

RECLAMATION

Managing Water in the West

Windy Gap Firming Project

Draft Environmental Impact Statement

DES 08-30

Executive Summary



**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

August 2008

EXECUTIVE SUMMARY

DRAFT ENVIRONMENTAL IMPACT STATEMENT

WINDY GAP FIRING PROJECT

INTRODUCTION

The Windy Gap Firing Project (WGFP) is a proposed water supply project that would provide more reliable water deliveries to Front Range and West Slope communities and industries. The Municipal Subdistrict, Northern Colorado Water Conservancy District 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 Draft EIS for a more complete description and analysis.



Existing Windy Gap Reservoir, Grand County, Colorado

Due to limitations and constraints with the existing system, the current Windy Gap 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 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,

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.

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

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.



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.

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 the Participants to improve the efficiency of water use, extend supplies, and reduce overall demand, conservation measures 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.

PUBLIC AND AGENCY PARTICIPATION

Reclamation provided an early and open process to determine the scope of significant issues to be addressed in the Draft Environmental Impact Statement (DEIS). Prior to initiation of the EIS process and publication of the Notice of Intent in September 2003, the Subdistrict, with Reclamation participation, held two public

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

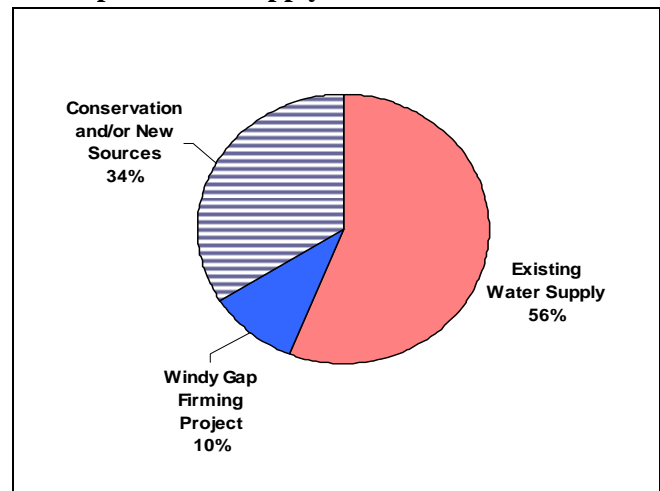


Table ES-1. WGFP Participant water supply, demand, and estimated shortage.

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.

information meetings in July 2003 to describe the proposed project. Following publication of the Notice of Intent and during and after three public scoping meetings in September and October 2003, Reclamation received input from the public, interested organizations, and agencies. An agency scoping meeting also was held in September 2003 to gather input from federal, state, and local government agencies. Periodic communication and meetings were held with various agencies and entities over the course of preparation of the DEIS.

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 DEIS. The No Action alternative and four action alternatives are described below.

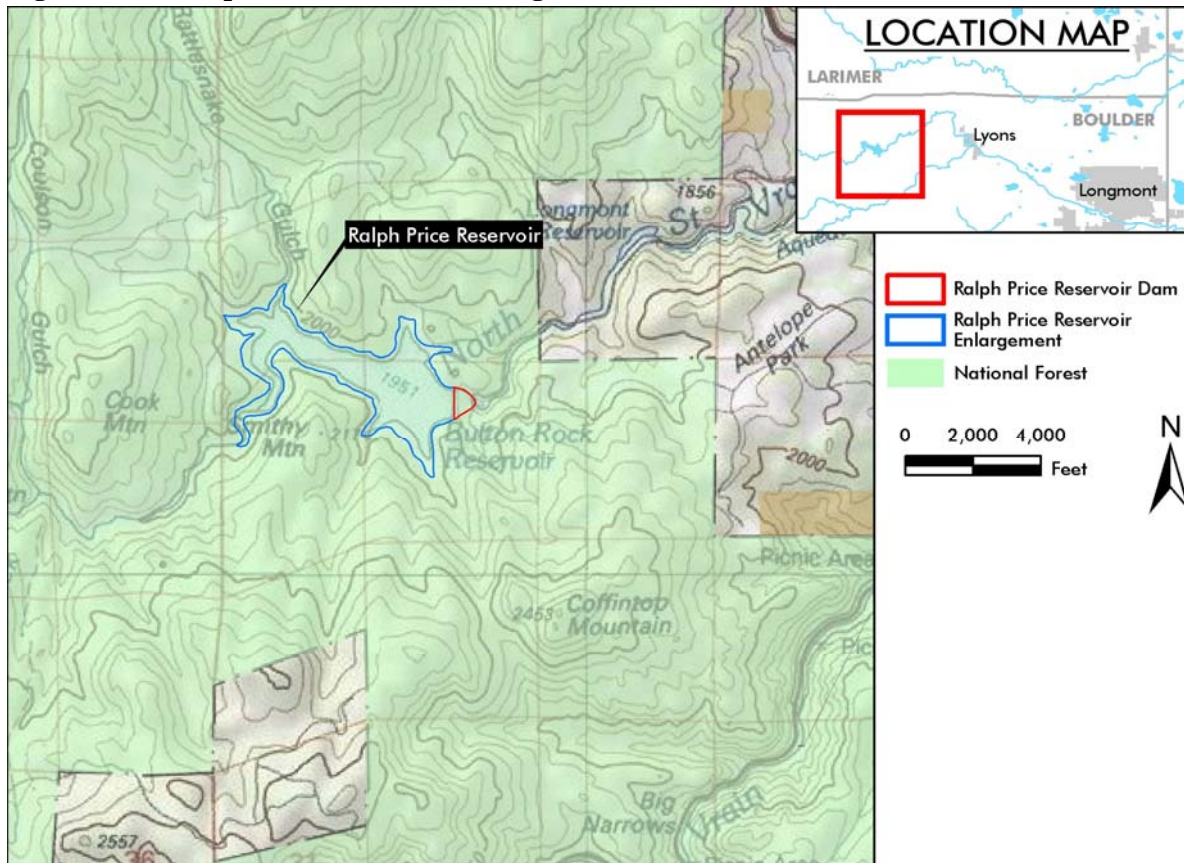
- **Alternative 1 (No Action):** Continuation of operations under existing agreements between Reclamation and the Subdistrict for conveyance of Windy Gap water through C-BT facilities and the enlargement of Ralph Price Reservoir by the City of Longmont.

- **Alternative 2 (Proposed Action):** Chimney Hollow Reservoir (90,000 AF) with repositioning.
- **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).

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 enlarge 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.

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



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. 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 full most of the time.



Chimney Hollow Reservoir Site

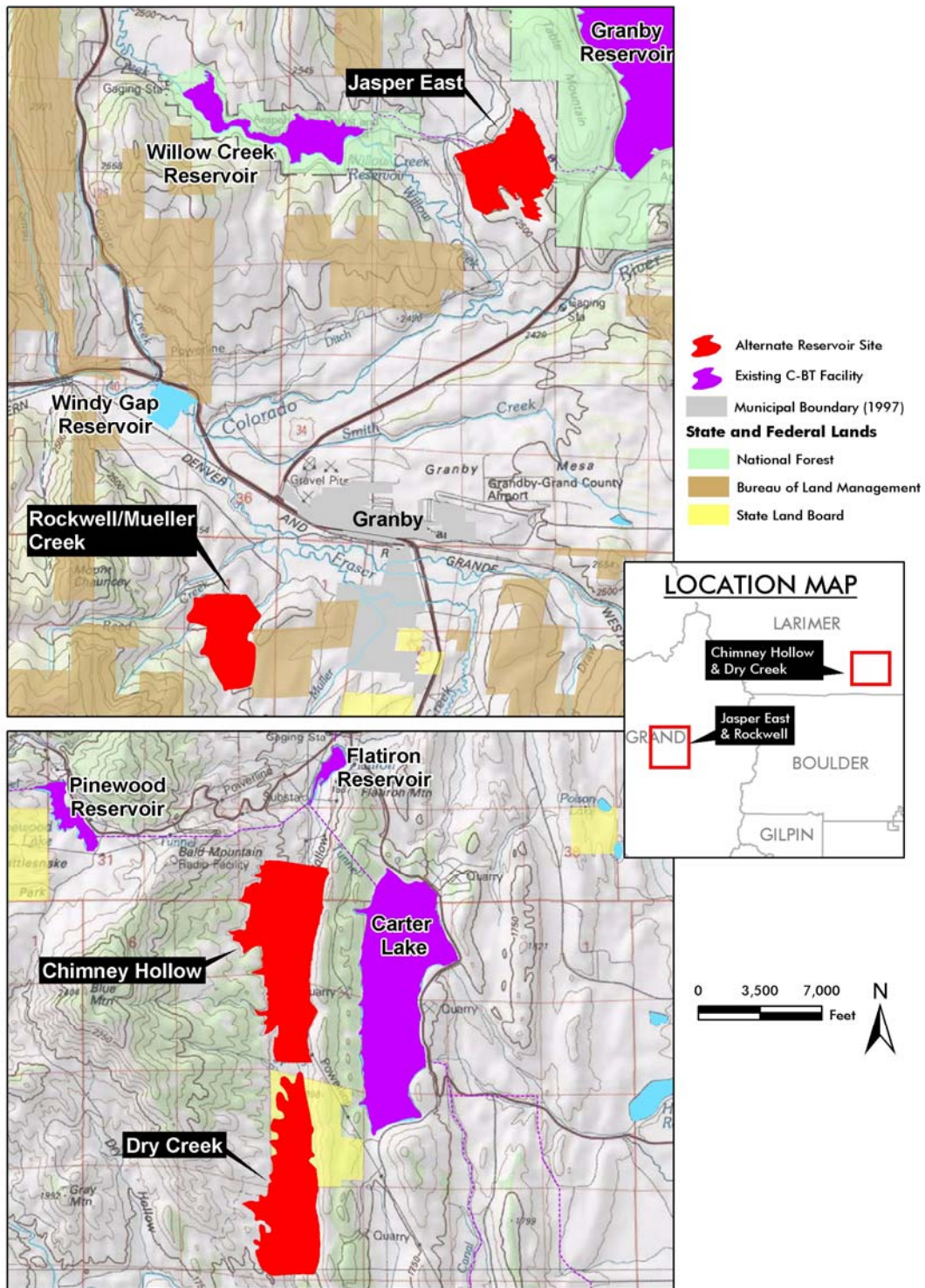
Alternative 3

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 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.

Figure ES-4. Alternative new reservoir sites.



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 Chimney Hollow 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. Impacts to these resources are discussed in detail in the DEIS. The following sections summarize the effects to other resources. Proposed mitigation is discussed at the end of this summary.

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 from hydrologic modeling are described below.

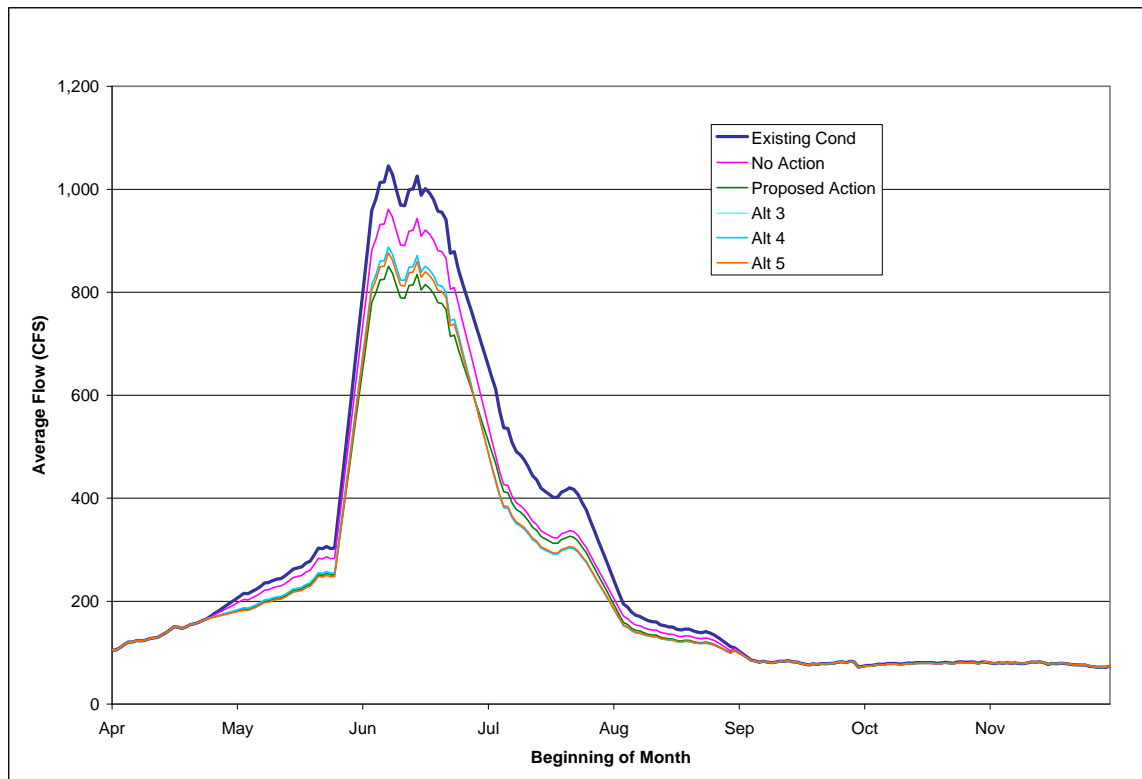
- Windy Gap diversions would increase about 7,000 AF per year on average from existing conditions under the No Action alternative compared to an increase of about 9,500 AF for the Proposed Action, and an increase of 12,000 AF for the other alternatives (Table ES-2).
- Colorado River average annual flow 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).
- Colorado River average annual flow below the Windy Gap diversion 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 the reductions in flow would occur between May and August (Figure ES-5) with 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. The average monthly percent flow reduction would be greater in wet years. In dry years, there would be no change in flow from existing conditions.

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

- Below Kremmling and the confluence with the Blue River, Colorado River average annual streamflow reductions 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.
- 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,

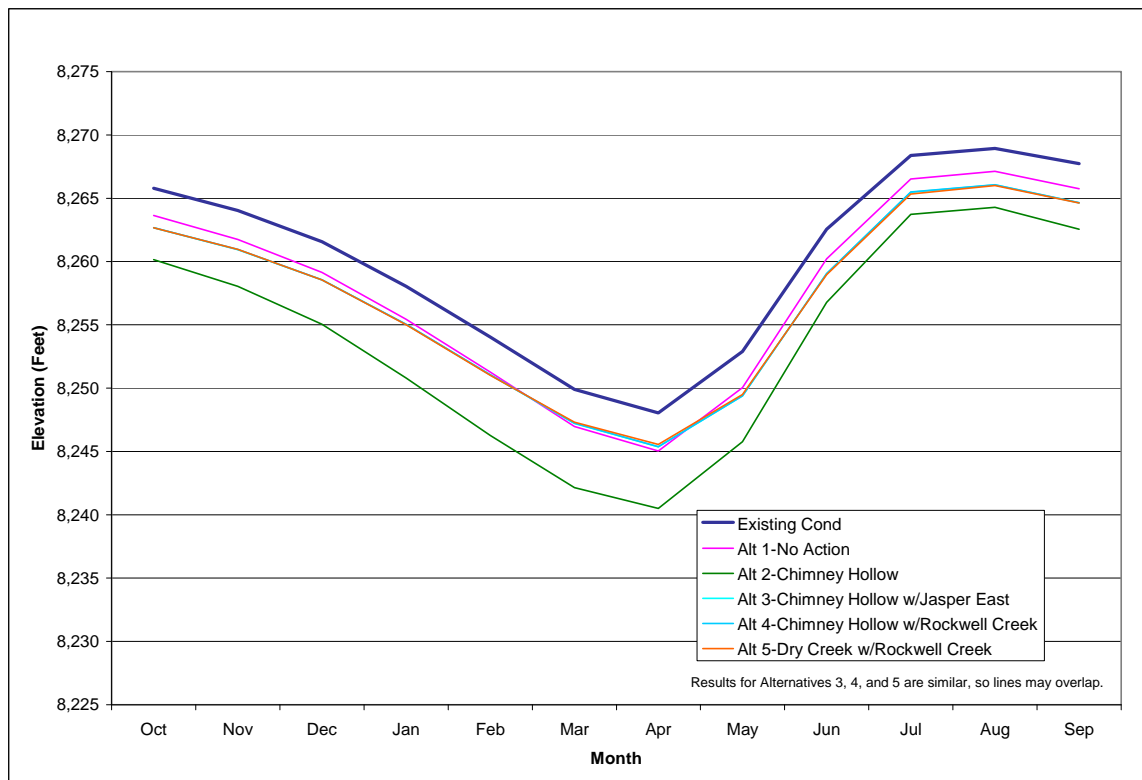
Figure ES-5. Average daily flow in the Colorado River below Windy Gap Reservoir by alternative.



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.
- 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, would decrease 2 to 6 feet under the Proposed Action, and would decrease 0 to 2 feet under the other alternatives.
- Windy Gap firm yield would increase from zero under existing conditions to about 26,000 AF under the Proposed Action and alternatives (Table ES-3). Firm yield under the No Action alternative would be about 1,200 AF and would not meet the project purpose and need.

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



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. The changes in flow expected from the WGFP are not expected to cause measurable changes to stream morphology or to 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

- Under all alternatives, the 2-year peak discharge on the Colorado River at the Hot Sulphur Springs gage below the Windy Gap diversion would be exceeded about 3 percent of the time, or about 1 percent less frequently than under existing conditions. High volume channel maintenance flows would also experience a slight decrease in frequency. The projected reduction in the frequency of peak discharges and channel maintenance flows is unlikely to significantly 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 45 days per year on average under existing conditions, would decrease to 38 days per year under the No Action alternative, 36 days under the Proposed Action, and 35 days under the other alternatives. The reduction in the frequency of flushing flows would remain adequate to transport sediment and prevent deposition.
- 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.

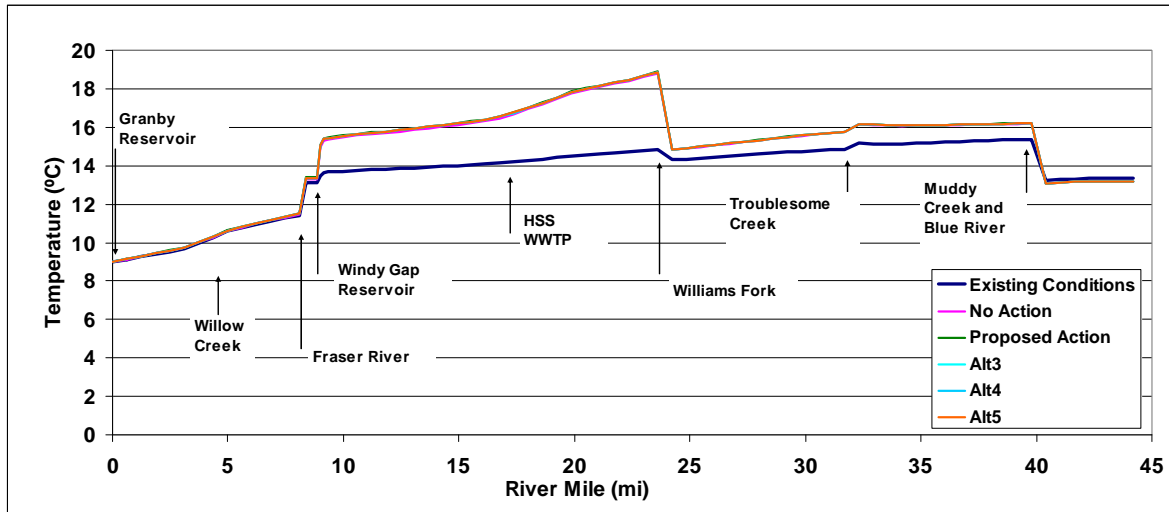
Surface Water Quality

Water quality impacts from WGFP include changes in the Colorado River 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 were also evaluated in 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.

- Under average flow conditions for a typical late July day below Windy Gap Reservoir, temperatures in the Colorado River are predicted to increase 0.5°C under the No Action alternative, 0.6°C for the Proposed Action, and 0.7°C to 0.8°C for the other alternatives. This would increase the potential for exceedance of the maximum weekly average temperature standard (18.2°C) for all alternatives.
- When Windy Gap diversions reduce Colorado River flow to the 90 cfs minimum flow in late July (which occurs infrequently), temperatures are predicted to increase about 4°C for all alternatives

(Figure ES-7). This would increase the potential for exceedance of the maximum weekly average temperature standard under all alternatives.

Figure ES-7. Colorado River predicted average daily stream temperatures for July 25 assuming diversion to the 90 cfs minimum instream flow below Windy Gap Reservoir.



- 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 concentrations is predicted to be less than the spawning standard for a few miles upstream of the Williams Fork.
- Ammonia and some metal concentrations in Willow Creek would increase slightly for all alternatives, but water quality standards are not expected to be exceeded.
- Total phosphorus concentrations in Granby Reservoir are predicted to increase under all alternatives and total nitrogen concentrations would increase under the No Action and Proposed Action alternatives (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

Table ES-4. Granby Reservoir predicted water quality changes 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%

change in water clarity as measured by the Secchi-disk depth for any of the alternatives.

- All alternatives would increase phosphorus concentrations in Shadow Mountain Reservoir; 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 not change in other alternatives.

Table ES-5. Shadow Mountain Reservoir predicted water quality changes 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%

- In Grand Lake, total phosphorus concentrations are expected to increase under all alternatives (Table ES-6). Total nitrogen is expected to increase under the No Action and Proposed Action alternatives. 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.

Table ES-6. Grand Lake predicted water quality changes 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, but temperature and DO concentrations would continue to exceed state standards in Granby Reservoir. 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.

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:

- The amount and frequency of available fish habitat in the Colorado River would decrease under all alternatives from reductions in streamflow. The greatest change would occur under the action alternatives, where up to a 24 percent decrease in adult rainbow trout habitat just upstream of the Williams Fork confluence would occur in 4 out of 10 years. Under the No Action alternative, the maximum decrease in habitat at this location would be 9 percent in 3 out of 10 years. Effects to juvenile rainbow trout and juvenile and adult brown trout would be less under all alternatives. The greatest reductions in fish habitat would occur during high runoff for a few months in the early spring and summer when Windy Gap diversions occur. A decrease in habitat at this time would have less impact than changes in flow during other times of the year when Windy Gap does not affect flows and less habitat is available.
- No adverse impacts to spring spawning rainbow trout or fall spawning brown trout are predicted for any of the alternatives.
- The potential for exceedance of the aquatic life temperature standard would increase at lower flows in the summer, but measurable impacts to fish populations are not expected because flow reductions in July and August would be infrequent.
- The amount and frequency of available fish habitat in Willow Creek would decrease from reduced summer flows.
- Lower water levels and changes in water quality in Granby Reservoir, Carter Lake, and Horsetooth Reservoir are unlikely to impact fish.
- 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.

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.
- 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. Future Windy Gap depletions in all alternatives are expected to be covered by the Recovery Plan for Upper Colorado River endangered fish. As a result, the WGFP would have no effect to the endangered fish species if the steps outlined in the Recovery Plan and Programmatic Biological Opinion are followed.
- 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 also increase when the reservoir is complete.
- 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 would further evaluate the effects of the actions and any conditions for approval.

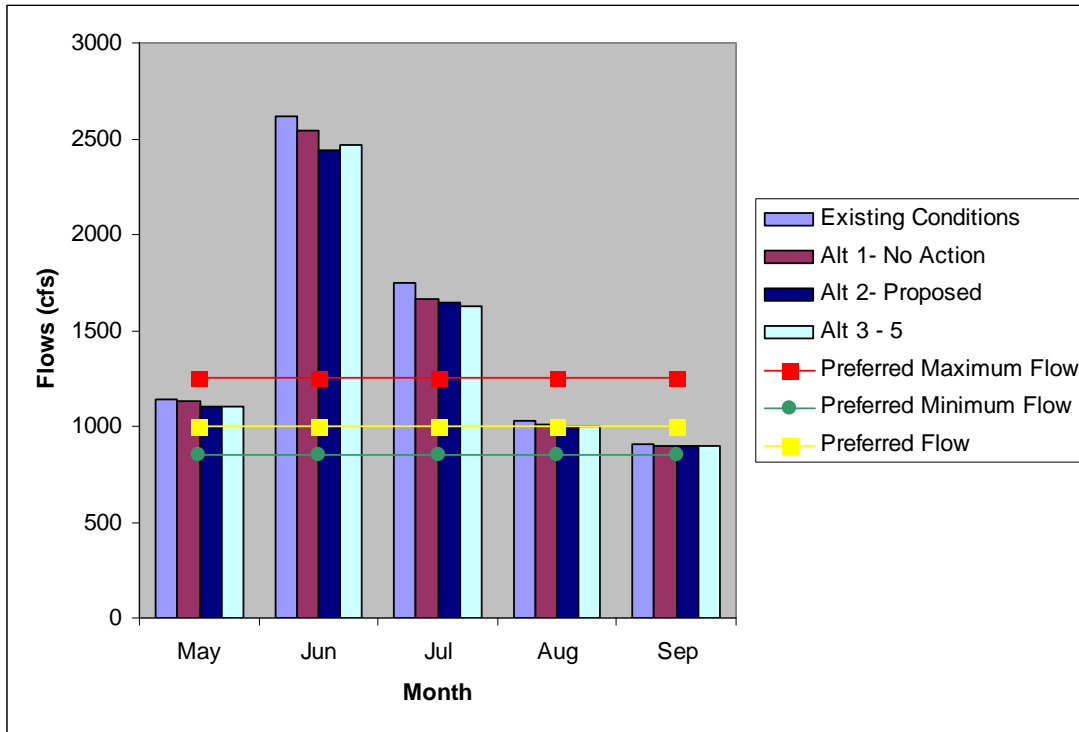
Recreation

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 these reaches of the river.

- There would be no change in the number of days that flows exceed the minimum kayaking flows in Byers Canyon in 29 years of the 47-year study period. In the remaining 18 years, there would be an estimated average decrease of 8 days per year with flows less than the preferred kayaking minimum of 400 cfs under the No Action alternative and an estimated average of 12 fewer days per year for the action alternatives.
- 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. Preferred rafting flows in Gore Canyon would occur about 24 days less under the No Action alternative compared to existing conditions over the 47-year study period. Under the Proposed Action, preferred rafting flows would occur about 23 days less than existing conditions over the 47 years. On average, this would be about 2.3 days per year 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-8.
- 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. On average during the 15 years, when preferred flows are not met, there would be about 1 less day per year in the preferred rafting flow range under Alternatives 2, 3, and 5. The greatest change in the number of days with preferred flows for kayaking 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.
- There would be no change from existing conditions in the number of days when preferred rafting and kayaking flows in the Pumphouse reach are between 2,000 to 3,000 cfs in 28 years of the 47-year study period under all alternatives. Over the 47-year period, there would be 6 more days of preferred flows under the No Action alternative and 20 fewer days under the Proposed Action. On average during the 19 years where flow changes occur, there would be about 1 less day per year in the preferred rafting flow range under all of the alternatives. The greatest decrease in the preferred flow range in a single year would be 17 days fewer under all of the action alternatives except Alternative 5, which would have 5 fewer days. The greatest increase in the number of days of preferred flows in a year would be 11 days under the No Action alternative compared to an increase of 3 days under the Proposed Action and 4 to 8 days under the other alternatives.

Figure ES-8. Average monthly streamflows on the Colorado River through Big Gore Canyon for rafting.



- No measurable effect to angler user days on the Colorado River or associated economic effects were identified for any of the alternatives.
- Access to Granby Reservoir boat ramps at Arapaho Bay, Stillwater, and Sunset would diminish in some months, primarily under the Proposed Action due to lower water levels.
- 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 would be impacted under the Proposed Action in September and by all alternatives in dry years.
- 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.

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.

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 has increased 17 percent to \$261 million.

- 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.
- 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.

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	
			Kayaking	Rafting
Alternative 1 – No Action	-\$416	-\$1,458	+\$349	+\$2,097
Alternative 2 – Proposed Action	-\$416	-\$1,393	-\$1,397	-\$6,989
Alternative 3	-\$416	-\$1,393	-\$1,397	-\$7,339
Alternative 4	-\$416	-\$1,151	-\$1,048	-\$9,437
Alternative 5	-\$416	-\$1,635	-\$349	-\$1,747

- The economic effect for the worst-case individual year (based on the 47-year study period) when preferred flows would not be available, would result in a loss of about 429 visitor days for commercial rafting in Big Gore Canyon with a value of about \$31,000. A decrease in the number of days with preferred kayaking flows in Big Gore Canyon and Pumphouse would result in the loss of about 3,375 visitor days with a value of about \$246,000. A reduction in preferred flows for rafting in Pumphouse would result in a loss of 3,875 user days with a value of \$279,000. This analysis is a “worst case” scenario, which assumes no boating when flows are outside of the preferred range.

- Some years would have an increase in boating days within the preferred ranges and would result in 675 to 2,475 additional visitor days with a value of \$49,275 to \$180,675.

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 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
- Changes in releases from Williams Fork and Wolford Mountain reservoirs to meet flow recommendations (10,825 AF of water) for endangered fish
- Increase in Wolford Mountain Reservoir contract demand
- Expiration of Denver Water's contract with Big Lake Ditch in 2013
- Climatic change and global warming (not quantitatively assessed)
- Mountain pine beetle killed trees (not quantitatively assessed)

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 would be about 2,500 AF less than under the direct effect model run (24,000 AF). The hydrologic changes associated with the WGFP would be slightly less than those described for direct effects because of the lower water diversions. 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. 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. 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

The Subdistrict has identified potential mitigation measures to reduce the impacts associated with implementation of the proposed WGFP. Most of these mitigation measures are applicable to all alternatives, but several are specific to the Proposed Action as noted. The inclusion of these mitigation measures does not imply that all measures listed will be implemented. Several mitigation measures under consideration will require additional hydrologic and water quality modeling, as well as coordination with cooperating agencies and other entities to accurately evaluate their value and effectiveness. These additional evaluations will be conducted between release of the DEIS and preparation of the Final EIS. In addition, it is anticipated that other mitigation strategies may be identified from the comments received on the DEIS. The Final EIS will include the mitigation measures that will be implemented for the selected alternative.

- To reduce potential drawdowns in Granby Reservoir under the Proposed Action, it may be possible to modify repositioning operations to deliver less C-BT or Windy Gap water to Chimney Hollow Reservoir during dry years. Additional hydrologic evaluations would be conducted to determine if changes in the timing of water deliveries to the East Slope can reduce impacts to Granby Reservoir while still meeting the purpose and need for the project.
- The Subdistrict will 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
- The Subdistrict will work with Grand County, the Colorado Division of Wildlife (CDOW), and others to determine if increasing bypass flows in the Colorado River from the existing minimum flow of 90 cfs to 135 cfs while Windy Gap is pumping during July and August would result in temperature reductions downstream of Windy Gap that would measurably benefit the trout fishery. If studies indicate that increased bypass flows would be effective, the Subdistrict would consider increasing required bypass flows under certain water supply conditions.
- A variety of best management practices will 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.
- All permanent wetland impacts will be replaced by purchasing credit in a wetland bank and on-site wetland creation.
- The Subdistrict will participate in the Recovery Program for endangered Colorado River fish.
- Opportunities for improvements to aquatic life habitat in the Colorado River and mitigation of impacts to fish will be coordinated with the CDOW, Grand County and other responsible agencies.
- Per an agreement with Larimer County Parks and Open Lands, Chimney Hollow Reservoir will be managed as open space. A plan for habitat restoration and enhancement, including development of a sport fishery at Chimney Hollow Reservoir, would be developed with Larimer County and CDOW. Similar agreements would be sought for other reservoir sites.
- The Subdistrict will curtail Colorado River diversions during the annual Big Gore Race, typically held the third week in August, if flows at the Kremmling gage are below 2,200 cfs.

- Additional evaluation and mitigation for adverse effects to eligible cultural resources will be conducted in coordination with Reclamation and the State Historic Preservation Officer.
- Additional specific mitigation measures are discussed in the DEIS.

WHAT'S NEXT?

Public hearings will be held after release of the DEIS. The time, date, and location of future opportunities for comments will be mailed to those on the Reclamation's mailing list and will be posted on Reclamation's website. Public notice on the availability of the DEIS also will be posted in local newspapers and copies of the DEIS will be placed in local libraries. Reclamation welcomes all comments during the 60-day comment period. Written and oral comments may also be made at the public hearings. Comments on the DEIS can be sent by:

Mail: Will Tully, Bureau of Reclamation
11056 West County Rd. 18E
Loveland, CO 80537

Fax: Will Tully, 970-663-3212

E-mail: wtully@gp.usbr.gov (with *Windy Gap Draft EIS Comment* as the subject line)

Copies of the DEIS and related documents are available online from Reclamation's website at:
<http://www.usbr.gov/gp/nepa/quarterly.cfm#ecao>

Paper copies of the DEIS may be obtained by calling Kara Lamb at 970-962-4326.