitatively assessed)
- Mountain pine beetle killed trees (not quantitatively assessed)
- 10825 Project with 5,412.5 AF releases from Granby Reservoir
- Subdistrict and Denver Water Fish and Wildlife Enhancement Plans
- Denver Water Colorado River Cooperative Agreement

### Land-based Reasonably Foreseeable Actions

- Various residential developments near new reservoir sites
- Western's replacement of the transmission line from the Granby Pumping Plant to the Windy Gap substation
- Larimer County open space development near Chimney Hollow Reservoir

### Cumulative Resource Effects

Future implementation of water-based reasonably foreseeable actions would result in changes in the amount and timing of Colorado River streamflows. In general, less water would be available for diversion by the WGFP. Firm yield for the Proposed Action (24,000 AF) would be about 2,500 AF less than under the direct effect model run. The hydrologic changes associated with the WGFP would be slightly less than those described for direct effects because of the lower water diversions, although cumulative water diversions would be greater. Water quality in the Colorado River from lower overall flows and increased wastewater



discharges upstream of Windy Gap Reservoir would result in higher ammonia concentrations and possibly lower inorganic phosphorus levels with assumed improvements in wastewater treatment. The potential for exceedance of the temperature standards in the Colorado River would increase with cumulative water diversions, but the releases from Granby Reservoir in the late summer from the 10825 Project would reduce temperature increases. Water quality in the Three Lakes, Carter Lake, and Horsetooth Reservoir would be similar to that under direct effects. Less fish habitat would be available in the Colorado River from the cumulative decrease in streamflows. Preferred recreational boating flows in the Big Gore Canyon and Pumphouse reaches of the Colorado River would occur less frequently, primarily because of lower Blue River flows from increased Denver Water demands. However, the assumption used in hydrologic modeling for Denver Water's future diversions in the Blue River basin are overstated by about 30,000 AF; therefore, reductions in Colorado River streamflow below the confluence with the Blue River are overstated in the Final EIS. The economic effects of reduced preferred flows for boating also would be greater than under direct effects. Other resource effects would be similar to those described for direct effects.

## MITIGATION

Avoidance and minimization of environmental impacts began with the screening of potential alternatives as described in Chapter 2 of the Final EIS. Comments received on the Draft EIS from the public; federal, state, and local agencies; and cooperating agencies provided valuable feedback in identifying additional mitigation measures that would reduce impacts associated with implementation of the WGFP. Mitigation and environmental commitments for the Proposed Action are discussed in detail in the mitigation sections for each resource and are summarized in Section 3.25 of the Final EIS. Following is a brief summary of the principal mitigation measures that would be implemented for the Proposed Action.

1. Curtailment of WGFP diversions after July 15 when temperature in the Colorado River below Windy Gap Reservoir and above the Williams Fork exceeds the chronic or acute temperature standard.
2. Flushing flows from the original Windy Gap Project (1980 MOU) would be modified to increase from 450 to 600 cfs. In any year when flows below Windy Gap have not exceeded 600 cfs for at least 50 consecutive hours in the previous two years, and total Subdistrict water supplies in Chimney Hollow and Granby Reservoirs exceed 60,000 AF on April 1, the Subdistrict would cease all Windy Gap pumping for at least 50 consecutive hours to enhance peak flows below Windy Gap.
3. The originally proposed prepositioning of C-BT water to Chimney Hollow Reservoir was modified to maintain higher water levels (>8,250 feet in elevation) in Granby Reservoir.
4. To offset nutrient loading to Granby Reservoir, Shadow Mountain Reservoir, and Grand Lake, the Subdistrict would implement point and nonpoint source nutrient mitigation measures upstream of Windy Gap Reservoir. This would serve to improve water quality in portions of Willow Creek, the Fraser River, and Colorado River year-round and offset nutrient loading to the Three Lakes from WGFP pumping.

5. The Subdistrict would participate in the Upper Colorado River Recovery Program and pay a fee to address depletions that would impact Colorado River endangered fish species.
6. Curtailment of WGFP diversions during the annual Gore Race in August would occur if flows in Gore Canyon drop below 1,250 cfs.
7. The Subdistrict would commit to continued participation and funding of the ongoing Nutrient Studies, with participation and collaboration by Reclamation, Northern Water, and Grand County, to better understand water quality issues in the Three Lakes system and provide guidance for future management decisions.
8. All permanent wetland impacts would be replaced by purchasing wetland bank credits.
9. Per an agreement with Larimer County Parks and Open Lands, Chimney Hollow Reservoir would be managed as open space. A plan for habitat restoration, enhancement, and wildlife management would be developed with Larimer County and CDPW.
10. A variety of best management practices would be implemented during and following construction to reduce erosion, protect water quality, suppress dust and noise, revegetate disturbed areas, and protect or avoid important wildlife habitat.

## **WHAT'S NEXT?**

A number of decisions, permits, and approvals are needed from federal, state, and local agencies to implement the WGFP. Reclamation is responsible for NEPA compliance and other decisions associated with use and connection to C-BT facilities, any changes in C-BT operations, and use of Reclamation land. The Corps, as a cooperating agency, has regulatory authority for Section 404 dredge and fill permitting requirements under the Clean Water Act. Western, a federal power marketing agency in the U.S. Department of Energy, will make a decision on the relocation of a transmission line for the Chimney Hollow Reservoir alternative. Both the Corps and Western are using this Final EIS to meet NEPA compliance requirements for their federal actions associated with the WGFP.

As the lead agency, Reclamation is responsible for preparation of the Final EIS and Record of Decision (ROD). In addition, Reclamation must make several decisions regarding potential actions associated with implementation of the Proposed Action or other alternatives. All of the action alternatives would involve a physical connection of WGFP conveyance facilities on the East Slope to C-BT facilities. Reclamation will need to decide whether to allow this connection. The No Action Alternative does not require any authorization by Reclamation.

Because the Proposed Action includes the storage of C-BT water in a new WGFP facility (a concept referred to as prepositioning), Reclamation also will need to make a decision regarding accounting for changes in the C-BT system to allow water storage and exchange between the two projects to occur. Implementation of prepositioning may require modification or replacement of the existing conveyance and storage contract between Reclamation, the Subdistrict, and Northern Water.

Reclamation expects to complete the NEPA process with a Record of Decision (ROD) no sooner than 30 days after the Final EIS is made available to the public. The ROD will document Reclamation's selection of an alternative for the WGFP and discuss the factors, including C-BT Project water rights that were considered in making that decision. If the selected alternative includes issuing a water contract, Reclamation intends to determine whether the proposed contract complies with Senate Document 80, and other applicable authorities, prior to execution of the proposed contract.

Copies of the Final EIS and related documents are available online from Reclamation's website at:  
[www.usbr.gov/gp/eca0](http://www.usbr.gov/gp/eca0)

To receive a copy of the Final EIS on compact disk, please submit a written request to the attention of Lucy Maldonado through regular mail or e-mail:

**Mail:** Lucy Maldonado, Bureau of Reclamation  
11056 West County Rd. 18E  
Loveland, CO 80537

**Fax:** Lucy Maldonado, 970-663-3212

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