RECLAMATION

Managing Water in the West

Windy Gap Firming Project

Recreation Resources Technical Report

July 2008

U.S. Department of the Interior
Bureau of Reclamation
Great Plains Region

Recreation Resources Technical Report

Windy Gap Firming Project

prepared for:

U.S. Bureau of Reclamation
Eastern Area Office
Loveland, Colorado

prepared by:

ERO Resources Corporation
1842 Clarkson Street
Denver, Colorado 80218

CONTENTS

TABLES

FIGURES

WINDY GAP FIRMING PROJECT
RECREATION RESOURCES TECHNICAL REPORT

1.0 INTRODUCTION

The Bureau of Reclamation (Reclamation) has received a proposal from the Municipal Subdistrict, Northern Colorado Water Conservancy District, acting by and through the Windy Gap Firming Project Water Activity Enterprise (Subdistrict) to improve the firm yield of the Windy Gap Project by constructing the Windy Gap Firming Project (WGFP). The proposal includes a connection of WGFP facilities to the Colorado-Big Thompson Project. For more information on the background and purpose of the WGFP, see the Windy Gap Firming Project Purpose and Need Report (ERO 2005a). This technical report was prepared to address the potential environmental effects on recreation resources associated with the alternatives described below and will be used in the preparation of the environmental impact statement (EIS).

2.0 ALTERNATIVES

The Windy Gap Firming Project Alternatives Report (ERO 2005b) identified four action alternatives in addition to the No Action alternative for evaluation in the EIS. All action alternatives include development of 90,000 AF of new storage in either a single reservoir on the East Slope, or a combination of East and West Slope reservoirs. The Subdistrict's Proposed Action is the construction of a 90,000 AF Chimney Hollow Reservoir with prepositioning. The alternatives are:

- Alternative 1 (No Action) – Continuation of existing operations and agreements between Reclamation and the Subdistrict for conveyance of Windy Gap water through the Colorado-Big Thompson facilities including 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)

Prepositioning, under the Proposed Action, involves the storage of Colorado-Big Thompson (C-BT) water in Chimney Hollow Reservoir. Windy Gap water pumped into Granby Reservoir would then be exchanged for C-BT water stored in Chimney Hollow. Windy Gap water stored in Chimney Hollow would be delivered and allocated to the WGFP Participants. This arrangement ensures temporary space in Granby Reservoir to introduce and store Windy Gap water. Total allowable C-BT storage would not change and the existing C-BT water rights and diversions would not be expanded. To prevent the C-BT Project from expanding their diversions through prepositioning, total modeled C-BT storage in Granby Reservoir and Chimney Hollow was limited to the capacity of Granby Reservoir, which is 539,758 AF. If this capacity limitation is reached, the model forces the C-BT Project to bypass water at Lake Granby. This water could

then be available for diversion at Windy Gap. Therefore, under prepositioning, C-BT diversions would not be expanded with respect to their current water rights and capacity limitations.

In addition to the action alternatives, a No Action alternative was identified based on what is reasonably likely to occur if Reclamation does not approve the connection of the new Windy Gap Firming Project facilities to C-BT facilities. Under this alternative, the existing contractual arrangements between Reclamation and the Subdistrict for storage and transport of Windy Gap water through the C-BT system would remain in place. All Project Participants in the near term would maximize delivery of Windy Gap water according to their demand, Windy Gap water rights, and C-BT facility capacity constraints including availability of storage space in Granby Reservoir, and the Adams Tunnel conveyance constraints. The City of Longmont would develop storage independently for firming Windy Gap water if the WGFP is not implemented. Most Participants indicate that, in the long term, they would seek other storage options, individually or jointly, to firm Windy Gap water because of their need for reliable Windy Gap deliveries and the substantial investment in existing infrastructure.

Those 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 Carriage Contract with Reclamation and the Northern Colorado Water Conservancy District (NCWCD). Participants that would operate under this scenario include Broomfield, Central Weld County Water District, Erie, Evans, Fort Lupton, Greeley, Little Thompson Water District, Louisville, Loveland, Platte River Power Authority, and Superior. The City of Lafayette anticipates that it would withdraw from participating in the WGFP, dispose of existing Windy Gap units, and not pursue acquisition of future units if the Firming Project is not constructed.

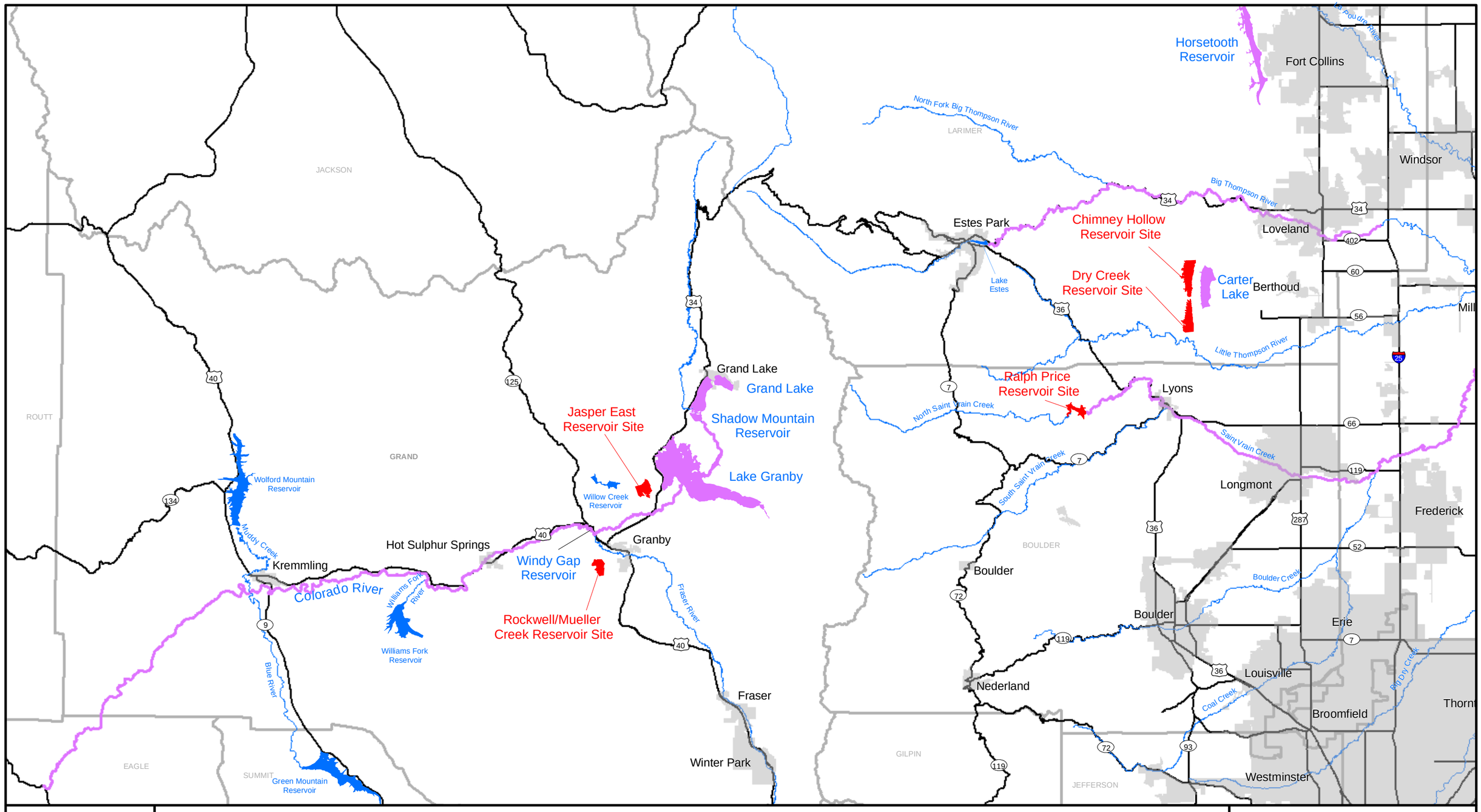
Longmont indicates that it would develop storage facilities for Windy Gap water independently if Reclamation does not approve a connection of WGFP facilities to C-BT facilities. The City would evaluate the enlargement of the existing Ralph Price Reservoir (Button Rock Dam) located on North St. Vrain Creek or Union Reservoir located east of the City. The enlargement of Ralph Price by 13,000 AF would be the City's preferred option because Union Reservoir would not have sufficient capacity for Windy Gap water and conveyance and distribution would be more efficient from a higher elevation reservoir.

Middle Park Water Conservancy District (MPWCD), under No Action, would continue to use Windy Gap water to provide augmentation flows for other water diversions in a manner similar to current operations. Through contractual agreements with the Subdistrict, MPWCD gets up to 3,000 AF of Windy Gap water in Granby Reservoir each year if Windy Gap water can be diverted and storage space is available. Any water stored in Granby for MPWCD is the last Windy Gap water to spill from Granby should a spill occur.

Detailed descriptions of the components and operation of the alternatives is included in the Draft Windy Gap EIS Alternatives Descriptions report (Boyle and NCWCD 2005).

3.0 STUDY AREA

The study area for the Recreation Resources Technical Report includes portions of Grand, Larimer, and Boulder counties that are potentially affected by project activities, including new and existing reservoirs and streams affected by changes in flow (Figure 1). The study area



ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

- Rivers and Streams Study Area
- Study Area Lakes
- Potential New or Enlarged Reservoirs

0 3 6 Miles

N

Figure 1
Recreation Study Area

Prepared for: Windy Gap Firming Project
File: Rec_Fig1_Study_Area.mxd
October 8, 2007

includes existing C-BT Reservoirs that would experience a change in operation including Granby Reservoir on the West Slope and Carter Lake and Horsetooth Reservoir on the East Slope. Water levels at Shadow Mountain and Grand Lake would not change for any of the alternatives, but potential changes in water quality that could affect recreation activities are discussed. The Chimney Hollow Reservoir site includes planned recreation development by Larimer County Parks and Open Lands. Recreation development at Dry Creek, Jasper East, and Rockwell/Mueller Creek Reservoirs is possible if a managing entity is identified.

The focus of effects to river-based recreation included changes in streamflow for the Colorado River from Granby Reservoir to State Bridge. Potential effects to recreation also were evaluated for Willow Creek on the West Slope and portions of North St. Vrain Creek, St. Vrain Creek, Big Thompson River, and Coal Creek and Big Dry Creek on the East Slope.

4.0 OBJECTIVES

The purpose of the Recreation Technical Report is to characterize the affected environment and identify potential environmental effects related to recreation for the proposed WGFP.

5.0 METHODS

The assessment of potential effects to recreation from WGFP alternatives was based on existing recreation facility data, hydrologic modeling output, and preliminary plans for new recreation facilities at the Chimney Hollow Reservoir site.

5.1. Data Sources and Analysis

Information on water-based and land-based recreational resources activities in the study area, such as boating, fishing, hiking, camping, and other potential recreation opportunities were identified. Much of the information on recreational resources, infrastructure, facilities, and significant user groups in the project area was gathered from recreation resource plans and studies prepared by federal and state agencies, including Reclamation, Bureau of Land Management (BLM), United States Forest Service (USFS), Colorado Division of Wildlife (CDOW), and local city and county agencies. Additional information was obtained during field visits, personal communications with recreation outfitters, and a thorough review of relevant recreation resource maps. Public scoping provided information on recreation issues of concern.

Information related to the type, location, and amount of recreational use (both historical and projected) was documented to the extent possible to develop a thorough understanding of recreation resources in the study area. The effects assessment was based primarily on potential changes to recreational use and opportunity due to changes in streamflow or lake levels. Hydrologic data for assessing effects to streamflow and reservoir water levels was taken from the Windy Gap Firming Project Draft Water Resource Technical Report (ERO and Boyle Engineering 2007). Potential effects to recreational fishing were based on the Aquatic Resource Technical Report (Miller Ecological 2008). Information on projected changes in water quality was taken from the Lake and Reservoir Water Quality Report (AMEC 2008) and the Stream Water Quality Technical Report (ERO and AMEC 2008). Land-based recreation effects at reservoir sites also were evaluated.

5.2. Assumptions

Recreation use was based on existing information. No formal recreation/user surveys were conducted. Effects were quantified to the extent possible based on available information. However, in most instances, effects to recreation were qualitative given the limited amount of recreation user preference data necessary to derive a relationship between 1) surface water elevation and visitor use at reservoirs, and 2) streamflows and visitor use on rivers. Direct and indirect effects of recreation development for the proposed Chimney Hollow Reservoir were based on conceptual recreation plans provided by Larimer County, and by evaluating other reservoirs having similar physical and geographical characteristics, as well as similar types of recreation.

6.0 AFFECTED ENVIRONMENT

Recreation in the study area (Figure 1) primarily occurs at reservoirs, lakes, rivers, and adjacent lands offering public access. These lands include state wildlife areas, BLM property and National Forests, Bureau of Reclamation land, and National Recreation Areas. A discussion of recreation opportunities occurring in the West Slope and East Slope study areas is provided below.

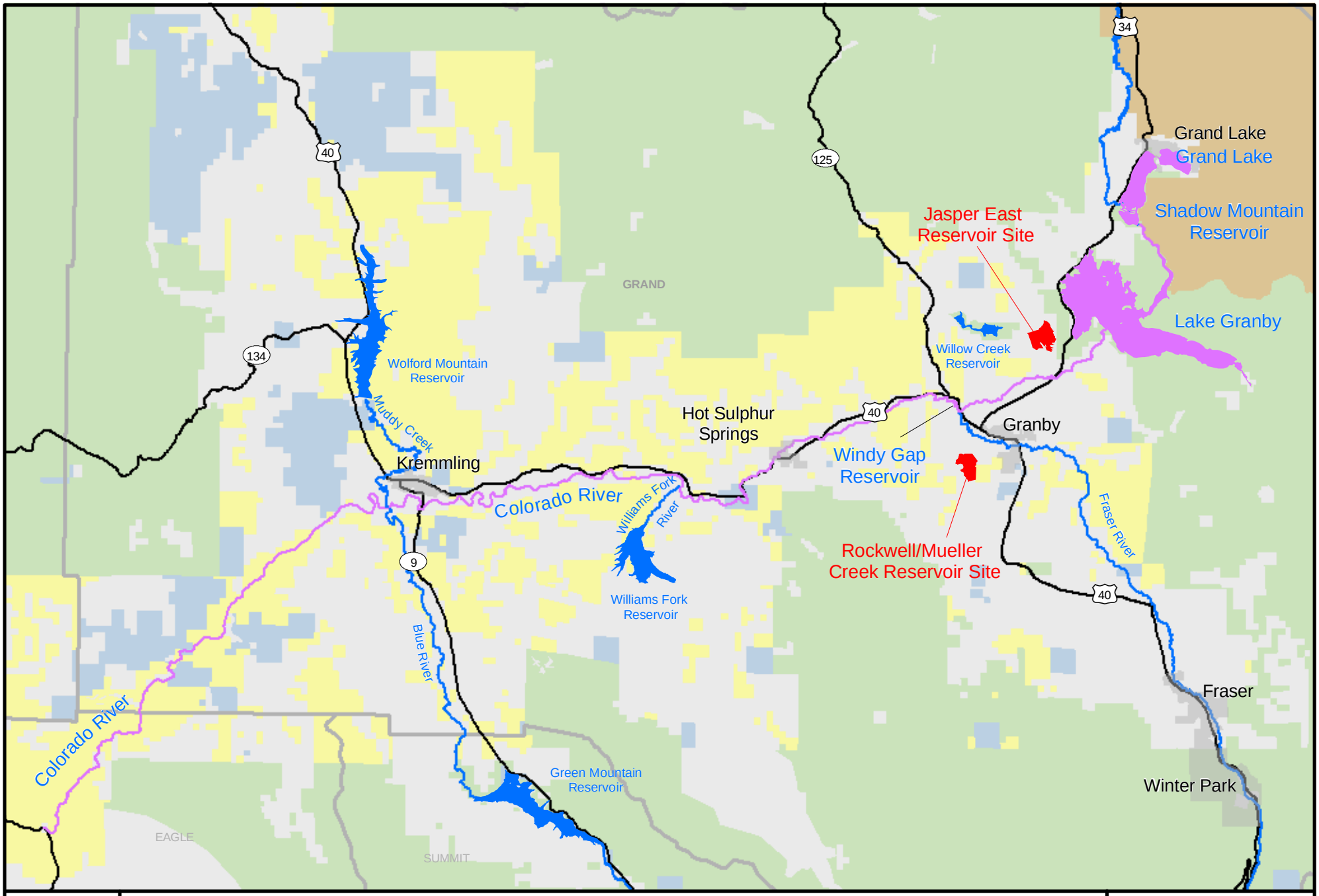
6.1. West Slope Recreation

6.1.1. Recreation at Existing Reservoirs

Reservoirs in the West Slope (Figure 2) portion of the study area are all located in Grand County and include Grand Lake, Shadow Mountain Reservoir, and Granby Reservoir (Three Lakes). Both Granby Reservoir and Shadow Mountain Reservoir are located within the Arapaho National Recreation Area (ANRA), which is about 4 miles northwest of the Town of Granby and is partially adjacent to Rocky Mountain National Park, Arapaho National Forest, and Indian Peaks Wilderness. Grand Lake is open to public use, but much of the surrounding land is private, and public access is limited to small areas of shoreline and one boat ramp on the eastern shore. Grand Lake can also be accessed by canal from Shadow Mountain Reservoir.

Willow Creek Reservoir is a C-BT facility located west of Granby Reservoir that also supports recreational uses as part of the ANRA. However, Willow Creek Reservoir would not be affected by any of the potential alternatives and will not be described further.

Windy Gap Reservoir is located on the Colorado River west of the Town of Granby. Recreation activities at Windy Gap Reservoir include wildlife viewing and picnicking. Existing recreation facilities (parking area, restrooms, informational kiosks, and picnic tables) and reservoir operation at Windy Gap Reservoir would not change for any of the alternatives; therefore, Windy Gap Reservoir is not included in the analysis.



ERO
ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

- Bureau of Land Management
- Colorado State Lands
- National Park Service
- Private
- United States Forest Service
- Rivers and Streams Study Area
- Study Area Lakes
- Potential New or Enlarged Reservoirs

0 2.5 5 Miles

N

Figure 2
Recreation Study Area
West Slope

Prepared for: Windy Gap Firming Project
File: Rec_Fig_West_Slope.mxd
October 8 , 2007

6.1.2. Three Lakes Recreation Activities and Uses

Recreation at Three Lakes primarily consists of boating, angling, and camping during the summer season (Memorial Day through Labor Day). Winter recreation in the area includes cross-country skiing, snowmobiling, and ice fishing. Together, the Three Lakes provide up to 9,200 surface acres of water for recreational use (Figure 3). The Three Lakes also provide scenic recreation opportunities for visitors traveling to Rocky Mountain National Park and through Grand County.

Boating. Power boating and sail boating are the most popular types of boating, but canoeing and kayaking are also common at Three Lakes. Boating facilities include marinas and boat ramps (Table 1). Marinas include the Trail Ridge Marina at Shadow Mountain Reservoir, Boater's Choice Marina and JR's Marina at Grand Lake, and Highland Marina and Beacon Landing Marina at Granby Reservoir. Each marina (except for Boater's Choice and JR's Marinas, which are located at Grand Lake, operates under a special use permit from the U.S. Forest Service. Powerboat and non-motorized boat rentals such as kayaks and canoes are available throughout the summer season at each marina. In addition, all marinas provide summer mooring and slip rentals, as well as various goods and services for purchase throughout the year.

Table 1. Three Lakes Boating Facilities.

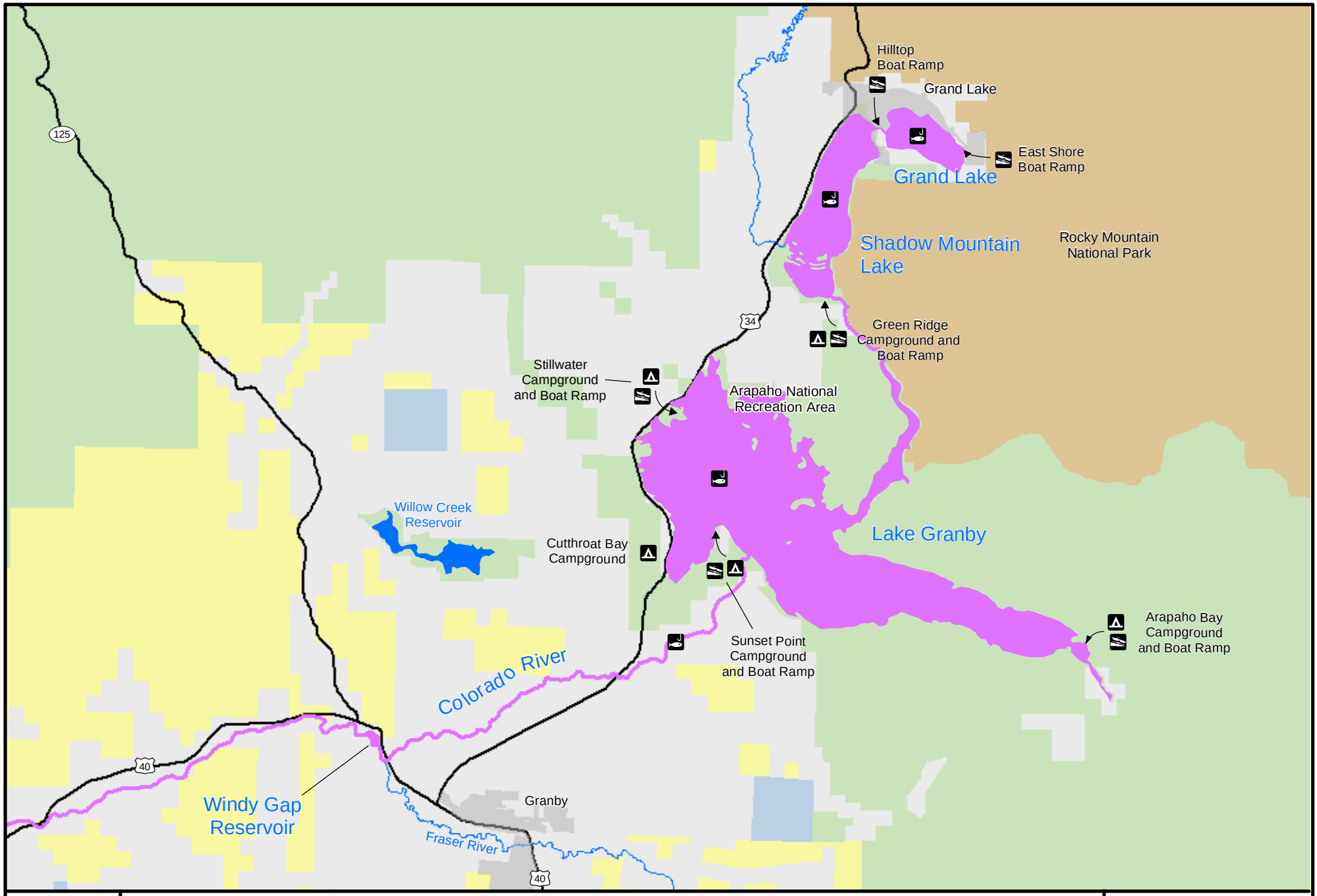
Recreation Activities and Uses	Surface Acres	Boat Ramps	Marinas
Grand Lake	507	1 (public)	2
Shadow Mountain Reservoir	1,852	2	1
Granby Reservoir (full reservoir)	7,250	3	4

Elevations of each of the boat ramps are provided in Table 2. No data are available on boat ramp elevations at Grand Lake. Both Grand Lake and Shadow Mountain Reservoir are maintained at elevations of about 5,369 feet and fluctuate less than 1 foot (Lund 2004; Lively 2006).

Table 2. Boat Ramp Elevations at Three Lakes.

Boat Ramp	Top Elevation (feet)	Bottom Elevation (feet)
Granby Reservoir		
Sunset	8,280	8,220
Stillwater	8,280	8,244
Arapaho Bay	8,280	8,250
Shadow Mountain		
Green Ridge	8,365	8,355
Hill Top	8,365	8,361
Grand Lake		
Sol Vista	n/a	n/a
Grand Lake	n/a	n/a
East Shore	n/a	n/a

Source: Mathews 2004.



ERO
ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

- Bureau of Land Management
- Colorado State Lands
- National Park Service
- Private
- United States Forest Service
- Fishing
- Campground
- Boatramp
- Rivers and Streams Study Area
- Study Area Lakes

0 1 2 Miles

1 Inch = 2 Miles

N

Figure 3
Three Lakes Recreation

Prepared for: Windy Gap Firming Project
File: Rec_Fig3_Three_Lakes.mxd
October 8, 2007

Fishing. Fishing from shore and boat are popular summer activities at the Three Lakes. Sport-fish species include lake trout, rainbow trout, brown trout and kokanee salmon. An estimated 500 to 3,000 anglers visit the Three Lakes on busy summer weekends (Oldham, pers. comm. 2005). Three major fishing tournaments are held during the summer that each attracts an estimated 1,000 anglers. Winter ice fishing is also common.

Camping. Developed campsites available at Granby Reservoir include Stillwater, Sunset Point, and Arapaho Bay, which offer full services from Memorial Day to Labor Day (Figure 3). Primitive camping can be found along the eastern shore and on the islands at Granby Reservoir. A breakdown of developed campsites available at the Three Lakes is provided in Table 3.

Table 3. Campgrounds and Campsites at Three Lakes.

Campgrounds	Number of Campsites
Shadow Mountain Reservoir	
Green Ridge Campground	80
Granby Reservoir	
Arapaho Bay	84
Stillwater Campground	127
Sunset Point	25
Cutthroat Bay	2 (group)

Hiking. Hiking opportunities are prevalent around Granby Reservoir and Shadow Mountain Reservoir in ANRA and in Rocky Mountain National Park near Grand Lake. About 29 miles of trails are accessed by six separate trailheads surrounding the Three Lakes (Mathews, pers. comm. 2004).

6.1.3. Recreation at Potential New Reservoir Sites

6.1.3.1. Rockwell/Mueller Creek

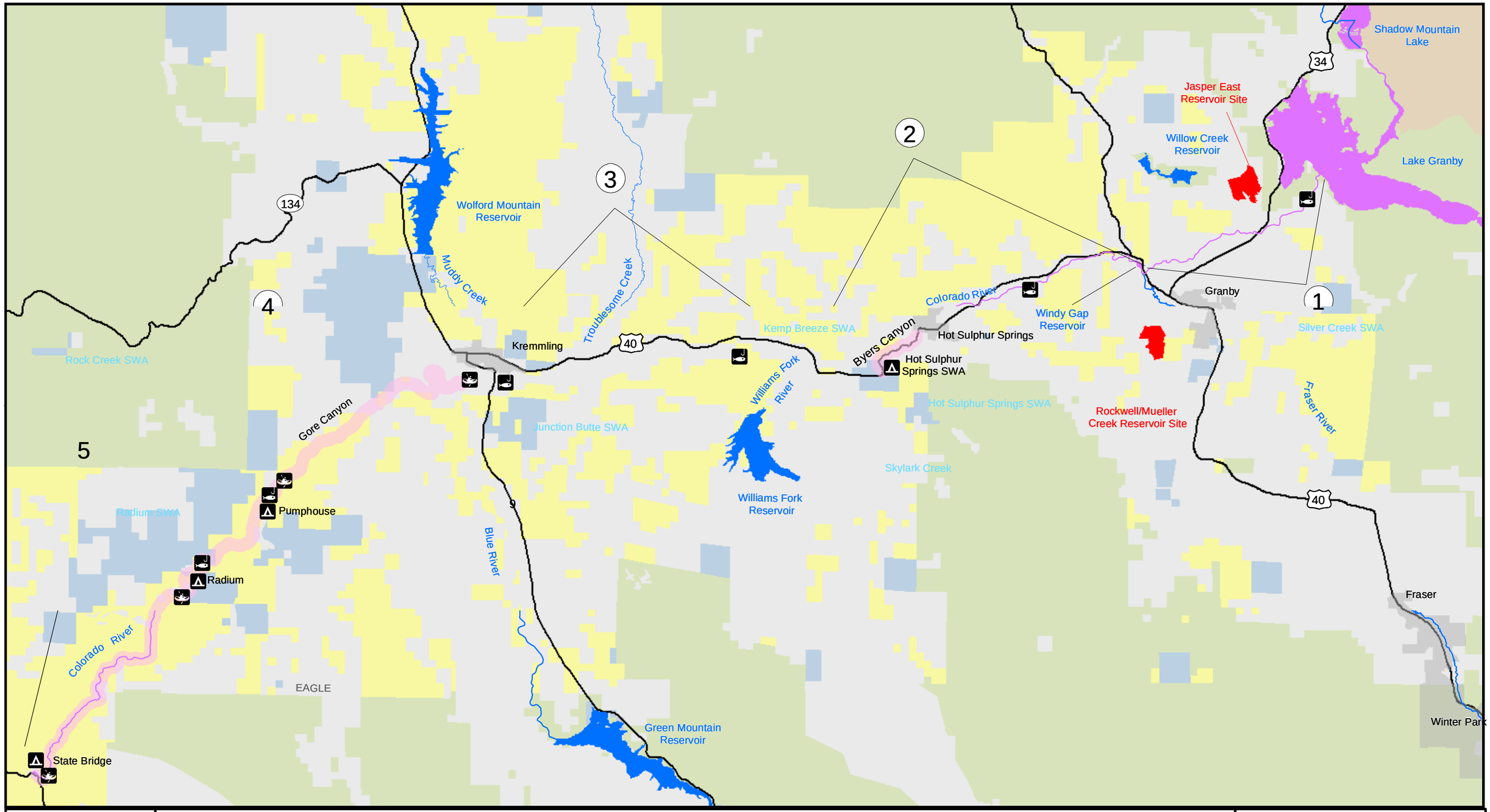
Most of the Rockwell Reservoir site lies on private lands that are not available for public use. A small portion of the site (about 51 acres) is on a BLM parcel that is open to the public, but only occasional dispersed recreational use occurs in this area (Cassel, pers. comm. 2005)

6.1.3.2. Jasper East

The Jasper East site is located on private lands not available for public use. Generally, Reclamation property associated with the Willow Creek pump canal and pumping plant is not open for public access. However, a small portion of the property located along the Willow Creek Pump Canal has a paved model airplane airstrip used by model airplane enthusiasts during the summer. County Road 40 crosses the reservoir site and provides access to Willow Creek Reservoir, which is included in the ANRA and provides camping, boating, and angling opportunities.

6.1.4. Colorado River Recreation

The Colorado River is the most popular river recreation attraction in the study area (Figure 4). About 65 miles of the Colorado River are located between Granby Reservoir and State Bridge. Fishing and boating (rafting and kayaking) are the primary recreation activities that



ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

- Bureau of Land Management
- Colorado State Lands
- National Park Service
- Private
- United States Forest Service
- Boating Destination
- Rivers and Streams Study Area
- Study Area Lakes
- Potential New or Enlarged Reservoirs
- Fishing
- Boating
- Campground

① Lake Granby to Windy Gap Reservoir
② Windy Gap Reservoir to Williams Fork River
③ Williams Fork River to Kremmling
④ Kremmling to Pumphouse (Big Gore Canyon)
⑤ Pumphouse to State Bridge

0 1.5 3 Miles

N

Figure 4
Colorado River Recreation

Prepared for: Windy Gap Firming Project
File: Rec_Fig4_colorado_River Recreation.mxd
October 2007

occur on the Colorado River, and camping and hiking on adjacent public lands are also popular. Recreation resources along the Colorado River, and potential effects to those resources, are described by five river reaches:

1. Granby Reservoir to Windy Gap Reservoir
2. Windy Gap Reservoir to Williams Fork River
3. Williams Fork River to Kremmling
4. Kremmling to Pumphouse (Big Gore Canyon)
5. Pumphouse to State Bridge

Information on flow preferences for boating and fishing was taken from previous studies, boating guidebooks, interviews with commercial rafters and fishing outfitters, and existing streamflow agreements.

The U.S. Department of the Interior developed the Principles to Govern the Release of Water at Granby Reservoir Dam to provide Fishery Flows immediately downstream in the Colorado River. The Principles were developed "to preserve at all times that section of the Colorado River between the reservoir to be constructed near Granby Reservoir and the mouth of the Fraser River as a live stream, and also to insure an adequate supply for irrigation, for sanitary purposes, for the preservation of scenic attractions, and for the preservation of fish life." The schedule of releases from Granby Reservoir is summarized as follows: 20 cubic feet per second (cfs) from September through April; 75 cfs from May through July; and 40 cfs in August. The bypass flow requirement may be reduced from May through September when the advanced forecast of inflow to the Three Lakes system and Willow Creek Reservoir is less than 230,000 AF (Boyle 2003; ERO and Boyle 2007). Bypass flows were estimated to be reduced by 15 to 30 percent (as stipulated) for a portion of the period from May through August during the 15 years between 1950 and 1992.

A Memorandum of Understanding (June 23, 1980) between the Municipal Subdistrict, NCWCD, and CDOW established instream flow requirements on the 24-mile reach of the Colorado River downstream of the WGFP to the mouth of the Blue River to support the fishery. These instream requirements include:

- From the Windy Gap Diversion Point to the mouth of the Williams Fork River: 90 cfs
- From the mouth of the Williams Fork River to the mouth of Troublesome Creek: 135 cfs
- From the mouth of Troublesome Creek to the mouth of the Blue River: 150 cfs

The Subdistrict would not be required to bypass water in excess of natural inflow to the Windy Gap diversion. In addition, the MOU includes flushing flows of 450 cfs for 50 hours during the period of April 1 through June 30 are required once every 3 years if equivalent flows do not otherwise occur.

The BLM completed the eligibility phase of a wild and scenic river evaluation for various reaches of the Colorado River within the study area to identify river segments for possible designation in the National Wild and Scenic Rivers System (BLM 2007a). This inventory and eligibility review was conducted as part of the BLM's Resource Management Plan (RMP) revision process. Four public open houses were conducted in July 2006 to provide information

and receive comments from the public. Eligibility criteria included free-flowing streams with outstanding remarkable values for scenic, recreational, geologic, fish, wildlife, historic, cultural, and other similar values. Five segments of the Colorado River within the WGFP study area were identified as eligible in the BLM study. These segments and the outstanding remarkable values for each segment are:

- Windy Gap to Hot Sulphur Springs — recreational (fish), wildlife, and historic
- Byers Canyon — recreational (fishing and floatfishing, scenic driving and other recreation), scenic, wildlife, geological, and historic
- Below Byers Canyon to the mouth of Gore Canyon — recreational (fishing, scenic driving, ad other recreation), wildlife, and historic
- Gore Canyon — recreation (fishing, floatfishing, scenic driving, and other recreation), scenic, geological, wildlife, historic, and cultural
- Pumphouse to State Bridge — recreation (fishing, floatfishing, scenic driving, and other recreation), scenic, geological, paleontological, wildlife, historic, and cultural

There are three classes for river designation under the Wild and Scenic Rivers Act—Wild, Scenic, and Recreational. All of these river reaches were preliminarily classified as Recreational.

The next phase of evaluation is to determine whether eligible river segments are suitable or not for inclusion in the Wild and Scenic Rivers System. BLM will complete the suitability evaluation as part of their RMP revision process with recommendations given in a Draft Environmental Impact Statement scheduled for 2008. BLM's policy is to manage and protect eligible river segments so as not to adversely constrain the suitability assessment or subsequent recommendations to Congress. River or stream segments must be found eligible and suitable to be considered for designation in the National Wild and Scenic Rivers System, and only Congress or the Secretary of Interior can designate segments.

6.1.4.1. Granby Reservoir to Windy Gap Reservoir

The 7-mile reach of the Colorado River between the Granby Reservoir dam and Windy Gap Reservoir is not known to be used extensively for recreation. There are no designated recreation sites, and this area is not known to be a boating destination. This reach of the river provides fishing opportunities, primarily on private lands, some of which (e.g., the Orvis property west of the Town of Granby) are currently being developed, and other locations where public access is available.

According to the USGS gage near Granby, the average flow of the river in the reach below Granby Reservoir, but above Willow Creek and the Fraser River is 40 to 90 cfs during August through March. During April through July, average monthly flows range from 200 to 500 cfs (Earthinfo 2005). Spills from Granby Reservoir have occurred historically from March through October, with the largest spills occurring in June and July. The largest average monthly spill was 950 cfs in June 1984 (ERO and Boyle 2007). Tributary inflow from Willow Creek and Fraser River provides additional flows to the Colorado River above Windy Gap Reservoir.

6.1.4.2. Windy Gap Reservoir to Williams Fork River

This approximately 14-mile reach of the Colorado River contains several recreational resources that support boating, angling, and camping. The USGS gage at Hot Sulphur Springs shows average monthly flows of 90 to 160 cfs from September through March, with average monthly flows of 300 to nearly 1,900 cfs from April through August. Highest flows occur in June (Earthinfo 2005).

Boating. Immediately west of Hot Sulphur Springs, Byers Canyon is a 2.6-mile run that provides between Class IV- and Class V rapids[1] when water flows are sufficient. Class IV- rapids are estimated to exist when the river is running between about 400 and 1,000 cfs, Class IV+ rapids exist between 1,000 and 2,000 cfs, and Class V rapids are believed to exist when flows are in excess of about 2,000 cfs (Banks and Eckardt 1999). Byers Canyon is not a destination for any commercial raft trips, and while it is occasionally used by private kayakers, it is not known to be a popular boating destination (Farr 2006). Kayaking at Byers Canyon is estimated at 15 boats per year (Crosby 2008).

Most of the remainder of this reach consists of relatively flat water. While some boaters may occasionally use this section of the river, it is not known to be a popular boating destination.

Fishing. This reach of the Colorado River has been designated by the Colorado Wildlife Commission as a "Gold Medal" stream. Gold Medal streams are considered to provide outstanding fishing opportunities for large trout. Relatively low-water flows and wide stream channels in this part of the Colorado River provide anglers opportunities to wade across the river in most areas. Fishing occurs throughout this reach of the Colorado River where public access is available, and on adjacent private lands. The Beaver Creek, Lone Buck, and Paul Gilbert Fishing Area Units of the Hot Sulphur Springs State Wildlife Area (SWA) provide public access along about 2 miles of the Colorado River. Rainbow and brown trout are the most popular gamefish species, although cutthroats and rainbow/cutthroat hybrids are also common. Agreements as part of the original Windy Gap Project provide a bypass flow of 90 cfs below Windy Gap Reservoir.

Camping. Developed campground facilities are located at the Beaver Creek Unit of the Hot Sulphur Springs SWA. A breakdown of campground facilities throughout the study area is found in Table 4.

Table 4. Upper Colorado Campgrounds and Associated Recreation Facilities.

Campground	Number of Campsites	Number of Boat Launches
Hot Sulphur Springs SWA (CDOW)	30 to 40	0
Pumphouse Recreation Area (BLM)	12	3
Radium (BLM)	8, +4 new sites in 2006	1
Mugrage Campground (CDOW)	5 (undeveloped)	0
Rancho Del Rio (private)	5 to 10	1
State Bridge (BLM)	5	1

[1] River difficulty ratings are generally described as: Class I – Easy; Class II – Novice; Class III – Intermediate; Class IV – Advanced; Class V – Expert; Class VI – Extreme (Banks and Eckardt 1999).

6.1.4.3. Williams Fork River to Kremmling

This approximately 16-mile reach of the Colorado River between the Williams Fork and the Blue River confluence with the Colorado River is not known to be a popular boating destination, and it does not have any developed recreational facilities. The upper section of this reach (above Troublesome Creek) is designated as a Gold Medal stream, and provides fishing opportunities where public access is available and from other private lands adjacent to the river, such as Elktrout Lodge property. Public access to the Colorado River is found within the Kemp-Breeze SWA, BLM's Sunset Bridge, Powers, and Highway 9 fishing accesses, all of which provide year-round parking and summertime porta-johns. Commercial guest ranches and outfitters also utilize this reach of the Upper Colorado for fishing on both the private and public lands.

Agreements in the original Windy Gap Project provide a bypass flow between the Williams Fork and Troublesome Creek of 135 cfs and a bypass flow of 150 cfs between Troublesome Creek and the Blue River.

6.1.4.4. Kremmling to Pumphouse (Big Gore Canyon)

Boating. The Big Gore Canyon reach is located between the confluence of the Colorado River and the Blue River near Kremmling and the Pumphouse Recreation Area (Figure 4). The USGS gage near Kremmling, located at the top of Gore Canyon, shows average monthly flows of 500 to 870 cfs from September through March and 1,000 to 3,500 cfs in April through August. Highest flows occur in June (Earthinfo 2005). This reach of the Colorado River supports a difficult 9.2-mile-long Class V- to Class VI rapids. Big Gore Canyon attracts advanced boaters from around the country, and is commonly used by commercial and private rafters. The Gore Race, which is one of the most popular whitewater rafting races in the country, is held on this stretch of stream. August is the primary month for boating in Big Gore Canyon and the Gore Race is typically held the third week of the month. No formal data are available for boating use in Gore Canyon; however, total annual boating use is estimated at 1,200 users, of which about 500 are commercial user days, 500 are private, and about 200 are participants in the Gore Race (Windsor, pers. comm. 2008).

Streamflow preferences vary for rafting and kayaking and by location (Table 5). Kayakers typically can run the river at lower and higher flows than rafters. Commercial rafting companies self-regulate when they will run rafting trips depending on flow volume. These limits are usually at flows between 850 and 1,250 cfs through the Big Gore Canyon, when the flow equates to a Class V- experience (Sommerhoff 2006). Preferred flow for rafting Big Gore Canyon is about 1,000 cfs (*Id.*). Private boaters are allowed to boat this reach at any flows; however, safety is an issue above and below this range of flows. Dates with conditions within these parameters for Big Gore Canyon during average conditions are:

- May 1 – May 20
- August 3 – September 30

Although flows between 850 and 1,250 cfs occur during both May and later in the summer, commercial trips are usually only run through Big Gore Canyon in August and September when the temperatures are warmer.

Table 5. Colorado River Boating Flows for Gore Canyon and Pumphouse.

Boating Type	Big Gore Canyon	Pumphouse to State Bridge
	cfs	
Preferred minimum rafting flows	850	400 to 800
Preferred rafting flows	1,000	2,000 to 3,000
Preferred minimum kayaking flows	400 - 800	400 to 800
Preferred kayaking flows	Class V- 800 to 1,300 Class V 1,300 to 2,200 Class V+ >2,200	1,100
Commercial rafting	850 to 1,250	No restrictions

Source: Sommerhoff 2006; Hydrosphere 2003; Banks and Eckardt 1999.

Fishing. High flows and lack of public access in Big Gore Canyon preclude much angling in this area.

Camping. The Big Gore Canyon is too narrow and steep for camping. Pumphouse is the closest available camping area.

Other Recreation Opportunities. The Gore Canyon Trail is a popular hiking trail for spectators during the annual Gore Festival, a boating race through Gore Canyon. This trail was once a continuous trail that began at boat launch 1 and traveled up the east side of the canyon. It was equipped with foot bridges, but is now missing segments and is no longer complete (Arkins 2006). Spectators of the Gore Canyon Race now illegally cross the railroad tracks to get a view of the festivities.

The canyon is too steep for any other types of recreation to occur in this reach of the Colorado River. This reach of the Colorado River, in addition to the Pumphouse to State Bridge reach, has also been the site of extreme triathlon events in the past. With the growth in popularity of these types of sporting events, it may be the site of future events.

Much of the adjacent lands along the Colorado River from Gore Canyon downstream to State Bridge are located within the BLM's Upper Colorado River Special Management Area, which requires intensive management to achieve specific recreation objectives and opportunities (BLM 1982).

6.1.4.5. Pumphouse to State Bridge

This reach of the Colorado River is located between the Pumphouse Recreation Area and State Bridge and provides the majority of the river-based recreation opportunities in the study area. Streamflow data were collected for only 10 years (1981-1990) at the USGS gage at Radium. The data show average monthly flows of 650 to 900 cfs from September through March and average monthly flows of 1,200 to 2,700 cfs from April through August (Earthinfo 2006). Flows are highest in August. Recreational activities include whitewater and flat water boating, angling, and adjacent uses such as camping, hot spring use, and hiking. The BLM allows the recreational use of the river and associated campgrounds through the use of a fee system. Private users of either the Pumphouse or Radium sites for boating purposes pay for a Recreational Use Permit. Users taking a commercial trip pay the outfitter, who holds a Special Recreation Permit with the BLM. Fees generated are used to maintain the site.

The Colorado River downstream of the Pumphouse Recreation Area includes about 11.6 miles of Class II and III water for intermediate kayakers and commercial and private rafters. Preferred flows for rafting this reach are between 2,000 and 3,000 cfs, and preferred minimum flows range between 400 and 800 cfs (Sommerhoff, pers. comm. 2006; Hydrosphere 2003); however, other sources have stated that the level should be at least 800 cfs (Costlow, pers. comm. 2006) (Table 5). Kayakers prefer flows of around 1,100 cfs, and find 400 cfs is a preferred minimum flow. For the period 1950-1996, average streamflows from Pumphouse to State Bridge remained above 800 cfs from April 29 through October 19. This is one of the State's more popular river runs and Pumphouse is Colorado BLM's most heavily used day-use site (Arkins, pers. comm. 2004).

The primary boating season is during the summer months of June to August. Although detailed information is not available, the distribution of boating use by month is estimated to be 18 percent in June, 42 percent in July, and 32 percent in August (Windsor, pers. comm. 2008). The remaining 8 percent of use occurs in May, September, and October. A total of 33 commercial rafting outfitters offer a variety of raft trips on the Upper Colorado River ranging in length from a half-day to three days. In 2004, two companies, Mad Adventures and Colorado River Runs, accounted for about 45 percent of the total guided rafting trips (BLM 2005). The BLM Kremmling Field Office reports total visitation for 2004 and 2005 of 44,566 and 42,247, respectively (BLM 2007b). These totals reflect the use of the Pumphouse and Radium recreation areas for boating, fishing, camping, and day uses. A breakdown of total commercial boating and fishing use numbers from 1999 to 2005 is provided in Table 6. Commercial numbers only reflect boating and fishing user days at Pumphouse and Radium on the Colorado River. Commercial boating user days in the upper Colorado River were estimated to be about 31,000 in 2006 and 32,000 in 2007 (CROA 2008).

Table 6. Total Annual Commercial Boating and Fishing Visitor Days (1999-2005) in the Pumphouse and Gore Canyon section of the Colorado River.

Year	1999	2000	2001	2002	2003	2004	2005
Commercial Boating	38,803	42,933	34,381	37,801	32,188	29,681	27,211
Commercial Fishing	1,560	1,671	1,537	1,992	1,745	3,552	2,225
Total Annual Commercial Visitors	40,363	44,604	35,918	39,793	33,933	33,233	29,436
Annual Percent Change		+9%	-19%	+10%	-14%	-2%	-11%

Source: BLM 2007b.

Fishing. The Colorado River between Pumphouse and State Bridge is a popular destination for anglers including both shore-based fishing and floatfishing. A "Wild Trout" waters CDOW management strategy is in place for the upper end of Gore Canyon downstream to the State Bridge, offering anglers the opportunity to fish for self-sustaining populations of wild trout. In 2005, 15 companies offered guided fishing trips on the Upper Colorado (Sterin, pers. comm. 2006). While there are no formal visitor counts along the Upper Colorado, the BLM estimates that there were about 30,000 to 40,000 annual user days in 2004 (Arkins, pers. comm. 2004).

Camping. Developed campground facilities are located at Pumphouse, Mugrage Campground, Radium, Rancho del Rio, and State Bridge (Table 4). Additional dispersed campgrounds are located within close proximity to Pumphouse, Radium, and State Bridge.

Some of these campsites—Benches, Island, Cabin, Cottonwood, Lone Tree, and the Radium Hot Springs—are located along the BLM portions of the Colorado River and are mostly accessible only by boat. Restroom facilities and metal fire rings are available at some of these locations. A breakdown of campgrounds and their associated campsites and boat launch facilities for all reaches of the Colorado River is provided in Table 4.

Other Recreation. Numerous roads and trails along the Colorado River between Kremmling and State Bridge lie within public lands (primarily managed by the BLM) and are used for hiking, hunting, mountain biking, scenic driving; and jeep, motorcycle, and Off Highway Vehicle (OHV) riding and driving. The Radium Hot Springs also draws visitors, both from the river and by foot from the nearby Trough Road (Grand County Road 1).

6.1.4.6. Willow Creek

The segment of Willow Creek between Willow Creek Reservoir and the Colorado River is not known to be used extensively for recreation. Most of this segment crosses private land and there are limited opportunities for public access. This portion of Willow Creek provides fishing opportunities on private lands. The creek is not large enough to support boating and there are no boating or land-based recreational uses on Willow Creek below Willow Creek Reservoir.

6.2. East Slope Recreation

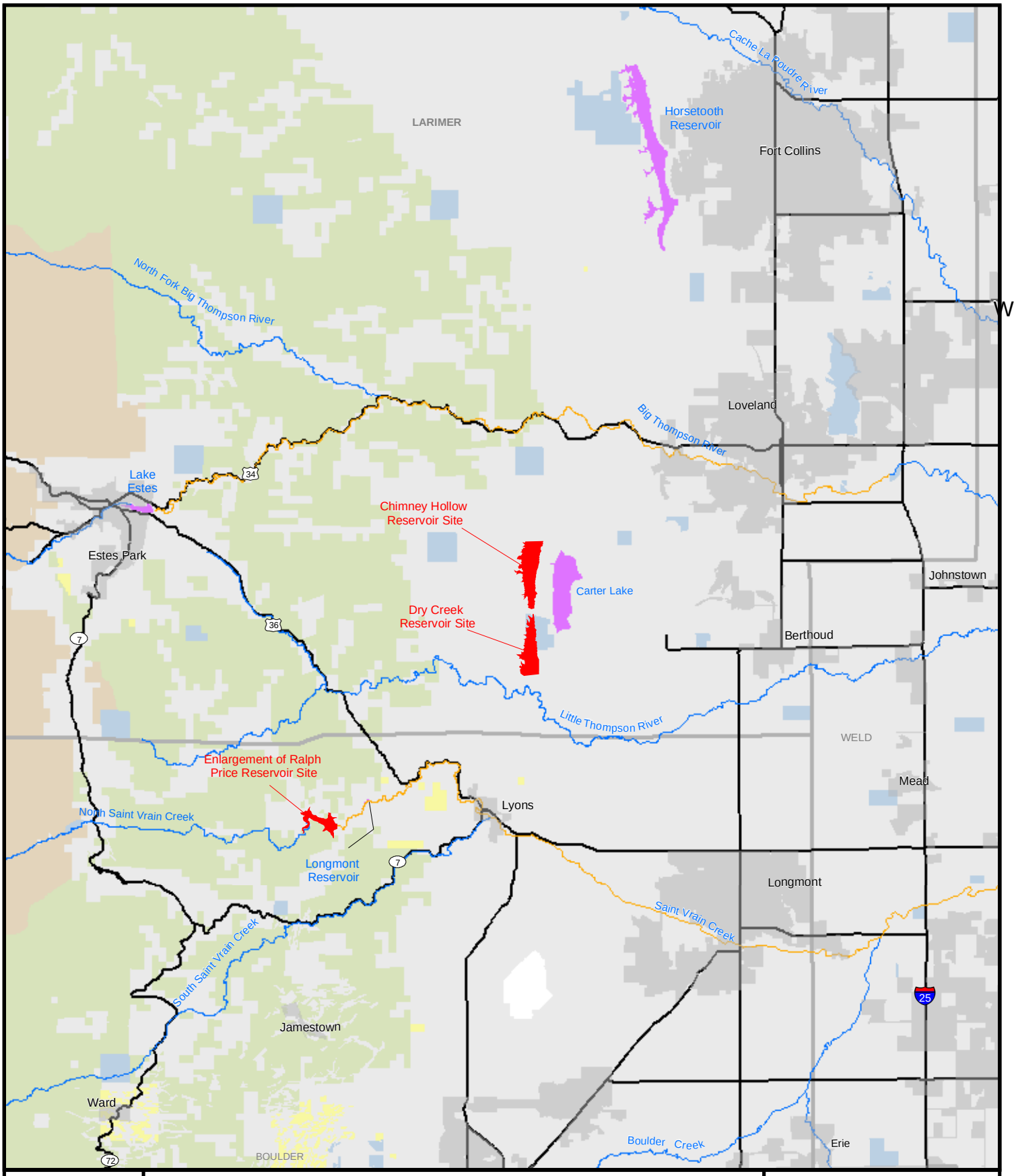
6.2.1. Recreation at Existing Reservoirs

Carter Lake and Horsetooth Reservoir in Larimer County provide year-round water- and land-based recreation opportunities including boating, fishing, camping, SCUBA, and hiking. Ralph Price Reservoir is located in Boulder County and provides opportunities for fishing, hiking, and wildlife viewing. Ralph Price is a walk-in only site, and boating and camping are not permitted (Figure 5). Additional information on these reservoirs is provided in the following sections.

6.2.1.1. Carter Lake

Land and water areas at Carter Lake are managed for public recreation purposes by the Larimer County Parks and Open Lands Department through an agreement with Reclamation (Figure 6). Recreation amenities at the 1,110-acre Carter Lake recreation site include campgrounds, a marina, three boat ramps, and about 4 miles of trails. Shoreline recreation activities are limited to developed sites rather than dispersed locations. Larimer County estimates the total number of day users during peak season weekends (May through September) to be approximately 2,200 (Fleming, pers. comm. 2003).

Boating. Two campgrounds—South Shore and North Pines—have boat launches. There is an additional boat ramp at the marina on the northeast edge of the reservoir. The marina has restaurant service, fishing and picnic supplies, firewood, boat mooring, gasoline, and boat rentals. Larimer County estimates average peak season weekend use to be 140 boats at low reservoir levels and 190 boats when the reservoir is full (Fleming, pers. comm. 2003). Based on historical water levels, the reservoir elevation ranges between 5,707 feet and 5,753 feet during



ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

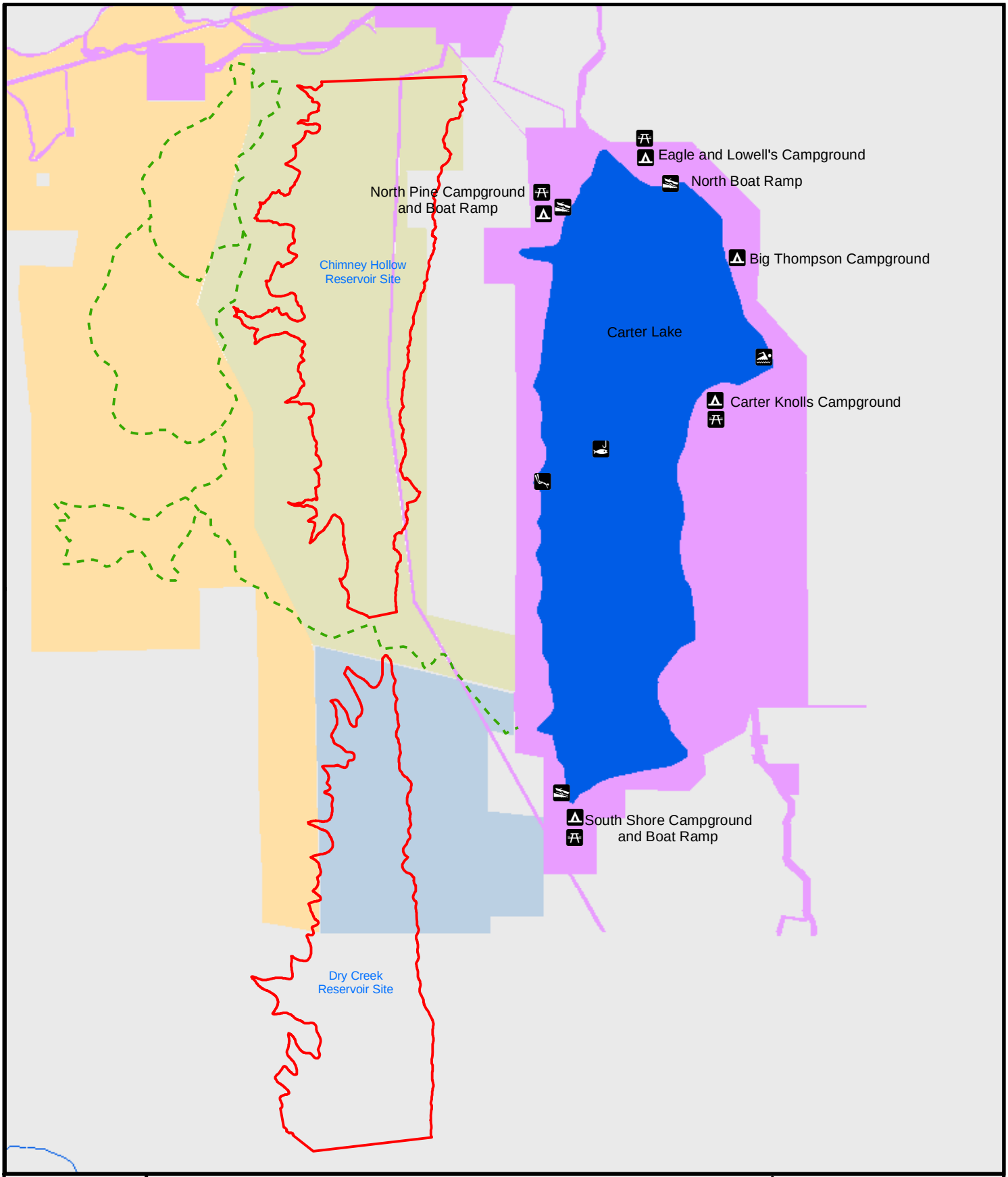
- Bureau of Land Management
- Colorado State Lands
- National Park Service
- Private
- United States Forest Service
- Existing Reservoirs
- Rivers and Streams Study Area
- Study Area Lakes
- Potential New or Enlarged Reservoirs

0 2.25 4.5 Miles

N

Figure 5
Recreation Study Area - East Slope

Prepared for: Windy Gap Firming Project
File: Rec_Fig5_East_Slope.mxd
October 2007



ERO
ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

Bureau of Reclamation
Colorado State Lands
SubDistrict
Private
Open Space Larimer City
Proposed Alternative Reservoirs
Proposed Trail
Fishing
Campground
Boatramp
Picnic Area
Swimming Area
Scuba Diving

0 1,500 3,000 Feet

N

Figure 6
Carter Lake

Prepared for: Windy Gap Firming Project
File: Rec_Fig6_Carter_Lake.mxd
October 2007

the May to September recreation season. The lower elevations of the boat ramps are:

- South: 5,695 feet
- North: 5,665 feet
- North Pines: 5,675 feet

Fishing. Fishing is allowed year-round from shore or boat, and species in the lake include rainbow trout, Snake River cutthroat, splake (a cross between a brook and lake trout), brown trout, walleye, yellow perch, kokanee salmon, and largemouth bass (Larimer County 2003).

Camping. Developed campgrounds are available on the north, east, and south sides of Carter Lake. Individual camps are reservable during peak season.

Hiking. Surrounding the lake are two hiking trails with a total trail length of about 4 miles. The Fawn Hollow trail, approximately 1 mile in length, is accessed from the north at the Dam One trailhead, and from the south at the Saddle trailhead. The Shoreline trail runs nearly the length of the east lakeshore and is 3 miles in length. The Shoreline trail is accessed from the north near the North Pines campground, and from the south at the South Shore campground. Portions of the Shoreline trail are accessible by wheelchair.

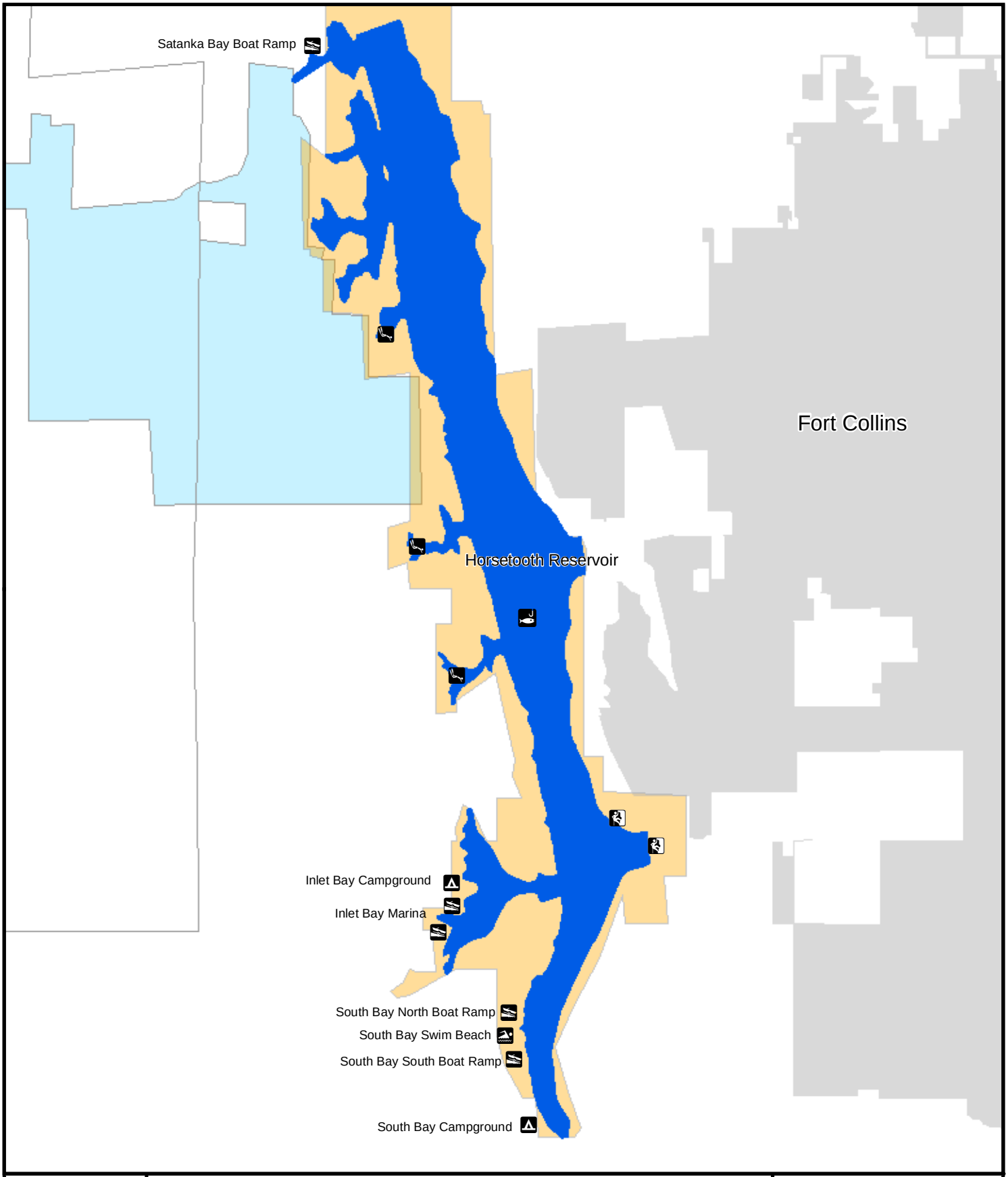
Other Recreation. Other recreation activities at Carter Lake are jet skiing, wind surfing, swimming, rock climbing, and SCUBA diving. Amenities include a volleyball court and horseshoe pits at South Shore, a swim beach on the east shore near Dam Two, and a playground at the Eagle Campground. The Bison Visitor Center is located about ½ mile north of the reservoir, and houses the Larimer County Parks and Open Lands Office.

6.2.1.2. Horsetooth Reservoir

Horsetooth Reservoir provides both land- and water-based recreation activities. The Larimer County Parks and Open Lands Department leases the property from Reclamation and administers recreation at the reservoir (Figure 7). Recreation facilities include four campgrounds, 111 campsites, eight boat-launch ramps, a public marina, and a developed public swim beach. On average, up to about 1,900 acres (or up to 2,143 acres when full to capacity) of water surface area is available for recreational use based on historical conditions. While formal visitation records are not maintained, it is estimated that there were about 700,000 visitor days at Horsetooth Reservoir in 2004 (Coffman, pers. comm. 2005). Use of the reservoir varies during the year, with the greatest activity occurring on the weekends and holidays from late May to early September. Although the reservoir is open year-round, it is susceptible to freezing during January and February, which makes boating opportunities unavailable.

Boating. Motorized boating is the primary recreation activity at Horsetooth Reservoir. Boaters access the reservoir from Inlet Bay, South Bay, and Satanka Cove. The lower elevations of existing boat ramps are:

- Inlet Bay – South: 5,370 feet
- Inlet Bay – Marina: 5,364 feet
- South Bay – South: 5,393 feet
- South Bay – North: 5,355 feet
- Satanka Cove: 5,385 feet



ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

Colorado State Lands
Private
Horsetooth Mountain Park
Fishing
Campground
Boatramp
Swim Area
Scuba Diving
Rock Climbing

0 2,000 4,000 Feet

1 Inch = 2500 Feet

N

Figure 7
Horsetooth Reservoir

Prepared for: Windy Gap Firming Project
File: Rec_Fig5_Horsetooth_Reservoir.mxd
October 2007

Approximately 123 acres of the reservoir are restricted to wakeless boating or are off limits to motorized boat traffic. These areas include the congested areas near boat ramps and docks, the swim beach, areas where boats are in slips or moorings, and narrow, high traffic areas like the neck of Inlet Bay. Other popular boating activities include pleasure boating, sailing, and canoeing/kayaking. Larimer County Parks and Open Lands staff estimate that the reservoir reaches capacity several times during the summer based on a current carrying capacity of 90 to 380 boats, depending upon the water surface available for boating (Coffman, pers. comm. 2005).

Fishing. Fishing is allowed year-round from shore or boat, and primary sport fish species include rainbow trout, crappie, smallmouth bass, white bass, largemouth bass, and walleye.

Camping. Camping is available at the South Bay Campground and Inlet Bay Campground, which are located along the south and southwest edges of the reservoir, respectively.

Hiking. Horsetooth Reservoir offers many miles of hiking trails both around the reservoir and in the adjacent Horsetooth Mountain Park.

Other Recreation. Other popular water-based recreation activities include water skiing, jet skiing, wind surfing, SCUBA, and swimming. The swim beach has an elevation of 5,333 feet. The sandstone cliffs around and adjacent to Horsetooth Reservoir are also popular rock climbing areas.

6.2.1.3. Ralph Price Reservoir

Ralph Price Reservoir, with a surface area of 227 acres, is located on North St. Vrain Creek about 7 miles west of Lyons. The reservoir is within Button Rock Preserve, which is bordered by Boulder County Open Space, U.S. Forest Service lands, and private property. No boating or camping is permitted. A special fishing permit is required to fish at Ralph Price Reservoir, and the City of Longmont issues only 600 permits each year. Longmont estimates that there were about 17,000 visitor days in 2004 (Huson, pers. comm. 2005).

Fishing. Fishing is permitted at Ralph Price Reservoir between May 1 and October 31. The reservoir is stocked with brown and rainbow trout and splake.

Other Recreation. Hiking and wildlife viewing within Button Rock Preserve, which is adjacent to Ralph Price Reservoir, are popular much of the year.

6.2.2. Recreation at Potential Reservoir Sites

6.2.2.1. Chimney Hollow

The proposed Chimney Hollow reservoir site is currently owned by the Subdistrict and is closed to public use. Larimer County Parks and Open Lands owns the 1,847-acre Chimney Hollow Open Space property immediately west of the proposed reservoir site (Figure 6). Recreation activity on these open space lands is currently limited. Larimer County has plans to develop a parking area, trailhead, and about 10 miles of trails in Chimney Hollow Open Space. Recreation activities planned on the Open Space property include hiking, biking, and horseback riding. If a reservoir were built at the Chimney Hollow site, Larimer County would manage recreation uses on the reservoir, which are anticipated to include nonmotorized boating and fishing. The area would be open on a day use basis only with no overnight stays.

6.2.2.2. Dry Creek

The proposed Dry Creek reservoir site is currently under private and public ownership (State Land Board) and there is no public recreation use (Figure 6). However, if developed it is expected that the area would be managed similar to the proposed Chimney Hollow site.

6.2.3. River Recreation

6.2.3.1. St. Vrain and North St. Vrain Creeks and Big Thompson River

Portions of the Big Thompson River and St. Vrain Creek are included within the study area where potential changes in streamflow would occur (Figure 8 and Figure 9).

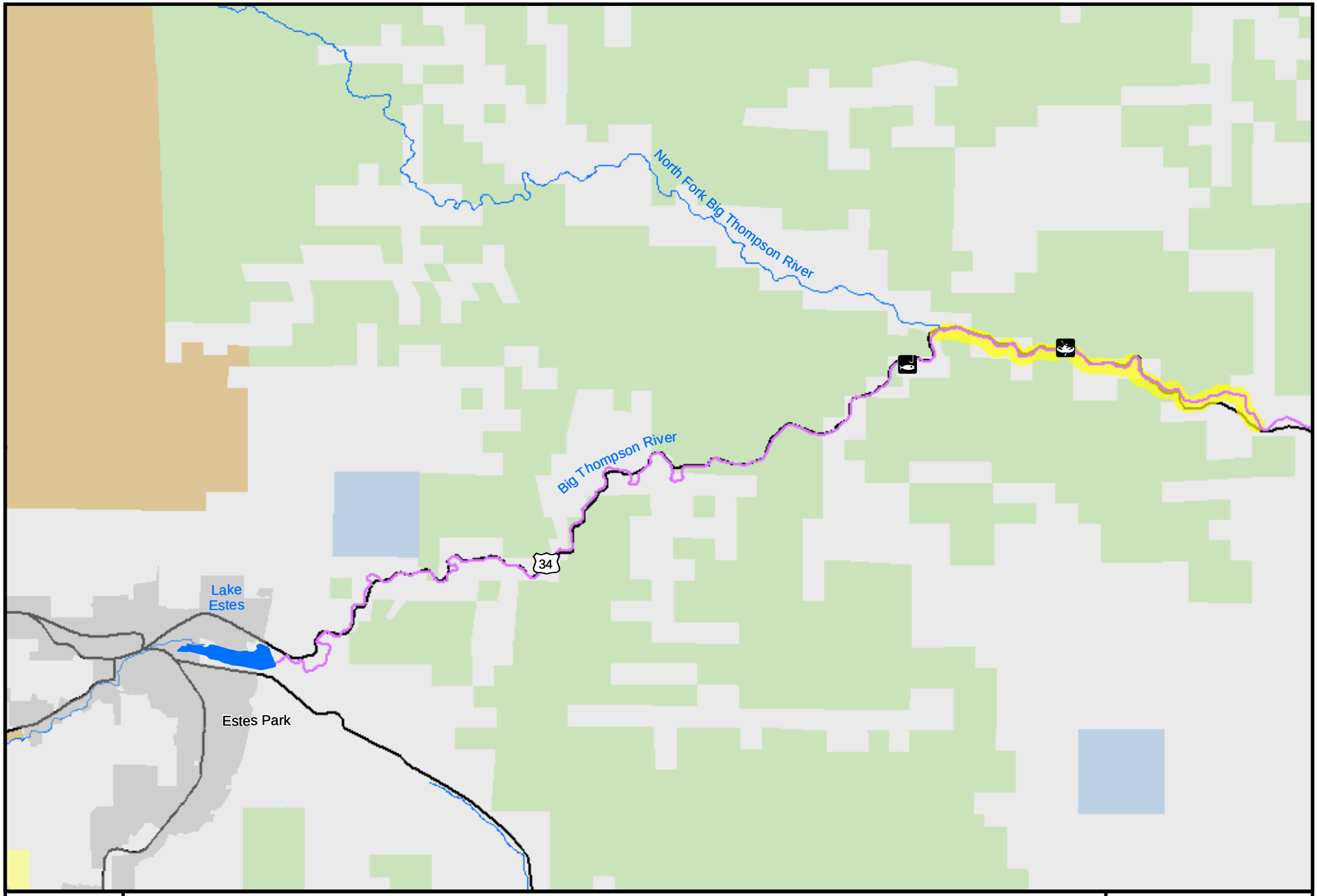
Fishing. North St. Vrain Creek, St. Vrain Creek, and the Big Thompson River offer fishing opportunities for several trout species including rainbow and brown trout (Miller Ecological 2008). Brown trout are the predominant species at lower elevations. Fishing opportunities are available on both public and private lands.

Boating. According to the USGS gage near Drake, average monthly flows on the Big Thompson River range from 21 to 90 cfs in September through April and 150 to 440 cfs from May through August. Flows are highest in June (Earthinfo 2005). Big Thompson Canyon from the town of Drake and 6.2 miles downstream is a destination for some kayakers, offering Class IV rapids when the river is above 400 cfs (Banks and Eckardt 1999). This run rarely has high enough water for kayaking and is not used by commercial or private rafts. Several boating runs occur on North St. Vrain Creek within the study area (Banks and Eckardt 1999). All of these runs are used by private kayakers, and are not used by commercial or private rafters. Boating is not permitted between Ralph Price Reservoir and Longmont Reservoir. Along North St. Vrain Creek below Longmont Reservoir, there are three kayak runs of varying difficulty (Figure 9):

- Longmont Reservoir to CR 80: 2 miles of Class V rapids (Section 1)
- CR 80 to Apple Valley Road: 2.4 miles of Class III water (Section 2)
- Apple Valley Road to downtown Lyons: 4.2 miles of Class III water (Section 3)

Boating reportedly occurs on the North St. Vrain when flows are between 150 and 500 cfs, making June and July the only months that it is boatable under average conditions (Banks and Eckardt 1999).

The Town of Lyons has a whitewater park for kayakers at Meadow Park on south St. Vrain Creek. Flows of 200+ cfs are preferred; however, the park is used by kayakers down to 60 cfs (Boulder Outdoor Center 2006). Depending on the flows available, the park is typically used in late May through early July.



ERO
ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

- Bureau of Land Management
- Colorado State Lands
- National Park Service
- Private
- United States Forest Service
- Popular Boating Destination
- Fishing
- Boating
- Rivers and Streams Study Area
- Study Area Lakes

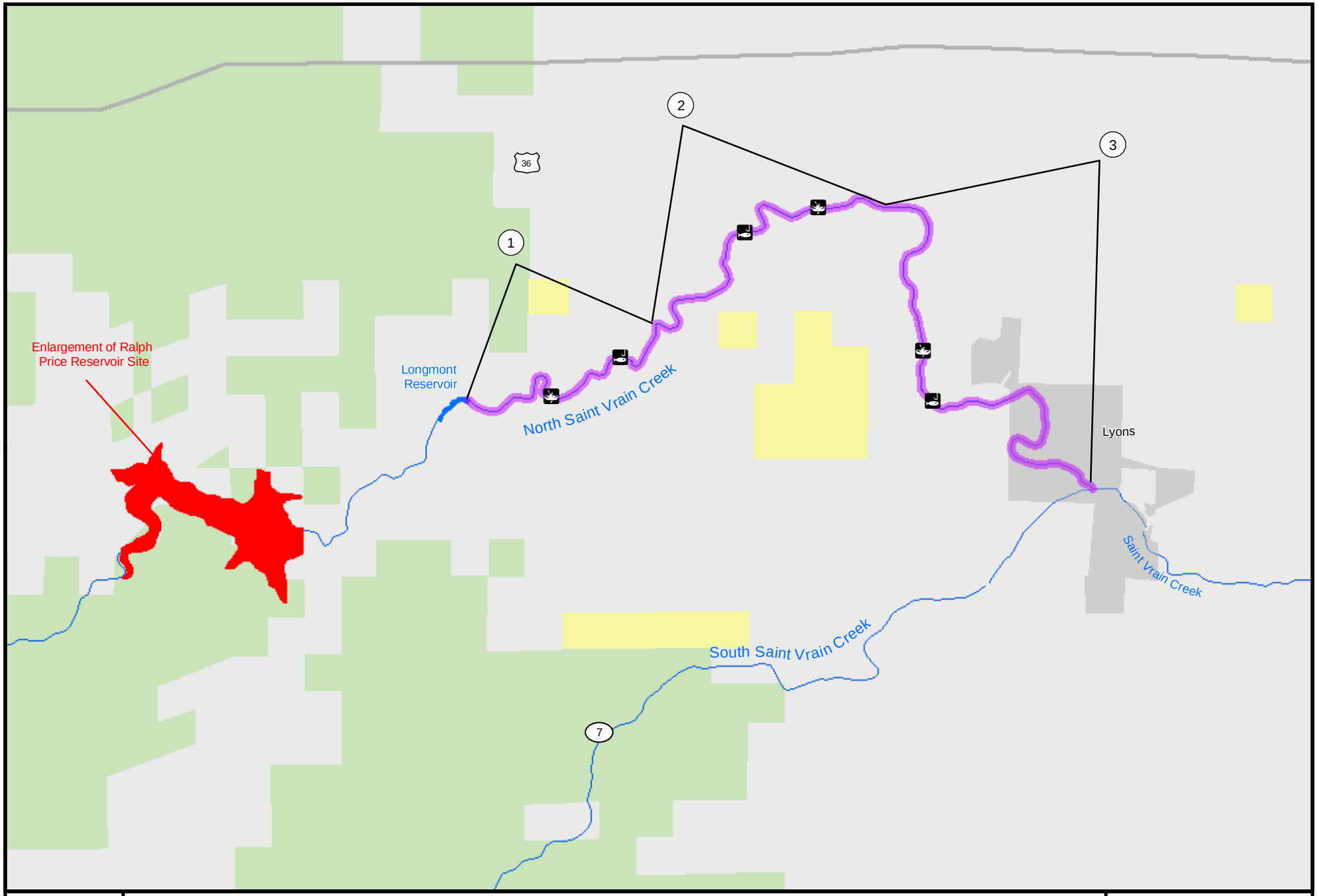
0 0.75 1.5 Miles

1 Inch = 1.5 Miles

N

Figure 8
Big Thompson River Canyon Recreation

Prepared for: Windy Gap Firming Project
File: Rec_Fig7_Big_Thompson_Canyon.mxd
October 2007



ERO Resources Corp.
1842 Clarkson Street
Denver, CO 80218
(303) 830-1188
Fax: 830-1199

- Bureau of Land Management
- Colorado State Lands
- National Park Service
- Private
- United States Forest Service
- Enlarged Reservoir
- Popular Boating Destination

- Fishing
- Boating
- ① Longmont Reservoir to County Road 80
- ② County Road 80 to Apple Valley Road
- ③ Apple Valley Road to Downtown Lyons

0 2,250 4,500 Feet

1 Inch = 4,500 Miles

N

Figure 9
North St. Vrain Creek Area

Prepared for: Windy Gap Firming Project
File: Rec_Fig7_St_Vrain_Creek_Area.mxd
October 2007

6.2.3.2. Other East Slope Rivers

The study area also includes the lower portions of the Big Thompson River (Loveland to the South Platte River), and St. Vrain Creek (Longmont to the South Platte River), Big Dry Creek (Broomfield to the South Platte River), and Coal Creek from Superior to Boulder Creek. While portions of these creeks and rivers may support occasional water-based recreational use such as fishing, wildlife viewing, or inner tubing, such use is very infrequent.

7.0 ENVIRONMENTAL CONSEQUENCES

This section describes the direct and indirect effects to water-based recreation resources in the study area for each of the alternatives.

7.1. Methods

Potential recreation effects were based primarily on changes in hydrologic conditions at affected streams and reservoirs for each of the alternatives. Average monthly and daily hydrological data for average, dry, and wet years was considered in the evaluation. Average conditions were defined as the average of water levels or streamflows for the years 1950 through 1996. Wet and dry year averages were calculated by averaging the 5 wettest and 5 driest years in the same time period. In addition, estimated daily flow for the Colorado River was used to evaluate how flow changes could affect boating. Hydrological data is found in the Windy Gap Firming Project Water Resource Report (ERO and Boyle Engineering 2007). Potential effects to angling were based on the results of the fish and aquatic life effects presented in the Aquatic Resources Technical Report (Miller Ecological 2008).

To evaluate changes in reservoir recreation opportunities, potential effects were evaluated by comparing water surface area under existing conditions with projected values under Alternative 1 (No Action) and with other alternatives. Because of the similarity in effects between Alternatives 3, 4, and 5, values from Alternative 5, which are representative of all three alternatives, are shown in the tables and figures comparing alternatives. In general, a decrease in reservoir surface area would be considered a negative effect, although a measurable effect in recreation use or the quality of the experience is difficult to quantify. The analysis also considered how changes in water levels may affect use of existing recreation facilities, such as boat ramp access.

The effects analysis does not attempt to correlate potential changes in reservoir water levels with visitor use. Studies in the Arkansas River basin (Smith and Hill 2000) indicate that water levels in reservoirs do not generally influence people's behavior patterns and it would be speculative to attempt to draw such conclusions about future visitor use patterns based on reservoir elevations. However, Smith and Hill showed a strong correlation between water surface area available for recreation and user satisfaction.

For river-based recreation on the Colorado River, Willow Creek, Big Thompson River, North St. Vrain Creek, and St. Vrain Creek, hydrological data for each alternative were used to evaluate how changes in river flows under each alternative would potentially affect recreational opportunities and the quality of the recreation experience. Potential effects to boating were based on the amount of streamflow (in cfs) for each of the alternatives in comparison with available information on the preferred range of flows for kayaking or rafting.

For the Colorado River, potential effects to rafting and kayaking were determined by evaluating changes in average monthly streamflow and changes in daily flow. Flow changes were evaluated at the three segments of the Colorado River where boating occurs: Byers Canyon near the Hot Sulphur Springs gage, and in the Big Gore Canyon and Pumphouse reaches of the river represented by the Kremmling gage. Average monthly flow data provide a graphical representation of the changes in streamflow in relation to boating preferences. Daily hydrologic data was used to estimate the change in the number of days when preferred rafting and kayaking flows would occur. This involved an analysis of the number of days during the boating season when flows would be within preferred ranges for rafting or kayaking. Daily data from the 47-year hydrologic period of record (1950-1996) indicated the number of days when flows fell within a preferred boating range, the average change in the number of days per year that preferred flows would occur compared to existing conditions, and the range of change in the number of days per year that preferred flows for boating would occur compared to existing conditions. The analysis of daily data also indicated the frequency of flow changes based on the number of years in the period of record that there would be a change in boating flows for each of the alternatives.

Potential effects to recreation for Colorado River reaches eligible for designation under the Wild and Scenic Rivers Act are discussed, but no determination is made on whether this would affect the suitability of these reaches for designation. The BLM is currently evaluating suitability as part of the Resource Management Plan revision.

7.1.1. Recreation Seasons

As described under each resource type in the Affected Environment section, the effects analysis focuses on the peak recreation season—May through September. The peak visitor use season is typically shorter on the West Slope due to higher elevations, greater distances from Front Range population centers, and colder temperatures. However, commercial outfitters still do business on the West Slope during the months of May and September; therefore, these months were included in the analysis. Recreational use on the West Slope is also bolstered during the summer months by out-of-state tourists. Conversely, East Slope reservoirs are generally warmer in the late spring and early fall, and attract a large proportion of Front Range residents who seek recreation opportunities closer to home.

7.2. West Slope Reservoirs

West slope reservoirs that may have impacts are discussed below. Green Mountain Reservoir, located in Summit County along the Blue River, would not be affected by any operations of Windy Gap; therefore, no effects to recreation are anticipated.

7.2.1. Grand Lake and Shadow Mountain Reservoir

No changes in surface water elevation at Grand Lake and Shadow Mountain Reservoir would occur under any of the alternatives because as part of the C-BT Project, Reclamation limits reservoir fluctuations to no more than 1 foot from the top of the conservation pool. Information from the Lake and Reservoir Water Quality Report (AMEC 2008) indicates there would no change in water quality parameters that exceed recreational water quality standards for recreation use. Reduced water clarity and algal growth has been a concern in Grand Lake and Shadow Mountain Reservoir that may contribute to a diminished recreation experience (Stahl and

Crabtree 2005). Predicted small reductions in water clarity would continue or slightly increase the potential for a diminished recreation experience under all of the alternatives. The Aquatic Resources Technical Report (Miller Ecological 2008) concluded that predicted minor changes in dissolved oxygen levels and no change in the trophic status in these reservoirs are unlikely to affect the fish communities in Grand Lake and Shadow Mountain Reservoir. Thus, there would be no effect to recreational fishing opportunities at these lakes for any of the alternatives.

7.2.2. Willow Creek Reservoir

Water surface elevation and surface area would not be affected at Willow Creek Reservoir under any of the alternatives and hence there would be no effect to boating, fishing, or other recreation activities for any of the alternatives.

7.2.3. Granby Reservoir

7.2.3.1. Summary of Effects on Granby Reservoir Hydrology

The average monthly surface area of Granby Reservoir would decrease less than 140 acres or about 2 percent from existing conditions under the No Action alternative during the recreation season in average conditions (Table 7). Under the Proposed Action the average monthly decrease in surface area would be about 350 acres or a 6 percent decrease from existing conditions and Alternatives 3 to 5 would have less than a 3 percent decrease in surface area. In average conditions the No Action Alternative would result in an average reduction in the lake level of 2 feet through the summer recreation season (June through August) compared to existing conditions. The Proposed Action would reduce the level of Granby Reservoir by the greatest amount, with May having the largest drop in lake level. All of the alternatives including No Action would result in lower lake levels in Granby Reservoir than under existing conditions.

Table 7. Average Monthly Changes in Granby Reservoir Water Levels and Surface Area in Average Conditions.

Alternative	May		June		July		August		September	
Existing Conditions	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**
	8,253	**5,970**	**8,263**	**6,440**	**8,268**	**6,722**	**8,269**	**6,750**	**8,268**	**6,691**
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	-3	-140	-2	-113	-2	-90	-2	-88	-2	-96
Alt 2 – Proposed Action	-7	-351	-6	-281	-5	-225	-5	-226	-5	-251
Alt 3 – 5	-3	-167	-4	-174	-3	-147	-3	-143	-3	-150

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

In wet years the No Action Alternative and Alternatives 3 to 5 would result in a decrease in Granby Reservoir surface area of less than 4 percent compared to existing conditions, while the Proposed Action would reduce the surface area by less than 6 percent (Table 8).

Table 8. Average Monthly Changes in Granby Reservoir Water Levels and Surface Area in Wet Years.

Alternative	May		June		July		August		September	
Existing Conditions	Elev	SA	Elev	SA	Elev	SA	Elev	SA	Elev	SA
	8,253	5,968	8,266	6,619	8,277	7,151	8,280	7,298	8,280	7,297
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	-5	-223	-4	-190	-2	-84	0	0	0	-2
Alt 2 – Proposed Action	-8	-388	-6	-302	-3	-167	-1	-45	-1	-27
Alt 3 – 5	-5	-246	-5	-254	-3	-148	-1	-49	-1	-36

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

In dry years there would be decreases in Granby Reservoir surface area from existing conditions of less than 2 percent in the summer under the No Action alternative, less than 7 percent for the Proposed Action, and less than 3 percent for Alternatives 3 to 5 (Table 9). The greatest decrease in Granby Reservoir surface elevations would occur during consecutive dry years. Under the Proposed Action, water level decreases of up to 22 feet could occur during consecutive dry years in the peak recreation season compared to existing conditions (ERO and Boyle 2007). Under the No Action Alternative, during successive dry years the largest drop in lake level that would occur would be about 18 feet. Under Alternatives 3 to 5, the largest decrease in the level of the lake would be 5 feet.

Table 9. Average Monthly Changes in Granby Reservoir Water Levels and Surface Area in Dry Years.

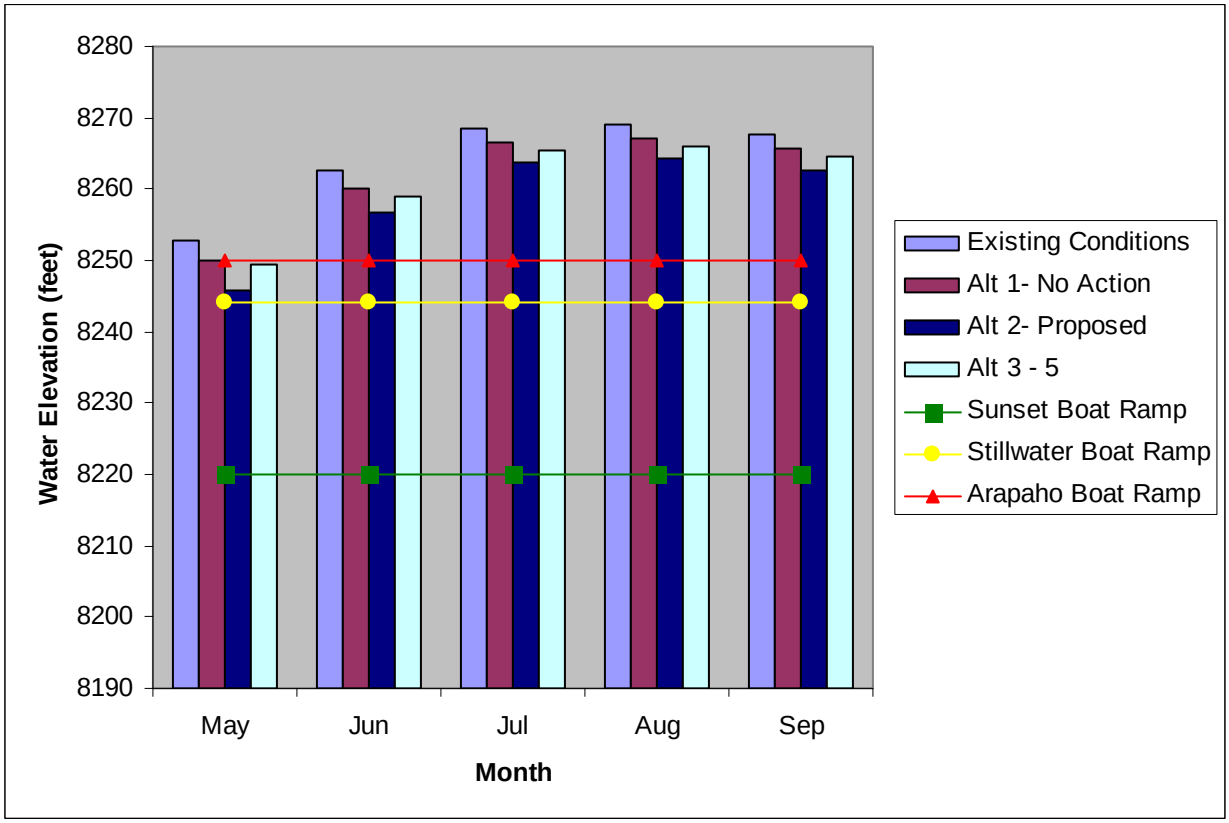
Alternative	May		June		July		August		September	
Existing Conditions	Elev	SA	Elev	SA	Elev	SA	Elev	SA	Elev	SA
	8,253	5,988	8,256	6,108	8,255	6,076	8,252	5,910	8,248	5,727
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	-2	-103	-2	-100	-2	-101	-2	-106	-2	-116
Alt 2 – Proposed Action	-5	-263	-5	-256	-5	-259	-6	-311	-8	-391
Alt 3 – 5	-2	-84	-2	-91	-2	-93	-2	-118	-3	-154

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

7.2.3.2. Boating

As shown in Figure 10, in average conditions, none of the alternatives would affect boat access to existing Granby Reservoir boat ramps during the June to August recreation season. All of the alternatives, except No Action, would lower water levels below the bottom of the Arapaho Bay boat ramp during May.

Figure 10. Average Monthly Water Levels at Granby Reservoir Boat Ramps.



Boat ramps remain accessible under existing conditions during the summer recreation season in dry years. All of the alternatives in dry years would lower Granby Reservoir below the bottom of the Arapaho Bay boat ramp (8,250 feet) in August, while the Proposed Action would do so in both May and August. In June and July, the water elevation would be at 8,250 feet, which may affect use of the Arapaho Bay boat ramp. None of the other boat ramps would be affected during the summer recreation season in dry years.

During periods of consecutive dry years, lake levels under all alternatives and existing conditions could drop below the Arapaho Bay (8,250 feet) and Stillwater (8,244 feet) boat ramps during a portion of the summer recreation season. The Proposed Action alternative could decrease water levels below the Sunset Boat ramp in consecutive dry years, which would eliminate boat access from all three boat ramps.

7.2.3.3. Fishing

Lower average water levels under all of the alternatives would not affect accessibility for shoreline fishing, but in dry years when reservoir levels are low, mud flats in portions of the shoreline might affect access. The Aquatic Resource Report (Miller Ecological 2008) concluded that minor changes in water elevations, a slight decrease in dissolved oxygen levels, and the lack of change in the trophic status is unlikely to affect fish communities in Granby Reservoir. Thus, there would be no adverse effect to fishing success at Granby Reservoir for any of the alternatives.

7.2.3.4. Camping and Hiking

Changes in reservoir storage would not directly affect camping adjacent to Granby Reservoir. Similarly, other land-based recreation such as hiking would not be directly affected. Camping, hiking, and shoreline activities could decrease during periods of low water levels and when less boat ramp access is available.

7.2.3.5. Visitor Use and Experience

The relatively small reduction in boatable area on this large reservoir in most years is unlikely to noticeably affect recreation use of the reservoir or the quality of the recreation experience under any of the alternatives. Additional exposed shoreline at lower water levels could reduce the aesthetic value and affect the quality of the visitor experience. During a sequence of dry years, there would be reduced access to boat ramps under all of the alternatives, which may reduce the number of visitors and quality of the recreational experience at Granby Reservoir. Visitor user days have historically declined during dry or drought years, although this may be due to factors other than water levels, including campfire restrictions and weather (Orr 2008).

7.2.4. Potential New West Slope Reservoirs

7.2.4.1. Rockwell/Mueller Creek Reservoir

Construction of a new Rockwell/Mueller Creek Reservoir in Alternatives 4 and 5 would not affect any existing recreation facilities. Very little recreational use currently occurs on the publicly accessible (BLM) portion of the site. Following construction, some recreation such as fishing and boating may occur at the reservoir. Rockwell/Mueller Reservoir may support fishing, but substantial seasonal fluctuations and low water levels during the winter months could affect the establishment of a viable fishery (Miller Ecological 2008). Although recreation use is possible, no agency has been identified to manage recreation at a new reservoir.

7.2.4.2. Jasper East Reservoir

Construction of Jasper East Reservoir in Alternative 3 would not affect any publicly accessible recreation opportunities. Jasper East Reservoir could support fishing, but substantial seasonal fluctuations and very low water levels during the winter months could affect productivity. Reservoir construction would require relocation of the model airplane facility and County Road 40 that is used to access Willow Creek Reservoir and other recreation opportunities on Forest Service lands. The road would need to be rerouted around the reservoir to provide access to Willow Creek Reservoir. The model airplane facility also could be relocated. Although recreation use is possible, no agency has been identified to manage recreation at a new reservoir.

7.3. East Slope Reservoirs

7.3.1. Ralph Price Reservoir

Recreation at Ralph Price Reservoir would be affected only under the No Action Alternative. The size of the reservoir would be increased by about 77 acres. It is anticipated that recreation at the reservoir would be suspended during construction. Detailed information on the construction schedule for expanding Ralph Price Reservoir is not currently available but it is estimated to take about 2 years. During this time, no fishing, hiking, or wildlife viewing would be allowed due to

the temporary closure of the Button Rock Preserve and Ralph Price Reservoir. Potential increases in visitor use at other locations in the northern Front Range area from the temporary loss of recreation access at Ralph Price would be minor and dispersed over a number of different locations.

Following construction, angling, hiking, and wildlife viewing would be opened to the public. Fishing use may remain low for the first few years following construction because it would take several years to restore fish populations to pre-construction levels (Miller Ecological 2008). The larger reservoir would provide additional fish habitat and benefits to recreational fishing. The existing trail around portions of the reservoir would be inundated; therefore, trail relocation would be required. Recreational use following construction and refilling would be similar to existing conditions.

7.3.2. Carter Lake

7.3.2.1. Summary of Effects on Carter Lake Hydrology

Carter Lake surface area would decrease less than 1 percent and the surface elevation would decrease less than 1 foot from existing conditions during the peak recreation season under all the alternatives in average conditions (Table 10).

Table 10. Average Monthly Changes in Carter Lake Elevation and Surface Area in Average Conditions.

Alternative	May		June		July		August		September	
Existing Conditions	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**
	5,753	**1,119**	**5,751**	**1,115**	**5,741**	**1,170**	**5,721**	**980**	**5,707**	**913**
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	-1	-2	-1	-4	-1	-6	-1	-6	-1	-5
Alt 2 – Proposed Action	-1	-4	-1	-4	-1	-3	0	-2	0	-1
Alt 3 – 5	-1	-2	-1	-4	-1	-5	-1	-4	-1	-3

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

In wet years, all of the alternatives would reduce the water surface elevation by less than 2 feet throughout the peak recreation season (Table 11). In dry years, there would be no change in Carter Lake water levels for any of the alternatives during the recreation season, except for a 1-foot reduction from May to July under Alternatives 3 to 5 (Table 12). During successive dry years, lake levels could drop up to 7 feet under the No Action Alternative, as much as 27 feet under the Proposed Action, and about 2 feet for other alternatives compared to existing conditions. The chance of a decrease in the elevation of Carter Lake exceeding 4 feet under any conditions would be 6 percent for the Proposed Action.

Table 11. Average Monthly Changes in Carter Lake Elevation and Surface Area in Wet Years.

Alternative	May		June		July		August		September	
Existing Conditions	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**
	5,752	**1,118**	**5,756**	**1,130**	**5,753**	**1,121**	**5,736**	**1,049**	**5,718**	**964**
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	0	-2	-1	-3	-1	-6	-2	-9	-2	-12
Alt 2 – Proposed Action	-2	-9	-2	-5	-2	-6	-2	-9	-2	-10
Alt 3 – 5	0	-1	-1	-2	-1	-6	-2	-8	-2	-10

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

Table 12. Average Monthly Changes in Carter Lake Elevation and Surface Area in Dry Years.

Alternative	May		June		July		August		September	
Existing Conditions	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**
	5,754	**1,124**	**5,750**	**1,107**	**5,736**	**1,048**	**5,716**	**956**	**5,704**	**900**
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	0	-1	0	-2	0	-2	0	-1	0	0
Alt 2 – Proposed Action	0	0	0	0	0	1	0	2	0	2
Alt 3 – 5	-1	-2	-1	-2	-1	-2	0	-2	0	-2

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

7.3.2.2. Boating

None of the alternatives under average conditions, wet, dry, or even successive dry years would cause the water level to decrease below the lower elevation of any of the boat ramps. Therefore, recreational boating would be unaffected by any of the alternatives.

7.3.2.3. Fishing

Predicted lower average water levels at Carter Lake with no change in the lake's trophic status are unlikely to substantially impact the fish community under any of the alternatives (Miller Ecological 2008). Thus, none of the alternatives would measurably affect fishing opportunities at Carter Lake.

7.3.2.4. Camping and Hiking

Minor projected changes in reservoir surface area for any of the alternatives are unlikely to measurably affect the availability or quality of land-based recreation activities such as camping and hiking.

7.3.2.5. Other Recreation

Other types of recreation such as swimming, wind surfing, SCUBA diving, and rock climbing would not be affected by any of the alternatives.

7.3.2.6. Visitor Use and Experience

The small projected changes in Carter Lake water surface area under all of the alternatives are unlikely to adversely affect visitor numbers or recreation activities. A large decline in surface area after several consecutive dry years, particularly under the Proposed Action, could diminish the overall quality of the user experience by increasing the distance between land-based facilities and the water surface, and potentially reducing the overall aesthetics of the experience.

7.3.3. Horsetooth Reservoir

7.3.3.1. Summary of Effects on Horsetooth Reservoir Hydrology

The No Action Alternative would not affect water levels during the peak recreation season in Horsetooth Reservoir under average conditions (Table 13). The Proposed Action would reduce average monthly water surface area less than 5 percent or from 3 to 83 acres compared to existing conditions. Alternatives 3 to 5 would reduce monthly average lake surface area to about 30 acres or 2 percent.

Table 13. Average Monthly Changes in Horsetooth Reservoir Elevation and Surface Area in Average Conditions.

Alternative	May		June		July		August		September	
Existing Conditions	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**
	5,416	**1,834**	**5,420**	**1,892**	**5,418**	**1,854**	**5,406**	**1,703**	**5,396**	**1,579**
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	0	-2	0	-4	0	-6	0	-6	0	-5
Alt 2 – Proposed Action	-6	-83	-6	-79	-6	-74	-4	-55	-3	-38
Alt 3 – 5	-2	-30	-2	-26	-2	-25	-1	-16	-1	-8

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

In wet years, the Proposed Action would reduce lake surface area less than 5 percent (79 acres) and Alternatives 3 to 5 less than 1 percent (18 acres) compared to existing conditions during the summer recreation season or up to a 79 acre decrease in reservoir surface area in May (Table 14).

Table 14. Average Monthly Changes in Horsetooth Reservoir Elevation and Surface Area in Wet Years.

Alternative	May		June		July		August		September	
Existing Conditions	Elev	SA	Elev	SA	Elev	SA	Elev	SA	Elev	SA
	5,419	1,872	5,425	1,962	5,425	1,955	5,415	1,820	5,404	1,684
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	0	-4	0	-3	0	-4	0	-5	0	-5
Alt 2 – Proposed Action	-6	-79	-4	-55	-3	-51	-4	-54	-4	-54
Alt 3 – 5	-1	-18	-1	-10	-1	-9	-1	-7	0	-6

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

During dry years, the Proposed Action would reduce water levels during the summer recreation season between 3 and 9 feet or a reduction in surface area by up to 109 acres in July (Table 15). Likewise, Alternatives 3 to 5 would reduce water levels by up to 5 feet or a reduction in surface area by up to 66 acres. During a sequence of dry years, under the Proposed Action the lake level would decline between 35 and 40 feet below existing conditions during the recreation season. The chance of a decrease in Horsetooth Reservoir of more than 10 feet in any given year would be about 15 percent under the Proposed Action.

Table 15. Average Monthly Changes in Horsetooth Reservoir Elevation and Surface Area in Dry Years.

Alternative	May		June		July		August		September	
Existing Conditions	Elev	SA	Elev	SA	Elev	SA	Elev	SA	Elev	SA
	5,411	1,769	5,411	1,764	5,405	1,697	5,395	1,565	5,386	1,458
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	0	2	0	1	0	-3	0	-6	0	-4
Alt 2 – Proposed Action	-8	-94	-8	-102	-9	-109	-7	-84	-3	-46
Alt 3 – 5	-5	-59	-5	-63	-5	-66	-3	-44	-1	-14

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

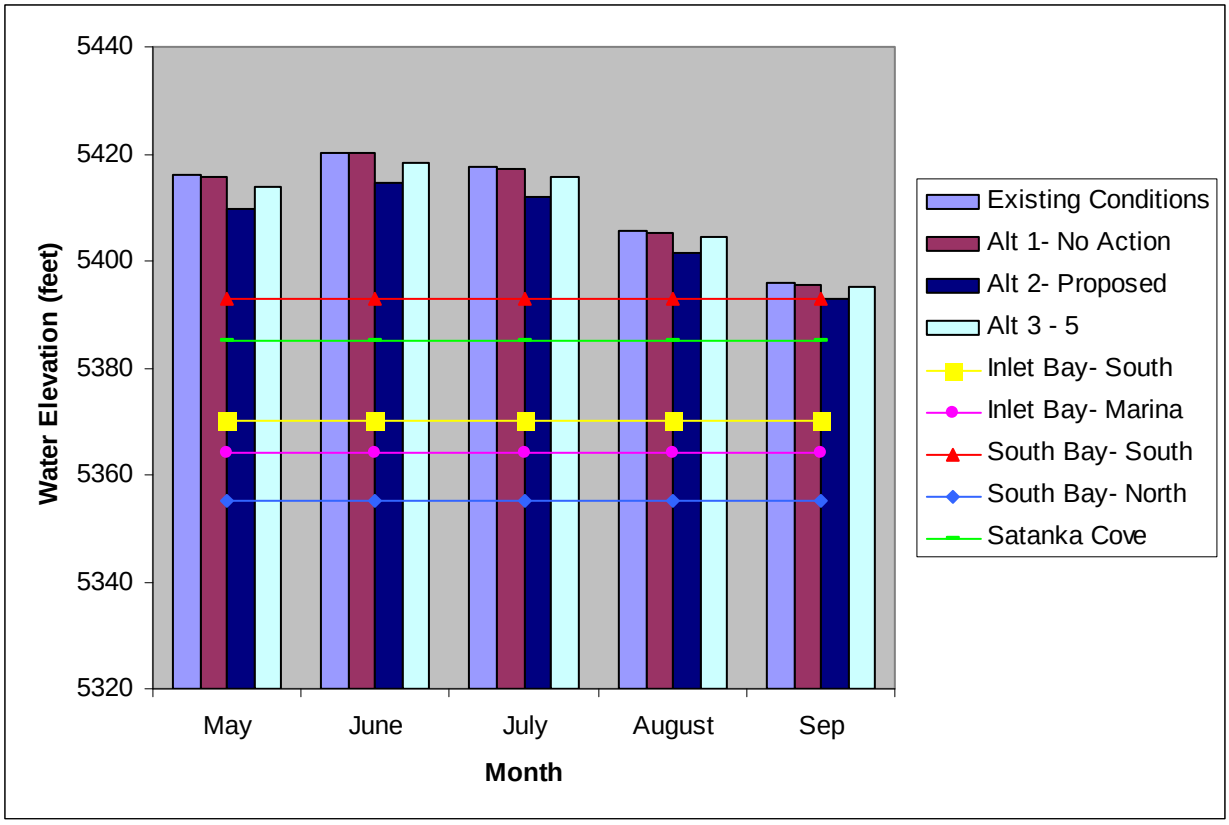
7.3.3.2. Boating

Under average conditions, the Proposed Action would reduce the lake elevation in September to 5,393 feet. This could affect the accessibility and use of the South Bay – South boat ramp, whose bottom elevation is also 5,393 feet. None of the other alternatives would affect boating access under average conditions, and none of the alternatives would affect boating access under wet conditions. The lower elevation of each of the boat ramps and the predicted direct effects of each alternative under average conditions are shown in Figure 11. A reduction in water surface area of up to 83 acres for the Proposed Action and 6 acres or less for other alternatives would slightly reduce boating capacity from existing conditions.

In dry years, all of the alternatives would lower lake levels to an elevation that is at or below the South Bay – South boat ramp in August, and at or below both the South Bay – South and Satanka Cove boat ramps in September. Lake levels in dry years already drop to at or below

both of these ramps in September under existing conditions. The lost use of these boat ramps, and a related decrease in lake surface area in August of dry years could affect the availability of boating opportunities.

Figure 11. Average Monthly Water Levels at Horsetooth Reservoir Boat Ramps.



7.3.3.3. Fishing

Lower reservoir elevations under all of the alternatives would have minimal affect on the fish community or habitat at Horsetooth Reservoir (Miller Ecological 2008). Projected minor changes in water quality with no change in the lake's trophic status would not measurably impact fishing opportunities.

7.3.3.4. Camping and Hiking

Land-based recreation activities such as camping and hiking would not be affected by any of the alternatives in average conditions, wet years, or dry years.

7.3.3.5. Other Recreation

Other recreation such as swimming, wind surfing, SCUBA diving, and rock climbing would not be affected by any of the alternatives.

7.3.3.6. Visitor Use and Experience

Projected changes in Horsetooth water elevations are unlikely to substantially affect recreation activities under any of the alternatives. A reduction in lake surface area, particularly under the Proposed Action, could diminish the overall quality of the user experience by

increasing the distance between land-based facilities and the water surface, and potentially reducing the overall aesthetics of the experience. A large decline in lake levels after several consecutive dry years under the Proposed Action would impact access to boat ramps, reduce boating capacity, and diminish the quality of the recreation experience.

7.3.4. Potential New East Slope Reservoirs

7.3.4.1. Chimney Hollow Reservoir

The Chimney Hollow Reservoir site does not currently support any recreational uses. However, Larimer County Parks and Open Lands is planning to provide public access if the reservoir is constructed, in association with its adjacent open space area on the west side of the Chimney Hollow Reservoir site. The additional access and facilities would benefit recreation opportunities on the Eastern Slope. The differences in reservoir size and function between Alternatives 2, 3, and 4 would not affect planned recreation facilities at the Chimney Hollow site. If a reservoir were not constructed (Alternatives 1 and 5), Larimer County would likely continue to pursue plans for trails and other facilities without a water-based recreation component on County lands.

It is estimated that Chimney Hollow Reservoir would receive about 50,000 annual visitors for either the 90,000 AF reservoir in Alternative 2 or the 70,000 AF reservoir under Alternatives 3 and 4. Recreation at Chimney Hollow would be limited to day use and non-motorized boating; thus, visitor use is likely to be substantially lower than the 300,000 annual visitors to Carter Lake (Flenniken 2006; Rieves 2005).

Chimney Hollow Reservoir would provide non-motorized boating opportunities, while Carter Lake provides both motorized and non-motorized uses. Thus, Chimney Hollow Reservoir would reduce the potential for recreational conflicts among differing user groups by offering an alternative non-motorized experience at the new reservoir nearby. Chimney Hollow Reservoir would support cool water and cold water fish species similar to other Front Range reservoirs like Carter Lake, although it may be less productive based on the predicted trophic status (Miller Ecological 2008). The Subdistrict and Larimer County would work with the CDOW to develop a management plan for fisheries management. The new reservoir would provide an additional recreational fishing opportunity.

7.3.4.2. Dry Creek Reservoir

The Dry Creek Reservoir site, included in Alternative 5, does not support any existing recreation activities and thus would not impact any recreational resources. Future recreation opportunities or facilities at this site, if they were developed, would generally benefit recreation amenities in the region, and also may complement land-based facilities (such as trails) that would be developed on Larimer County Open Space property near the Chimney Hollow site. Dry Creek also has the potential to provide fish habitat similar as described for Chimney Hollow and therefore an additional recreational fishing opportunity. Road access would need to be determined if public recreation is developed at Dry Creek.

7.4. West Slope River Recreation

7.4.1. Colorado River

As described in the Affected Environment, recreation resources along the Colorado River, and potential effects to those resources, are described by five different river reaches. Potential effects to reaches of the river below Windy Gap Reservoir were evaluated primarily using average and wet year hydrologic data because there would be no change from existing conditions in dry years. Daily data for all years in the 47-year study period were used to evaluate the effect on preferred boating flows.

7.4.1.1. Granby Reservoir to Windy Gap Reservoir

Summary of Streamflow Changes. Colorado River flows below Granby Reservoir are dominated by releases made to meet the needs of downstream water users and minimum flow requirements (per the U.S. Department of Interior *Principles to Govern the Release of Water at Lake Granby Dam to provide Fishery Flows*, Secretarial Decision Document 1961) and to "spill" excess water that cannot be stored in the C-BT system. Because of this, the streamflow in this reach can fluctuate widely. The WGFP model determines the amount of Windy Gap pumping each month and does not take into account whether or not Lake Granby is nearing a spill condition. As a result, the model occasionally shows pumping of Windy Gap water into Lake Granby early in the runoff season, and the same water is spilled from Granby Reservoir in succeeding months. Thus, changes in streamflow below Granby Reservoir are likely to be less than predicted by the model and would occur primarily in wet years from changes in spills. Tributary inflow from Willow Creek and the Fraser River provide additional flows to the Colorado River above Windy Gap Reservoir.

In average conditions, the No Action alternative is estimated to reduce Colorado River streamflow above Windy Gap by a monthly average of 0 to 6 percent from existing conditions from May to September (Table 16). The Proposed Action and Alternatives 3 to 5 would result in an estimated monthly average 0 to 11 percent reduction in Colorado River flow between May and September. In wet years, the percent decrease in streamflow would be similar to average conditions throughout the May to September season for all of the alternatives, with the exception of greater percent changes in July and August (Table 17).

Table 16. Estimated Average Monthly Changes to Colorado River Flow above Windy Gap Reservoir in Average Conditions.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**545**	**—**	**1,137**	**—**	**519**	**—**	**168**	**—**	**83**	**—**
Alt 1 – No Action	544	0%	1,084	-5%	487	-6%	164	-2%	82	-1%
Alt 2 – Proposed Action	540	-1%	1,020	-10%	462	-11%	152	-9%	82	-1%
Alt 3 – 5	540	-1%	1,045	-8%	467	-10%	155	-7%	82	0%

*Percent change in streamflow from existing conditions.

Table 17. Estimated Average Monthly Changes to Colorado River Flow above Windy Gap Reservoir in Wet Years.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	% *	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**1,041**	**—**	**2,660**	**—**	**1,730**	**—**	**462**	**—**	**124**	**—**
Alt 1 – No Action	1,040	0%	2,604	-2%	1,565	-10%	462	0%	126	2%
Alt 2 – Proposed Action	1,044	0%	2,618	-2%	1,517	-12%	367	-21%	128	3%
Alt 3 – 5	1,049	1%	2,598	-2%	1,540	-11%	383	-17%	121	-2%

*Percent change in streamflow from existing conditions.

Boating. This reach of the Colorado River is not a popular boating destination. The reductions in streamflow for all of the alternatives would slightly reduce the suitability for boating under average flow conditions, but because of the limited boating activity in this area, there would be negligible effects to boating recreation.

Fishing. Projected changes in streamflow and water quality below Granby Reservoir as a result of changes in reservoir releases under all of the alternatives are unlikely to adversely affect fish populations; however, there may be some shift in fish habitat as a response to reductions in spills (Miller Ecological 2008). Recreational fishing opportunities under any of the alternatives along this reach of the Colorado River would remain similar to existing conditions.

Other Recreation Activities. No public lands border this reach of the Colorado River that supports recreation activities. Changes in streamflows are unlikely to adversely affect land-based recreational activities.

7.4.1.2. Windy Gap Reservoir to Williams Fork River

Summary of Streamflow Changes. In average conditions, all of the alternatives would result in reductions in Colorado River flow measured at Hot Sulphur Springs during the May-September recreation season (Table 18). In all cases, the greatest percent reductions would occur in July. The No Action Alternative would reduce July streamflow by an average of 20 percent (95 cfs), while the Proposed Action would reduce July streamflow an average of 22 percent (108 cfs) at the Hot Sulphur Springs gage below Windy Gap Reservoir. Alternatives 3 to 5 would result in about a 27 percent (351 cfs) flow reduction in July**.**

In wet years, the relative effects to streamflow would be similar to average conditions, with the exception of July and August (Table 19). In July, the average streamflow reduction would be 25 percent under the No Action Alternative and between 26 and 28 percent for the Proposed Action and other alternatives, compared to existing conditions. In August, the average streamflow reduction would be 23 percent under the No Action Alternative and between 33 and 34 percent for the Proposed Action and Alternatives 3 to 5, compared to existing conditions. However, streamflow reductions in wet years would be in the context of flows that are two to three times larger than those in average conditions.

Table 18. Estimated Average Monthly Changes to Colorado River Flow at Hot Sulphur Springs in Average Conditions.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**278**	**—**	**953**	**—**	**482**	**—**	**170**	**—**	**87**	**—**
Alt 1 – No Action	262	-6%	877	-8%	386	-20%	153	-10%	87	-1%
Alt 2 – Proposed Action	237	-15%	776	-19%	374	-22%	144	-15%	86	-1%
Alt 3 – 5	235	-16%	800	-16%	351	-27%	141	-17%	87	0%

*Percent change in streamflow from existing conditions.

Table 19. Estimated Average Monthly Changes to Colorado River Flow at Hot Sulphur Springs in Wet Years.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**730**	**—**	**2,414**	**—**	**1,709**	**—**	**468**	**—**	**127**	**—**
Alt 1 – No Action	715	-2%	2,328	-4%	1,282	-25%	361	-23%	129	2%
Alt 2 – Proposed Action	584	-20%	2,237	-7%	1,259	-26%	314	-33%	130	3%
Alt 3 – 5	589	-19%	2,227	-8%	1,233	-28%	311	-34%	124	-2%

*Percent change in streamflow from existing conditions.

Boating. Byers Canyon, below Hot Sulphur Springs, provides Class IV to V whitewater kayaking at streamflows above about 400 cfs. Under existing conditions, flows in this reach of the Colorado River on average exceed 400 cfs in June (953 cfs) and July (482 cfs). Average monthly flow data indicate that flows would remain above 400 cfs for all of the alternatives in June, but would drop below 400 cfs in July (Figure 12). Estimated daily flow data indicate that in 29 years of the 47-year period of record, the number of days that flow exceeds 400 cfs for any of the alternatives (Table 20) would not change. 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 No Action and an estimated average of 12 fewer days per year for the action alternatives. The greatest decrease in preferred flows for rafting in a single year would be 34 days under No Action and 49 under all the action alternatives, with an increase of 1 day in some years for Alternatives 2 to 4.

Although Byers Canyon does not support commercial boating and is infrequently used for kayaking, these changes would affect the availability of whitewater flows in Byers Canyon primarily during July. Besides Byers Canyon, none of the alternatives are expected to impact boating opportunities on this reach of the Colorado River, which is not known to be a popular boating destination.

Figure 12. Average Monthly Streamflows on the Colorado River below Hot Sulphur Springs and Preferred Minimum Flows for Kayaking.

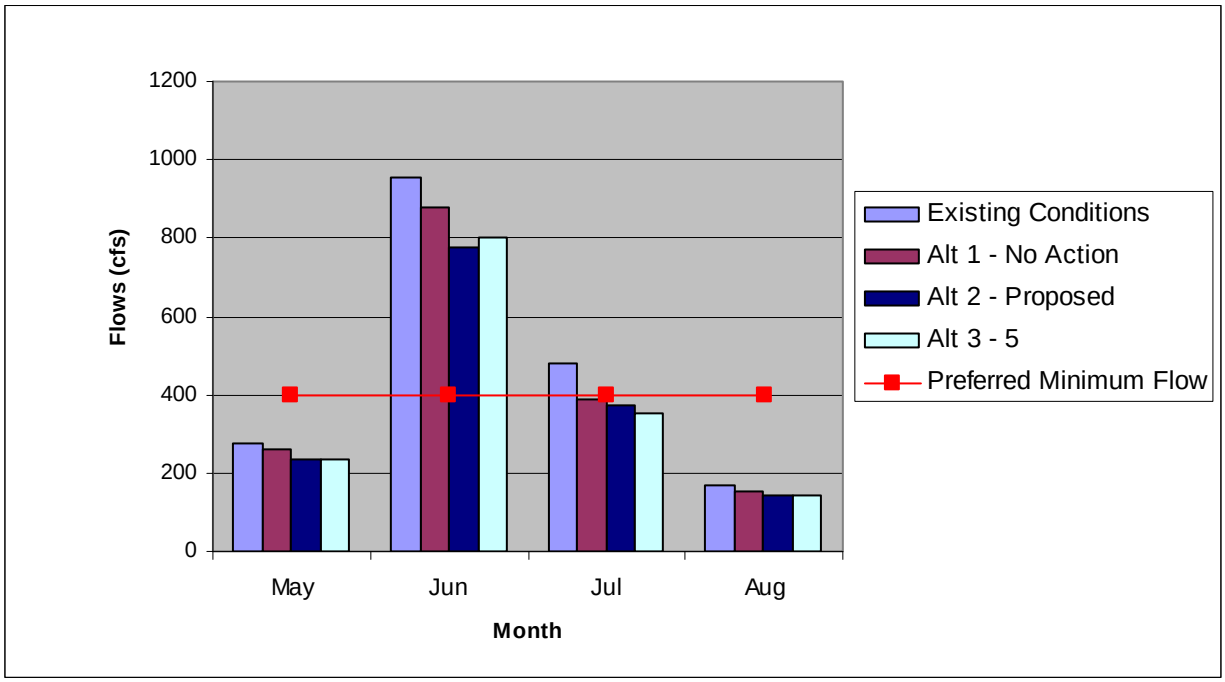


Table 20. Comparison of Preferred Boating Flow Days (flows above 400 cfs) in Byers Canyon (June 1 through July 26) between Existing Conditions and the Alternatives.

Alternative	Total days in 47-year period flows are >400 cfs	Average change in preferred flow days per year from EC during the 18 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 18 years when flow changes occur
Existing Conditions (EC)	1,012		
Alt 1 – No Action	870	8.0	-34 to 0
Alt 2 – Proposed Action	792	12.0	-49 to +1
Alt 3	793	11.0	-49 to +1
Alt 4	778	12.3	-49 to +1
Alt 5	789	12.4	-49 to 0

*There would be no change in the number of days when flows exceed 400 cfs between EC and any of the alternatives in 29 of the 47 years.

Fishing. The Colorado River between Windy Gap Reservoir and Williams Fork River would have the greatest decrease in fish habitat on the Colorado River (Miller Ecological 2008). Reduced flow and the frequency of flow reductions could affect adult rainbow trout habitat and to a lesser extent brown trout habitat under all the alternatives. The reduction in fish habitat in this reach is unlikely to adversely affect the Gold Medal fishery or fishing opportunities because

the majority of the diversions would occur in the high flow months. Flows sufficient for channel and fish habitat maintenance and sediment transport would still occur (ERO and Boyle 2007).

Other Recreation Activities. None of the alternatives would directly affect other recreation activities that occur along the Colorado River in this reach. These activities include camping, hiking, mountain biking, hunting, scenic driving, and OHV riding. The recreational experience for these activities is unlikely to be affected, although some visitors may discern a reduction in aesthetic value of the Colorado River from periodic lower flows.

7.4.1.3. Williams Fork River to Kremmling

Summary of Streamflow Changes. Average monthly flow reductions of 0 to 18 percent would occur in this reach of the Colorado River during the recreation season under the alternatives under average conditions (Table 21). The greatest change would occur under Alternatives 3 to 5, in July (Figure 13). The No Action and Proposed Action alternative would reduce July river flows an average of 13 and 14 percent, respectively.

In wet years (Table 22), the effects to streamflow would be similar to average conditions, with greater percent flow reductions in July and August. In July, the average monthly streamflow would decrease by 18 percent for the No Action alternative, and between 19 and 21 percent for the Proposed Action and Alternatives 3 to 5. August flow reductions would range from 17 to 25 percent. Although the percent flow reduction is greater in wet years, flows are generally two to three times greater than average years.

Table 21. Average Monthly Changes to Colorado River Flow below Williams Fork in Average Conditions.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**308**	**—**	**1,194**	**—**	**735**	**—**	**276**	**—**	**191**	**—**
Alt 1 – No Action	292	-5%	1,118	-6%	641	-13%	261	-5%	190	-1%
Alt 2 – Proposed Action	267	-13%	1,017	-15%	629	-14%	251	-9%	190	-1%
Alt 3 – 5	264	-14%	1,041	-13%	606	-18%	248	-10%	190	0%

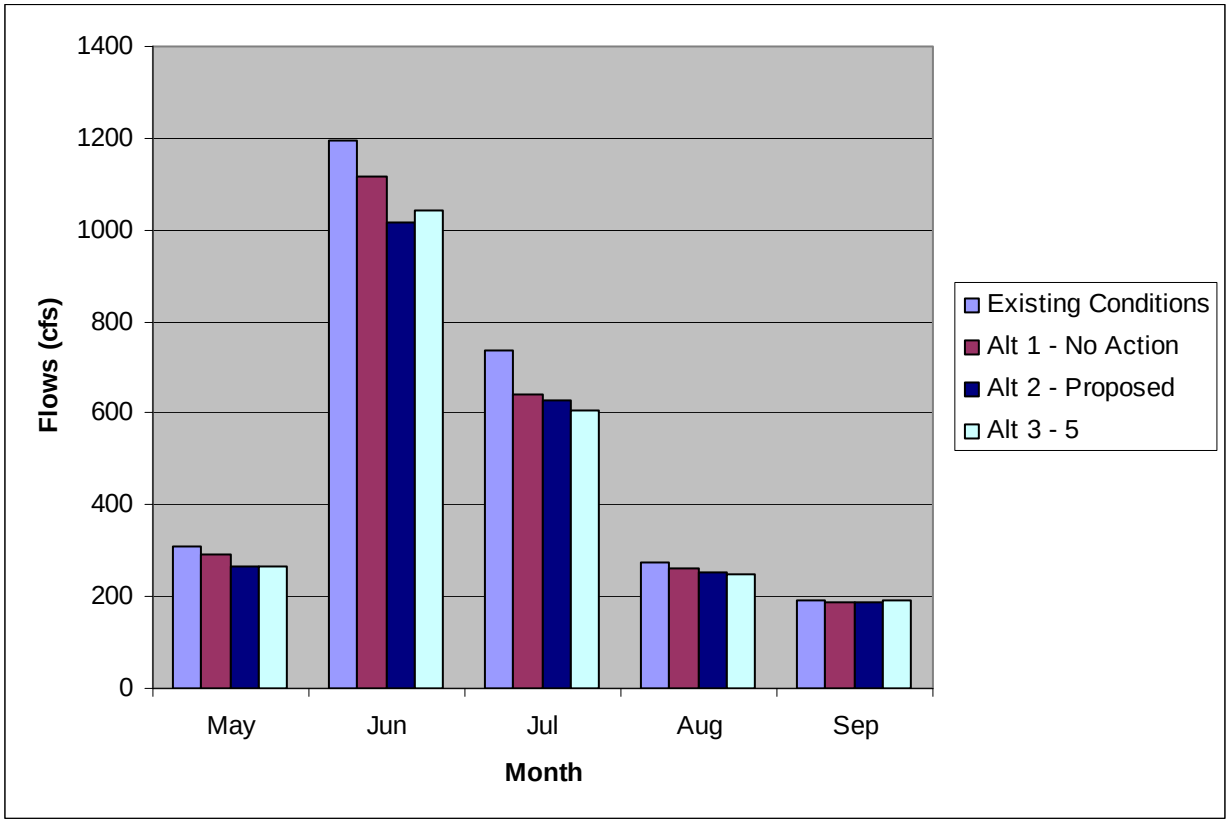
*Percent change in streamflow from existing conditions.

Table 22. Average Monthly Changes to Colorado River Flow below Williams Fork in Wet Years.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**803**	**—**	**2,965**	**—**	**2,314**	**—**	**639**	**—**	**215**	**—**
Alt 1 – No Action	788	-2%	2,878	-3%	1,887	-18%	533	-17%	217	1%
Alt 2 – Proposed Action	657	-18%	2,787	-6%	1,864	-19%	485	-24%	219	2%
Alt 3 – 5	662	-18%	2,778	-6%	1,838	-21%	482	-25%	212	-1%

*Percent change in streamflow from existing conditions.

Figure 13. Average Monthly Streamflows on the Colorado River below Williams Fork.



Boating. This reach of the Colorado River is infrequently used for boating. In average years, potential boating opportunities would be slightly diminished by flow reductions for each of the alternatives. This potential impact would be greatest under Alternatives 3 to 5, and slightly reduced under the No Action and Proposed Action. Because of the limited existing boating in this reach of the Colorado River, none of the alternatives would have a substantial effect on recreational boating.

Fishing. Projected minor decreases in fish habitat below the Williams Fork under all the alternatives is not expected to substantially affect the fish community along this reach of the Colorado River (Miller Ecological 2008). Fish productivity should remain high and impacts to the Gold Medal fishery would be minor.

Other Recreation Activities. None of the proposed alternatives would directly affect other recreation activities that occur in this reach of the Colorado River. These activities include camping, hiking, mountain biking, hunting, scenic driving, and OHV riding. The recreational experience for these activities is unlikely to be affected, although some visitors may discern a reduction in aesthetic value of the Colorado River from periodic lower flows.

7.4.1.4. Kremmling to Pumphouse (Big Gore Canyon)

Summary of Streamflow Changes. Average monthly streamflow reduction of 1 to 7 percent would occur during the recreation season under the alternatives in average conditions

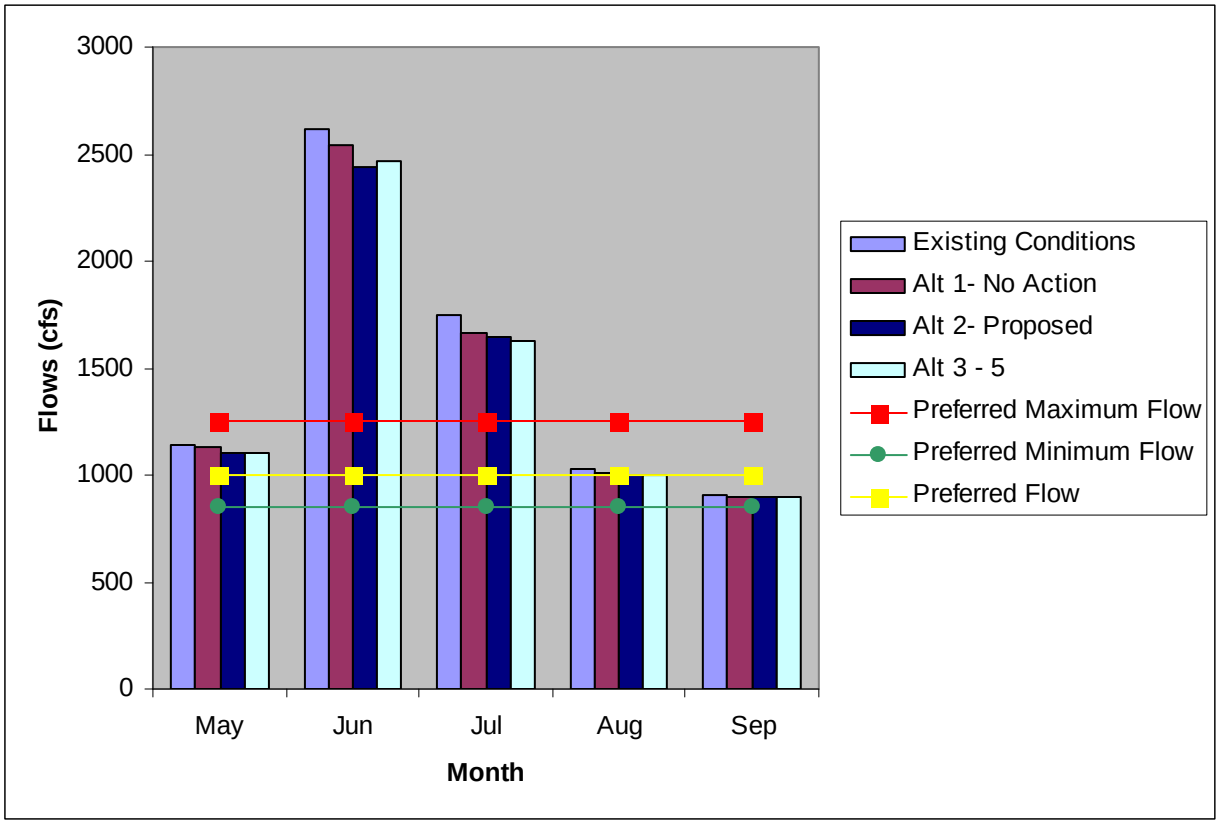
(Table 23 and Figure 14). The largest streamflow decreases (7 percent) would occur in June under the Proposed Action and July under Alternatives 3 to 5.

Table 23. Average Monthly Changes to Colorado River Flow near Kremmling in Average Conditions (below Blue River confluence).

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**1,145**	**—**	**2,619**	**—**	**1,745**	**—**	**1,026**	**—**	**909**	**—**
Alt 1 – No Action	1,129	-1%	2,542	-3%	1,660	-5%	1,010	-2%	901	-1%
Alt 2 – Proposed Action	1,104	-4%	2,442	-7%	1,647	-6%	1,002	-2%	899	-1%
Alt 3 – 5	1,101	-4%	2,466	-6%	1,624	-7%	999	-3%	901	-1%

*Percent change in streamflow from existing conditions.

Figure 14. Average Monthly Streamflows on the Colorado River through Big Gore Canyon and Preferred Rafting Flows.



In wet years, average monthly streamflows for all alternatives would decrease from 0 to 10 percent during the recreation season (Table 24). The No Action Alternative would result in a maximum streamflow decrease of 9 percent in July, while the Proposed Action and other alternatives would result in a maximum decrease of 10 percent in July. Streamflows in wet years for all alternatives are more than double average year flows.

Table 24. Average Monthly Changes to Colorado River Flow near Kremmling in Wet Years (below Blue River confluence).

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**2,231**	**—**	**5,885**	**—**	**4,725**	**—**	**1,694**	**—**	**945**	**—**
Alt 1 – No Action	2,216	-1%	5,798	-1%	4,298	-9%	1,588	-6%	947	0%
Alt 2 – Proposed Action	2,086	-7%	5,707	-3%	4,274	-10%	1,540	-9%	948	0%
Alt 3 – 5	2,091	-6%	5,697	-3%	4,249	-10%	1,537	-9%	942	0%

*Percent change in streamflow from existing conditions.

Boating. The whitewater run through Big Gore Canyon is considered to have Class V rapids. Commercial outfitters only run trips when flows are greater than 850 cfs and less than 1,250 cfs (Figure 14). The preferred flow for rafting Gore Canyon is around 1,000 cfs (Sommerhoff 2006). Kayakers have a higher tolerance for changing flows, but their preferred flow for kayaking Big Gore Canyon, as well as for the reach between Pumphouse and State Bridge (Table 5), is around 1,100 cfs. The lowest flow typically used for kayaking in these two reaches of the Colorado River is around 400 to 800 cfs (Figure 15). While all of the alternatives would reduce the flow under average conditions by a monthly average of 1 to 7 percent during the recreation season, the greatest change of any alternative (Proposed Action) would reduce the average monthly flow in June by 7 percent from 2,619 cfs, under existing conditions, to 2,442 cfs. None of the alternatives would reduce the average conditions flow in May through September below 850 cfs, the lowest flow that commercial rafters typically use on the river.

Figure 15. Average Monthly Streamflows on the Colorado River between Kremmling and State Bridge and Preferred Kayaking Flows.

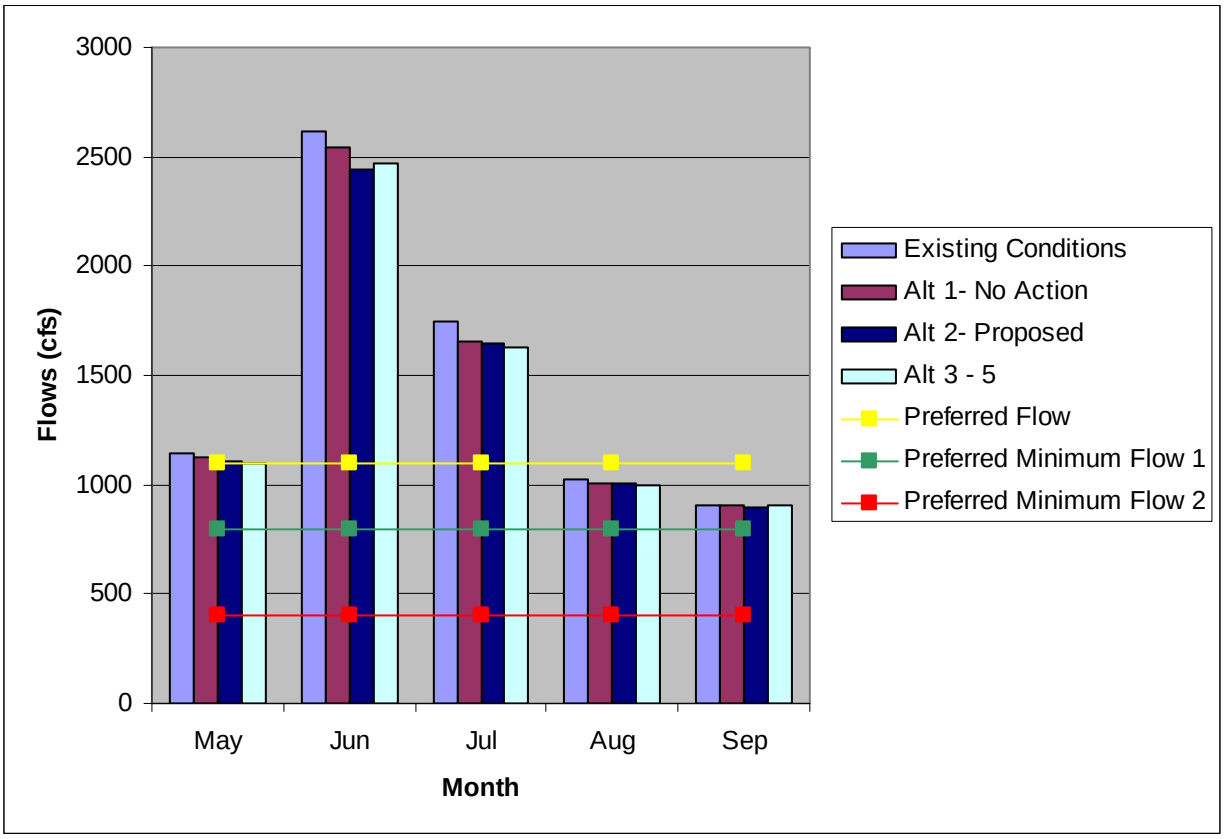


Table 25 and Table 26 demonstrate the number of days in the 47-year period where flows were within the preferred range for rafting and kayaking in August, the primary boating season based on commercial outfitter and user preference data, as discussed in Section 6.1.4.4. The upper flow limit of 2,200 cfs for kayaking was based on the limited number of boaters that use the river when flows reach a Class V+ rating through the canyon.

Estimated daily flow data indicates that in 37 of the 47-year period of record, there would be no change from existing conditions in the number of days preferred rafting flows of 850 to 1,250 cfs occur in Big Gore Canyon for any of the alternatives (Table 25). 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 preferred flows for rafting in a single year would be 11 days under all of the alternatives (year 1961), with an increase of 1 day in some years for the action alternatives. Projected flows for all of the alternatives would allow commercial outfitters to continue to run trips through Big Gore Canyon in August most of the time. Reduced flow in about 10 out of 47 years would decrease opportunities for commercial rafting by several days.

Table 25. Comparison of Preferred Rafting Flow Days (850 to 1,250 cfs) in Big Gore Canyon between Existing Conditions and the Alternatives in August.

Alternative	Total days in 47-year period flows were between 850 and 1,250 cfs	Average change in preferred flow days per year from EC during the 10 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 10 years when flow changes occur
Existing Conditions (EC)	848		
Alt 1 – No Action	824	-2.4	-11 to 0
Alt 2 – Proposed Action	825	-2.3	-11 to +1
Alt 3	825	-2.3	-11 to +1
Alt 4	829	-1.9	-11 to +1
Alt 5	821	-2.7	-11 to +1

*There would be no change in the number of days when flows are between 850 and 1,250 cfs in 37 of 47 years.

There would be no change in the number of days that flows fall within the preferred range of 400 to 2,200 cfs for kayaking in 45 out of the 47-year study period in Big Gore Canyon and in the Pumphouse to State Bridge reach under any of the alternatives (Table 26). During the 2 years when flow changes fall outside the preferred range, there would be an average of 2 additional days of preferred flow. The greatest change in the number of preferred flow days in a single year would range from an increase of 3 days to a decrease of 1 day under all of the alternatives. There would be no substantial change in kayaking opportunities in Big Gore Canyon or Pumphouse to State Bridge under any of the alternatives.

Table 26. Comparison of Preferred Kayaking Flow Days (400 to 2,200 cfs) in Big Gore Canyon and Pumphouse to State Bridge between Existing Conditions and the Alternatives in August.

Alternative	Total days in 47-year period flows were between 400 and 2,200 cfs	Average change in preferred flow days per year from EC during the 2 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 2 years when flow changes occur
Existing Conditions (EC)	1,421		
Alt 1 – No Action	1,425	+2	-1 to +3
Alt 2 – Proposed Action	1,425	+2	-1 to +3
Alt 3	1,425	+2	-1 to +3
Alt 4	1,425	+2	-1 to +3
Alt 5	1,425	+2	-1 to +3

*There would be no change in the number of days when flows for kayaking are between 400 and 2,200 cfs in 45 of the 47 years,

A change in the number of days that preferred kayaking flows would be between 1,100 and 2,200 cfs in Big Gore Canyon and Pumphouse also was evaluated based on daily data for the period from June to August (Table 28). Estimated daily flow data indicates that in 32 of the 47-year study period, there would be no change in the number of days in this flow range for any of the alternatives. Results also indicate that over the 47-year study period, there would be about 1 more day of preferred kayaking flows under the No Action alternative compared to existing conditions. Under the Proposed Action, there would be about 4 fewer days, which would average 1 day less per year of preferred kayaking flows during the 15 years when flow changes occur. The greatest change in preferred flows for kayaking in a single 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 days under the Proposed Action. Based on the information in Table 26 and Table 27, the potential for impacts to the annual Gore Race, usually held the third week in August, is unlikely in most years; however, there could be years when flows are less than preferred for kayaking. The WGFP under all of the alternatives would rarely divert water in late August and, therefore, would have minimal effects on the Gore Race.

Table 27. Comparison of Preferred Kayaking Flow Days (1,100 to 2,200 cfs) in Big Gore Canyon and Pumphouse to State Bridge between Existing Conditions and the Alternatives from June to August.

Alternative	Total days in 47-year period flows were between 1,100 and 2,200 cfs	Average change in preferred flow days per year from EC during the 15 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 15 years when flow changes occur
Existing Conditions (EC)	1,034		
Alt 1 – No Action	1,035	+<1	-15 to +7
Alt 2 – Proposed Action	1,030	-<1	-15 to +6
Alt 3	1,030	-<1	-15 to +6
Alt 4	1,037	+<1	-15 to +10
Alt 5	1,033	-<1	-15 to +10

*There would be no change in the number of days when preferred flows for kayaking are between 1,100 and 2,200 cfs in 32 of the 47 years.

Fishing. The Gore Canyon Class V rapids prevent any boating-fishing activities, and the canyon itself is too narrow and steep to provide streamside fishing opportunities.

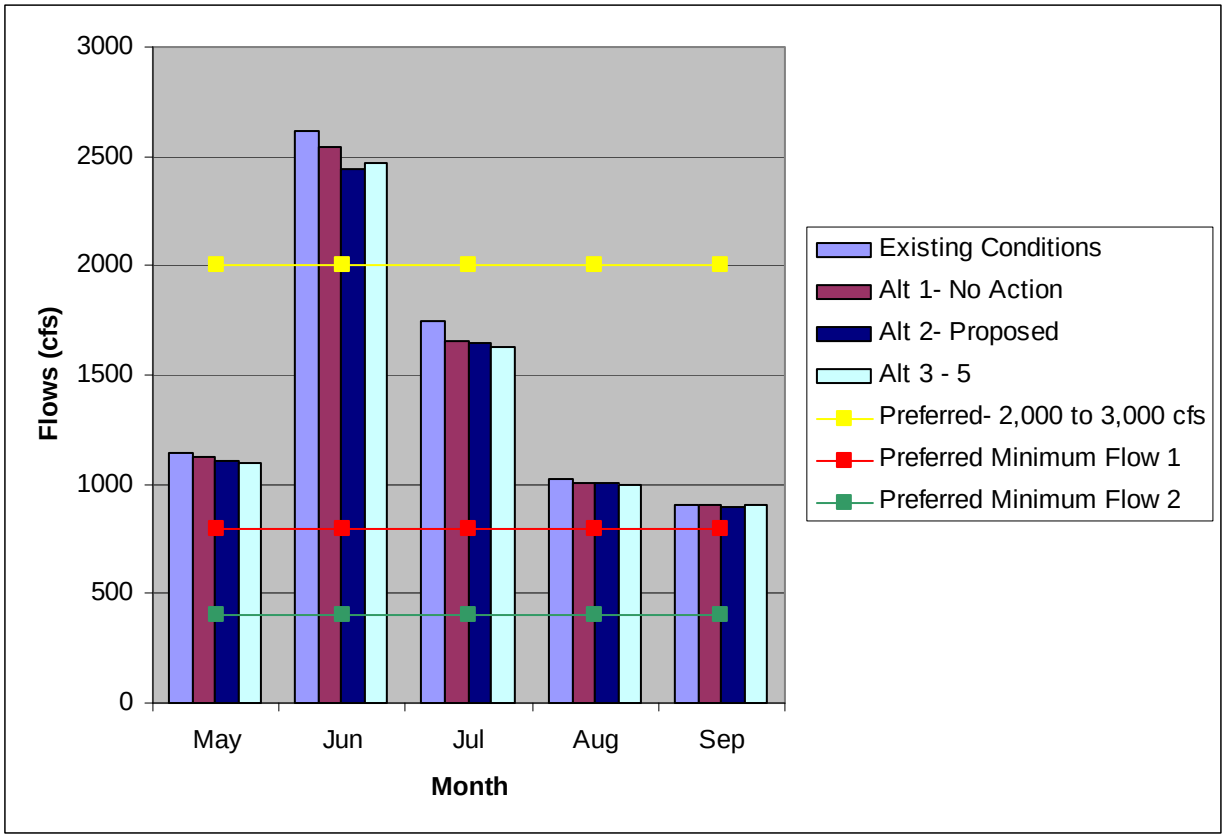
7.4.1.5. Pumphouse to State Bridge

Boating. The reach of the Colorado River between Pumphouse and State Bridge is generally flat water with some Class II and III rapids. The flows for this reach are measured by the same gage as for Big Gore Canyon (Table 23 and Table 24). Rafting companies prefer flows between 2,000 and 3,000 cfs, and typically curtail operations at flows less than 400 to 800 cfs (Figure 16). Kayakers have the same preferences for flows (1,100 cfs) on this reach as they do for Big Gore Canyon (Figure 15).

Table 28 and Table 29 demonstrate the number of days in the 47-year study period where flows were within the preferred range for both rafting and kayaking in the months of June

through August in the Pumphouse reach of the Colorado River based on commercial outfitter and user preference data as discussed in Section 6.1.4.4.

Figure 16. Average Monthly Streamflows on the Colorado River from Pumphouse to State Bridge and Preferred Rafting Flows.



In the Pumphouse reach of the Colorado River, there would be no change in the number of days that preferred rafting and kayaking flows between 400 and 3,000 cfs occur in 34 out of the 47-year study period (Table 28). Over the 47-year period, there would be 22 additional days under the No Action alternative compared to existing conditions when flows are in the preferred flow range. Under the Proposed Action, there would be a total of about 38 additional days in the preferred flow range. The number of days in the preferred flow range increases for other alternatives as well, as a result of diversions that reduce flow below 3,000 cfs. On average, this would be an increase of about 3 days per year during the 13 years when flow changes occur for the action alternatives and 2 days for the No Action alternative. In those years when there is a change in the number of days with flows in the preferred range, the estimated change varies from 12 days fewer (year 1961) to 14 additional days under all of the alternatives.

Table 28. Comparison of Preferred Rafting and Kayaking Flow Days (400 to 3,000 cfs) from Pumphouse to State Bridge between Existing Conditions and the Alternatives for June through August.

Alternative	Total days in 47-year period flows were between 400 and 3,000 cfs	Average change in preferred flow days per year from EC during the 13 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 13 years when flow changes occur
Existing Conditions (EC)	3,498		
Alt 1 – No Action	3,520	+1.7	-12 to +14
Alt 2 – Proposed Action	3,536	+2.9	-12 to +14
Alt 3	3,535	+2.8	-12 to +14
Alt 4	3,534	+2.8	-12 to +14
Alt 5	3,536	+2.9	-12 to +14

*There would be no change in the number of days when flows are between 400 and 3,000 cfs in 34 of the 47 years.

There would be no change from existing conditions in the number of days when preferred rafting and kayaking flows in the Pumphouse reach are in the higher flow range of 2,000 to 3,000 cfs in 28 of the 47-year study period under the alternatives (Table 29). 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 in the preferred rafting flow range under all of the alternatives. The greatest decrease in the preferred flow range in a single year (year 1952) 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 and 8 days under Alternative 5. Although overall there would be more preferred flow days available between 400 and 3,000 cfs as shown in Table 28, there would be fewer days in the preferred higher flow range. This could reduce the number of boaters or diminish the boating experience when flows drop below 2,000 cfs. A reduction in preferred kayaking flows of 1,100 to 2,200 cfs would be the same as discussed for the Big Gore reach and shown in Table 27.

Table 29. Comparison of Preferred Rafting Flow Days (2,000 to 3,000 cfs) from Pumphouse to State Bridge between Existing Conditions and the Alternatives for June through August.

Alternative	Total days in 47-year period flows were between 2,000 and 3,000 cfs	Average change in preferred flow days per year from EC during the 19 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 19 years when flow changes occur
Existing Conditions (EC)	441		
Alt 1 – No Action	447	+0.3	-4 to +11
Alt 2 – Proposed Action	421	-1.1	-17 to +3
Alt 3	420	-1.0	-17 to +4
Alt 4	414	-1.4	-17 to +4
Alt 5	436	-0.3	-5 to +8

*There would be no change in the number of days when flows for rafting are between 2,000 and 3,000 cfs in 28 of 47 years.

Fishing. Projected minor changes to fish habitat in the Pumphouse reach of the Colorado River from changes in streamflow and water quality under all the alternatives is unlikely to affect recreational fishing use (Miller Ecological 2008).

Other Recreation Activities. The Radium Hot Springs are a popular attraction along this reach. They are accessible by either boat or on foot. Lower flows may raise the temperature of the hot springs with less dilution by cooler river water, although none of the alternatives are likely to adversely affect use of the hot springs or other nonboating recreation activities that occur along the Colorado River in this reach. Some visitors may discern a reduction in aesthetic value of the Colorado River from periodic lower flows that diminish the recreation experience. These other activities (e.g., camping, hiking, mountain biking, hunting, scenic driving, and OHV riding) would not be directly impacted. There could be a decrease in camping in upper Colorado River campgrounds during periods when streamflow is less than preferred for boating.

7.4.2. Willow Creek

Willow Creek is not a destination for boating recreational activities. Projected minor effects to fish habitat and water quality under all the alternatives would have negligible impact on the limited recreational fishing on Willow Creek (Miller Ecological 2008).

7.5. East Slope River Recreation

7.5.1. Big Thompson River

Summary of Streamflow Changes. All of the alternatives are estimated to maintain or increase Big Thompson River streamflows below Lake Estes during the May through September recreation season compared to existing conditions (Table 30). Under average conditions, the largest change at the Canyon gage would be an increase of 7 percent (15 to 17 cfs) in May and July under the Proposed Action compared to a maximum increase of 1 percent for the No Action

alternative. Increases for Alternatives 3 to 5, in average conditions, would range between 0 and 4 percent.

Table 30. Average Monthly Changes in Big Thompson River Flows at the Canyon Gage in Average Conditions.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**228**	**—**	**515**	**—**	**249**	**—**	**158**	**—**	**81**	**—**
Alt 1 – No Action	228	0%	519	1%	251	1%	158	0%	81	0%
Alt 2 – Proposed Action	243	7%	525	2%	266	7%	161	2%	81	1%
Alt 3 – 5	238	4%	521	1%	253	2%	160	1%	81	0%

*Percent change in streamflow from existing conditions.

During wet years, changes in Big Thompson River flows would decrease less than 1 percent and increase less than 3 percent under the alternatives during the entire summer season (Table 31). The No Action Alternative would reduce flows by less than 1 percent in June and the Proposed Action would increase water flows by less than 3 percent (6 cfs) during May. During dry years, no changes to flows are estimated to occur for any of the alternatives.

Table 31. Average Monthly Changes in Big Thompson River Flows at the Canyon Gage in Wet Years.

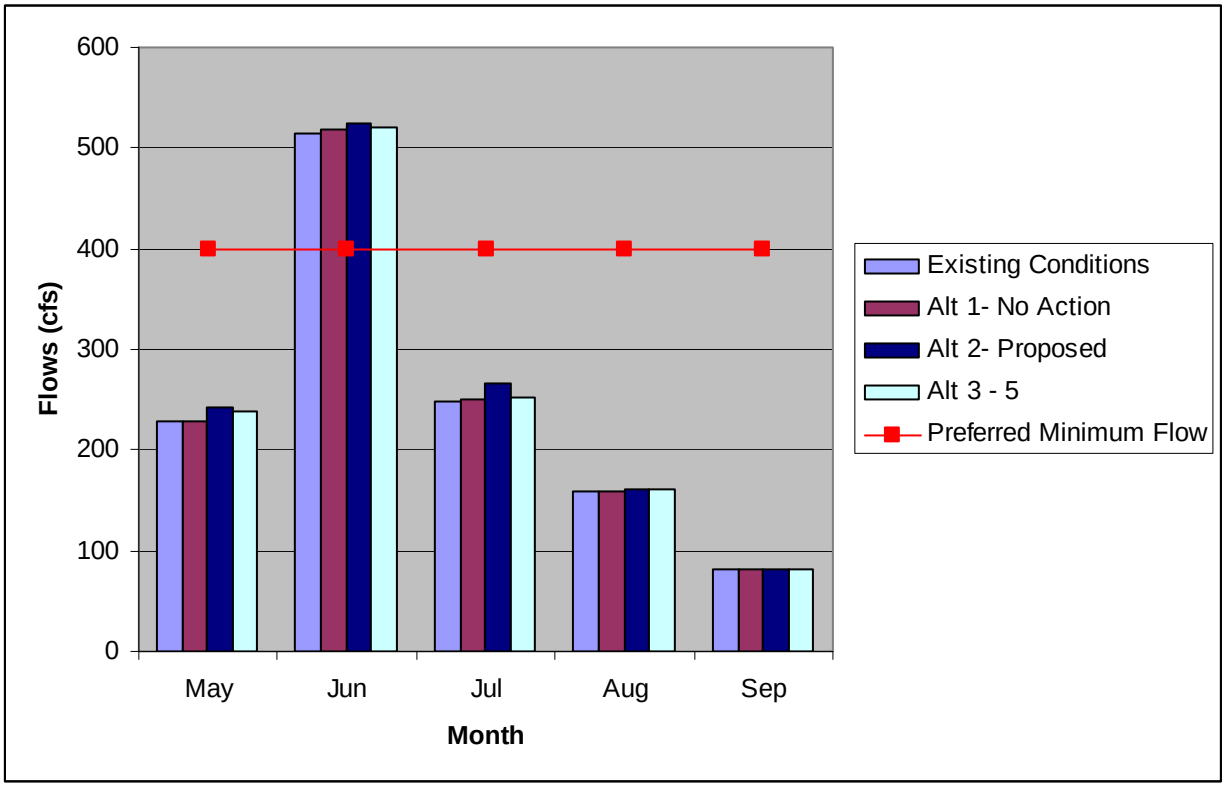
Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**178**	**—**	**581**	**—**	**444**	**—**	**228**	**—**	**94**	**—**
Alt 1 – No Action	178	0%	575	-1%	444	0%	228	0%	94	0%
Alt 2 – Proposed Action	184	3%	586	1%	452	2%	228	0%	94	0%
Alt 3 – 5	178	0%	581	0%	444	0%	228	0%	94	0%

*Percent change in streamflow from existing conditions.

Boating. The lower portion of the Big Thompson Canyon is considered to be a Class IV whitewater kayak run when flows exceed about 400 cfs. Under existing conditions in average conditions, such flows only occur during June, while in wet years they typically occur in both June and July. None of the alternatives would reduce the frequency of kayak flows above 400 cfs through the Big Thompson Canyon during average conditions, wet years, or dry years (Figure 17). Thus there would be no adverse effect to kayaking.

Fishing. The minor flow changes under any of the alternatives is not expected to alter fish habitat or recreational fishing opportunities along the Big Thompson River (Miller Ecological 2008).

Figure 17. Average Monthly Streamflows on the Big Thompson River at the Canyon Gage and Preferred Kayaking Flows.



7.5.2. North St. Vrain Creek and St. Vrain Creek

Summary of Streamflow Changes. Only the No Action alternative would affect streamflow on the North St. Vrain Creek below Longmont Reservoir and St. Vrain Creek above the St. Vrain Supply Canal near Lyons. Average monthly changes in flows during the May to September recreation season are summarized in Table 32. North St. Vrain streamflow would decrease by 11 percent in May and by 27 percent in July. In other recreation season months, the change from existing conditions is small, with the exception of a 19 percent increase in September.

Table 32. Average Monthly Changes in Flows on North St. Vrain Creek below Longmont Reservoir.

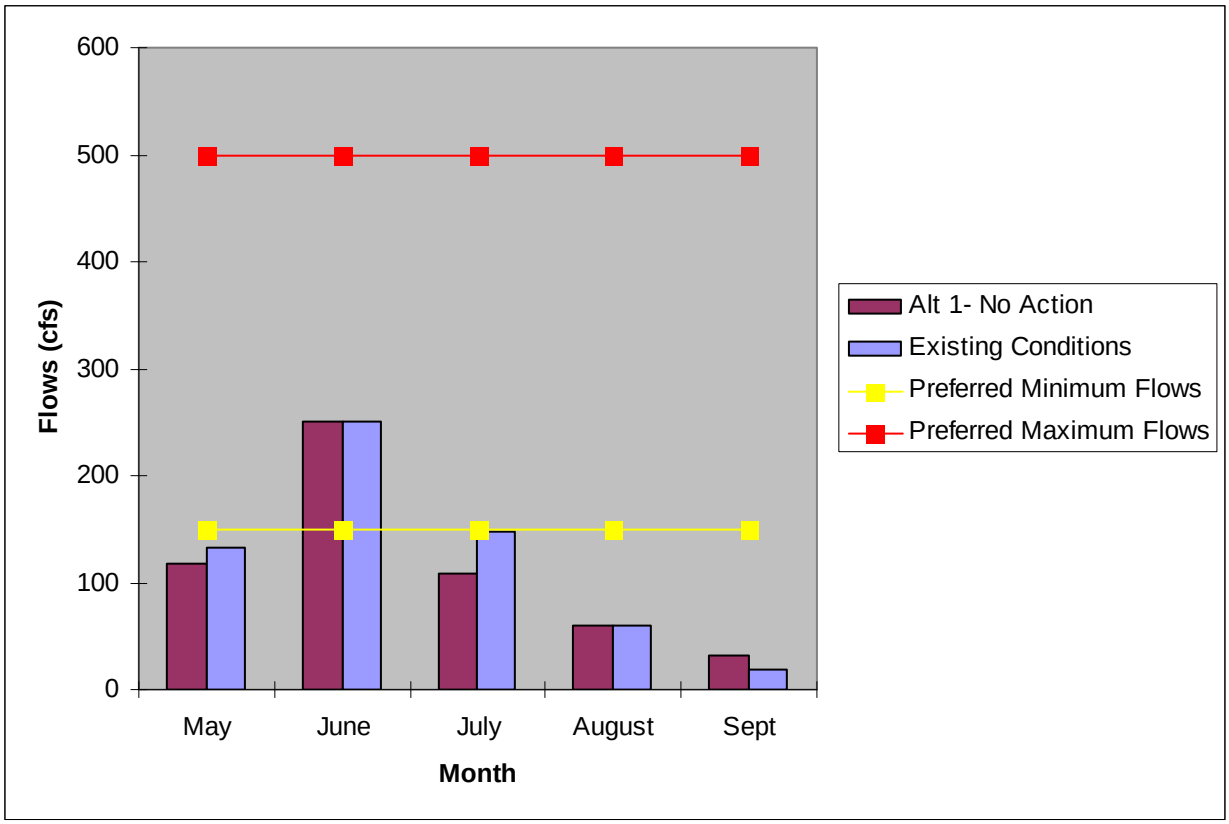
Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**133**	—	**250**	—	**147**	—	**59**	—	**19**	—
Alt 1 – No Action	118	-11%	250	0%	107	-27%	58	-2%	32	19%

*Percent change in streamflow from existing conditions.

Boating. The portion of the North St. Vrain Creek between Longmont Reservoir and Lyons has three distinct Class III kayaking runs in the summer. In average conditions, this reach has

desirable flows typically in June and part of July (existing conditions). The preferred minimum flows for kayakers on the North St. Vrain are between 150 and 500 cfs. The No Action Alternative would not affect boating during June, but average flows in July of 107 cfs would drop below preferred minimum flows for kayaking (Figure 18). This would likely reduce kayaking opportunities during part of July, although under existing conditions average flows are at the preferred minimum level for kayaking. Less than a 13 percent decrease in average monthly streamflow on St. Vrain Creek near Lyons would not reduce preferred flows for kayaking (>200 cfs) from May to July.

Figure 18. Average Monthly Streamflows on North St. Vrain Creek and Preferred Kayaking Flows.



Fishing. Projected seasonal decreases and increases in flow in North St. Vrain Creek and St. Vrain Creek under the No Action Alternative would have minor positive and negative effects on fish habitat, but is unlikely to adversely impact recreational fishing opportunities (Miller Ecological 2008).

7.5.3. Other East Slope Streams

For the other East Slope streams that would receive increased return flow below wastewater treatment plants (Big Thompson River below Loveland; and St. Vrain Creek below Longmont, Coal Creek, and Big Dry Creek), streamflow during the summer recreation season would increase average monthly flows an estimated 0.5 to 11.3 cfs, depending on the stream. (See the Water Resources Technical Report for a detailed description of anticipated flow changes.) Flow

increases would not negatively affect and may improve the fish habitat on these streams during dry years (Miller Ecological 2008). Flow increases on Front Range streams are not anticipated to adversely affect the infrequent use of these streams' water-based recreation.

8.0 CUMULATIVE EFFECTS

This section describes the cumulative effects primarily to water-based recreation resources in the study area for each of the alternatives.

8.1. Methods

Cumulative effects result from the incremental effect of an alternative action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a time period. This section of the report evaluates the potential cumulative effects to recreation resources associated with alternative actions in addition to identified reasonably foreseeable actions that are expected to occur in the future. Changes are discussed for the alternatives using the same methods discussed and in a similar format and sequence as the direct environmental effects in Section 7.0. However, because of the similarity in the effects of Alternatives 3, 4, and 5, which each include a combination of East and West Slope reservoirs, the cumulative effects analysis used the results of Alternative 5 (Dry Creek Reservoir and Rockwell/Mueller Creek Reservoir) as representative of these three alternatives.

Reasonably foreseeable actions that may affect water levels for this project are the Denver Water Moffat Collection System Project, urban growth in Grand and Summit Counties, reduction of Excel Energy's Shoshone Power Plant call, changes in releases from Williams Fork and Wolford Mountain Reservoirs to meet U.S. Fish and Wildlife Service flow recommendations for endangered fish in the 15-mile reach, Wolford Mountain Reservoir contract demand, and the expiration of Denver Water's contract with Big Lake Ditch in 2013. Further information on these reasonably foreseeable actions can be found in the Windy Gap Firming Project Water Resources Report (ERO and Boyle Engineering 2007). Dry year effects on recreation would be primarily related to changes in flow from reasonably foreseeable actions because WGFP diversions would be the same as existing conditions in dry years.

The only land-based reasonably foreseeable action identified with overlapping effects with the alternatives is the development of Chimney Hollow open space on lands owned by Larimer County Parks and Open Lands Department. County land (1,850 acres) is located west of the Chimney Hollow Reservoir site (Figure 6). The County intends to manage this property for recreation regardless of whether Chimney Hollow Reservoir is constructed.

8.2. West Slope Reservoirs

8.2.1. Grand Lake and Shadow Mountain Reservoir

The surface water elevation at both Grand Lake and Shadow Mountain Reservoir would experience no change from existing conditions due to the agreement the Bureau of Reclamation has made as a part of the C-BT Project to maintain water levels within 1 foot or less from the top of the conservation pool. Information from the Lake and Reservoir Water Quality Report (AMEC 2008) indicate minor changes to water quality. Reduced water clarity and algal growth in Grand Lake and Shadow Mountain Reservoir has been a concern that may contribute to a

diminished recreation experience (Stahl and Crabtree 2005). Predicted small reductions in water clarity would continue or slightly increase the potential for a diminished recreation experience under all of the alternatives. The Aquatic Resources Technical Report (Miller Ecological 2008) concluded there would be minor effects to fish habitat in Grand Lake and Shadow Mountain Reservoir and, therefore, there would be no adverse effect to recreational fishing at these lakes for any of the alternatives.

8.2.2. Willow Creek Reservoir

The water surface elevation of Willow Creek Reservoir would not be affected under any of the alternatives; therefore, recreation resources would not be affected.

8.2.3. Granby Reservoir

8.2.3.1. Summary of Cumulative Effects on Granby Reservoir Hydrology

In average conditions during the recreation season, Granby Reservoir surface area would decrease up to about 190 acres or 3 percent under the No Action Alternative compared to existing conditions (Table 33). The Proposed Action would result in a decrease in lake surface area of up to 431 acres or about 7 percent, while Alternatives 3 to 5 would result in less a 4 percent decrease in surface area. The No Action Alternative would reduce the average monthly lake level between 3 and 4 feet during the summer months. The Proposed Action would decrease average monthly water levels 6 to 9 feet from May through September and Alternatives 3 to 5 by 4 to 5 feet.

Table 33. Average Monthly Changes in Granby Reservoir Water Elevations and Surface Area under Cumulative Effects in Average Conditions.

Alternative	May		June		July		August		September	
Existing Conditions	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**
	8,253	**5,970**	**8,263**	**6,440**	**8,268**	**6,722**	**8,269**	**6,750**	**8,268**	**6,691**
Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions										
Alt 1 – No Action	-4	-191	-3	-165	-3	-144	-3	-141	-3	-147
Alt 2 – Proposed Action	-9	-431	-7	-354	-6	-300	-6	-306	-7	-330
Alt 3 – 5	-5	-228	-5	-232	-4	-207	-4	-205	-4	-209

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

In a wet year, decreases in water surface area represent less than a 5 percent change from existing conditions for the No Action Alternative and Alternatives 3 to 5 and less than 8 percent for the Proposed Action. Lake elevation during the summer months would be 1 to 6 feet under the No Action Alternative, 2 to 9 feet under the Proposed Action, and 2 to 6 feet under any of the other alternatives (Table 34). A dry year would reduce water surface area up to 493 acres (9 percent) under the Proposed Action and up to 184 acres for the No Action Alternative. Alternatives 3 to 5 would reduce water levels up to 214 acres (4 percent) (Table 35).

Table 34. Average Monthly Changes in Granby Reservoir Water Elevations and Surface Area under Cumulative Effects in Wet Years.

Alternative	May		June		July		August		September	
Existing Conditions	Elev	SA	Elev	SA	Elev	SA	Elev	SA	Elev	SA
	8,253	5,968	8,266	6,619	8,277	7,151	8,280	7,298	8,280	7,297
Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions										
Alt 1 – No Action	-6	-281	-5	-236	-3	-129	-1	-39	-1	-29
Alt 2 – Proposed Action	-9	-454	-7	-362	-5	-227	-2	-110	-2	-95
Alt 3 – 5	-6	-308	-6	-311	-4	-207	-2	-105	-2	-91

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

Table 35. Average Monthly Changes in Granby Reservoir Water Elevations and Surface Area under Cumulative Effects in Dry Years.

Alternative	May		June		July		August		September	
Existing Conditions	Elev	SA	Elev	SA	Elev	SA	Elev	SA	Elev	SA
	8,253	5,998	8,256	6,108	8,255	6,076	8,252	5,910	8,248	5,727
Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions										
Alt 1 – No Action	-3	-158	-3	-168	-4	-178	-4	-184	-4	-194
Alt 2 – Proposed Action	-7	-333	-7	-333	-7	-352	-8	-410	-10	-493
Alt 3 – 5	-3	-131	-3	-145	-3	-153	-4	-180	-4	-214

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

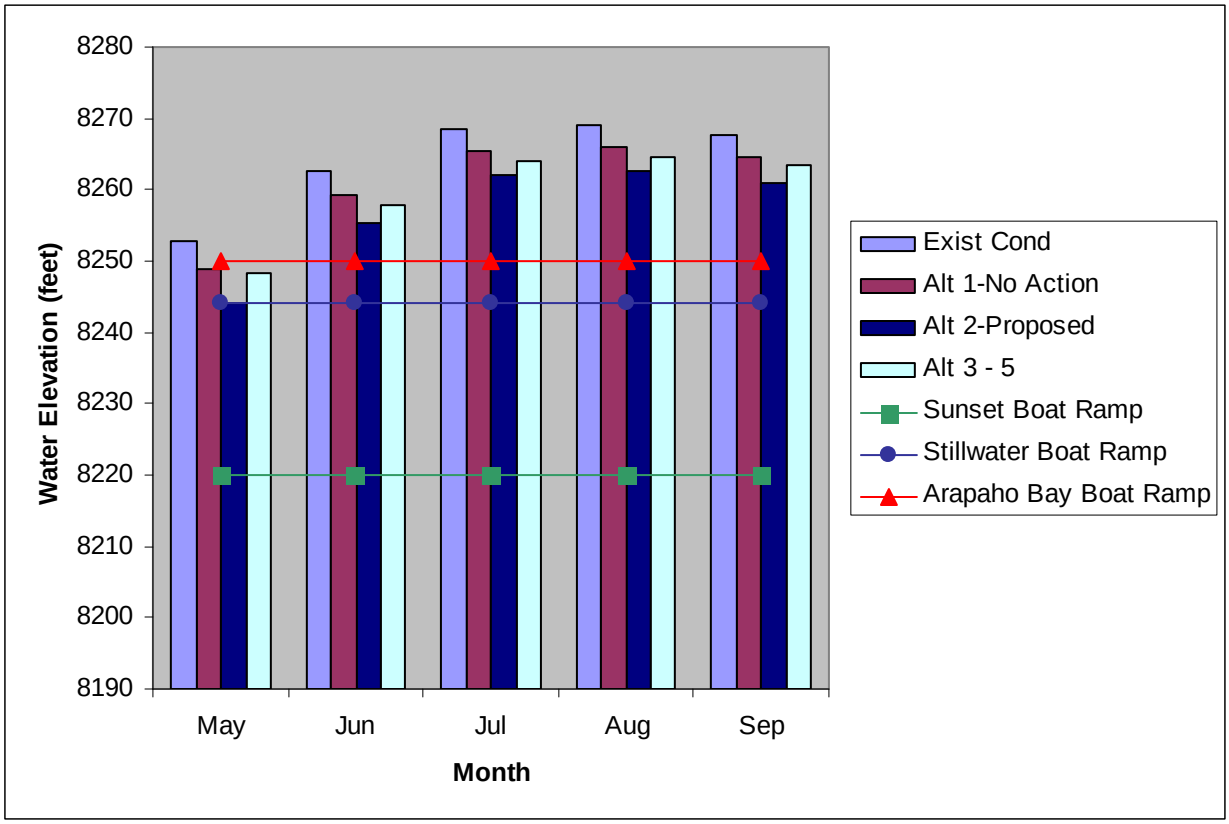
8.2.3.2. Boating

Average monthly water levels in relation to the existing boat ramps, Sunset, Stillwater, and Arapaho Bay is shown in Figure 19. The Proposed Action would bring water levels below the elevation of the Stillwater and Arapaho Bay locations during the month of May. The No Action alternative and other alternatives would also drop water levels below the Arapaho Bay boat ramp in May. The peak season of use is June through August; therefore reduced boat ramp access in May is unlikely to adversely affect recreation activity. All other alternatives in all other months in average years would not affect the use of any of the boat ramps.

In dry years, water levels would most often be below the bottom of the Arapaho Bay boat ramp under all alternatives from May to September. This likely would make this boat ramp unusable during the summer months. The use of the Stillwater boat ramp also would be affected under all alternatives during the month of September and during August under the Proposed Action in dry years.

During wet years, the Arapaho Bay boat ramp would be unusable during the month of May under all alternatives. The water level during the month of May under the Proposed Action would be 8,244 feet, which likely would affect the use of the Stillwater boat ramp (8,244 feet). None of the other boat ramps would be affected during the summer season in a wet year for any of the alternatives.

Figure 19. Average Monthly Water Levels at Granby Reservoir Boat Ramps under Cumulative Effects.



8.2.3.3. Fishing

Lower average water levels under all of the alternatives would not affect accessibility for shoreline fishing, but in dry years when reservoir levels are low, mud flats in portions of the shoreline might affect access. There would be minimal impacts to fish habitat and communities in Granby Reservoir under any of the WGFP alternatives (Miller Ecological 2008); therefore, there would be a minimal or no impact to recreational fishing success.

8.2.3.4. Camping and Hiking

Camping and hiking recreation at Granby Reservoir would not be directly affected by minor changes in water levels under any of the alternatives. Large declines in lake levels after several consecutive dry years could diminish the overall quality of the user experience by increasing the distance between land-based facilities and the water surface and potentially reducing the overall aesthetics of the experience. Camping and hiking could decline during periods when the reservoir is low, but other factors, such as campfire restrictions in dry periods, could also affect visitor use (Orr 2008).

8.2.3.5. Visitor Use and Experience

Average monthly Granby Reservoir water surface area would be lower under all alternatives during the summer months. The decrease in boatable area would be less than 3 percent under No Action, less than 7 percent for the Proposed Action, and less than 4 percent for the other alternatives. This amount of change on a large lake is unlikely to measurably affect recreation activity in a reservoir this size. In dry years and during May in average conditions, the use of some of the boat ramps would be affected. During these times, limited access could decrease visitor use. If the use of boat ramps is hindered due to low water levels, other boat ramps would be available. If crowding becomes an issue at the useable boat ramps and on Granby Reservoir, then displacement of visitors might occur. The recreational experiences for these activities are unlikely to be affected, although some visitors may discern a reduction in aesthetic value from periodic lower water levels. Displaced visitors would likely go to nearby Shadow Mountain Reservoir or Grand Lake.

8.2.4. Potential New West Slope Reservoirs

8.2.4.1. Jasper East and Rockwell/ Mueller Creek Reservoirs

No reasonably foreseeable actions were identified that would result in cumulative recreation effects if Jasper East or Rockwell/Mueller Creek Reservoirs are built. These reservoirs would operate in a manner similar to that described for direct effects (Section 7.2.4) and could provide fishing and recreation opportunities.

8.3. East Slope Reservoirs

8.3.1. Ralph Price Reservoir

No reasonably foreseeable actions were identified that would result in cumulative recreation effects if Ralph Price Reservoir is enlarged.

8.3.2. Carter Lake

8.3.2.1. Summary of Cumulative Effects on Carter Lake Hydrology

Water levels at Carter Lake would not be noticeably affected under any of the alternatives (Table 36). During average conditions or a dry year, average monthly surface area would decrease less than 5 acres and lake levels would not decrease more than 1 foot under any of the alternatives. In wet years, under all alternatives, the average monthly lake surface area would decrease less than 11 acres and lake levels would decrease less than 2 feet for all alternatives (Table 37). In dry years, fluctuations would be within 1 foot of existing conditions for all alternatives.

Table 36. Average Monthly Changes in Carter Lake Elevation and Surface Area under Cumulative Effects in Average Conditions.

Alternative	May		June		July		August		September	
Existing Conditions	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**
	5,753	**1,119**	**5,751**	**1,115**	**5,741**	**1,070**	**5,721**	**980**	**5,707**	**913**
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions (ft)									
Alt 1 – No Action	-1	-2	-1	-4	-1	-5	-1	-5	-1	-3
Alt 2 – Proposed Action	-1	-4	-1	-4	-1	-2	0	-1	0	0
Alt 3 – 5	-1	-2	0	-3	-1	-4	-1	-3	0	-1

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

Table 37. Average Monthly Changes in Carter Lake Elevation and Surface Area under Cumulative Effects in Wet Years.

Alternative	May		June		July		August		September	
Existing Conditions	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**	**Elev**	**SA**
	5,752	**1,118**	**5,756**	**1,130**	**5,753**	**1,121**	**5,736**	**1,049**	**5,718**	**964**
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	0	-2	-1	-3	-1	-6	-2	-9	-2	-11
Alt 2 – Proposed Action	-2	-9	-2	-6	-2	-7	-2	-9	-2	-10
Alt 3 – 5	-1	0	-1	-2	-1	-5	-2	-7	-2	-9

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

8.3.2.2. Cumulative Effects on Recreation

None of the alternatives under any average conditions, wet years, or dry years would affect camping or hiking in the area. The minor changes in reservoir elevations would not noticeably change the availability of boating opportunities at Carter Lake. Projected minor impacts to fish habitat and water quality at Carter Lake under all the alternatives (Miller Ecological 2008) is unlikely to adversely impact recreational fishing.

8.3.2.3. Summary of Cumulative Effects on Horsetooth Reservoir Hydrology

The No Action Alternative would not affect water levels in Horsetooth Reservoir during the peak recreation season (May through September) under average conditions, wet years, or dry years. The Proposed Action would reduce average monthly water surface area less than 72 acres during the peak recreation season in average conditions (Table 38). Alternative 5 would reduce the average monthly water surface area less than 25 acres during average conditions. Recreational experiences may change to the extent that changes in lake levels affect the aesthetic quality of the experience.

Table 38. Average Monthly Changes in Horsetooth Reservoir Elevation and Surface Area under Cumulative Effects in Average Conditions.

Alternative	May		June		July		August		September	
Existing Conditions	Elev	SA	Elev	SA	Elev	SA	Elev	SA	Elev	SA
	5,416	1,834	5,420	1,892	5,418	1,854	5,406	1,703	5,396	1,579
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	0	-1	0	-3	0	-4	0	-4	0	-4
Alt 2 – Proposed Action	-6	-72	-5	-69	-5	-64	-4	-46	-2	-30
Alt 3 – 5	-2	-25	-2	-22	-2	-20	-1	-12	0	-6

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

There would be less than a 2-acre change in the water surface area of Horsetooth Reservoir in wet years under the No Action Alternative (Table 39). During wet years, the Proposed Action would reduce water surface area less than 70 acres and Alternatives 3 to 5 would reduce water surface area less than 15 acres in wet years. The Proposed Action would reduce average monthly water surface area up to 89 acres during dry years, compared to 53 acres for Alternatives 3 to 5 and less than 3 acres for the No Action Alternative (Table 40).

Table 39. Average Monthly Changes in Horsetooth Reservoir Elevation and Surface Area under Cumulative Effects in Wet Years.

Alternative	May		June		July		August		September	
Existing Conditions	Elev	SA	Elev	SA	Elev	SA	Elev	SA	Elev	SA
	5,419	1,872	5,425	1,962	5,425	1,955	5,415	1,820	5,404	1,684
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	0	0	0	0	0	-2	0	-3	0	-3
Alt 2 – Proposed Action	-5	-70	-3	-50	-3	-48	-4	-51	-4	-51
Alt 3 – 5	-1	-15	-1	-9	-1	-9	-1	-7	0	-6

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

Table 40. Average Monthly Changes in Horsetooth Reservoir Elevation and Surface Area under Cumulative Effects in Dry Years.

Alternative	May		June		July		August		September	
Existing Conditions	Elev	SA	Elev	SA	Elev	SA	Elev	SA	Elev	SA
	5,411	1,769	5,411	1,764	5,405	1,697	5,395	1,565	5,386	1,458
	Changes in Lake Elevation (ft) and Surface Area (ac) from Existing Conditions									
Alt 1 – No Action	0	2	0	1	0	-1	0	-3	0	-2
Alt 2 – Proposed Action	-6	-77	-7	-84	-7	-89	-5	-64	-2	-27
Alt 3 – 5	-4	-49	-4	-52	-4	-53	-2	-30	0	-5

Elev = Lake Elevation (ft)
SA = Surface Area (ac)

8.3.2.4. Boating

In average conditions, during the course of the summer, access to one of the boat ramps at Horsetooth Reservoir would potentially be affected during September (Figure 20). The Proposed Action would reduce water levels to an elevation of 5,393 feet in the month of September, which is the same elevation as the bottom of the boat ramp at the South Bay – South location. The No Action Alternative and Alternatives 3 to 5 would reduce water levels to 5,395 feet compared to existing conditions at 5,396 feet. Because water levels would be close to the bottom of the South Bay – South boat ramp under existing conditions, as well as under the No Action Alternative and Alternatives 3 to 5, use of this boat ramp during the month of September could be affected.

Horsetooth Reservoir is open year-round, although the peak recreation season is May through September. Under all alternatives, the bottom of the South Bay – South boat ramp would be exposed during the months of October through December and almost level with each alternative during the month of January. The boat ramp at Satanka Cove could experience a similar effect because water levels would be near the bottom of the boat ramp under each of the alternatives from October through December. Recreation use during this off-peak season is generally low and three other boat ramps are available for use. Horsetooth Reservoir is also susceptible to freezing conditions during January and February, making boating opportunities unavailable.

In dry years, water levels would drop below the South Bay – South boat ramp bottom elevation (5,393 feet) under all alternatives in both August and September. During the month of September, the boat ramp at Satanka Bay (5,385 feet) would be unusable under the Proposed Action, and the water level would be at 5,386 feet under all alternatives, making it potentially unusable. Satanka Cove, under existing conditions, is unusable in September during dry years when water levels are at 5,386 feet. On a busy weekend, there may be potential for crowding at the useable boat ramps.

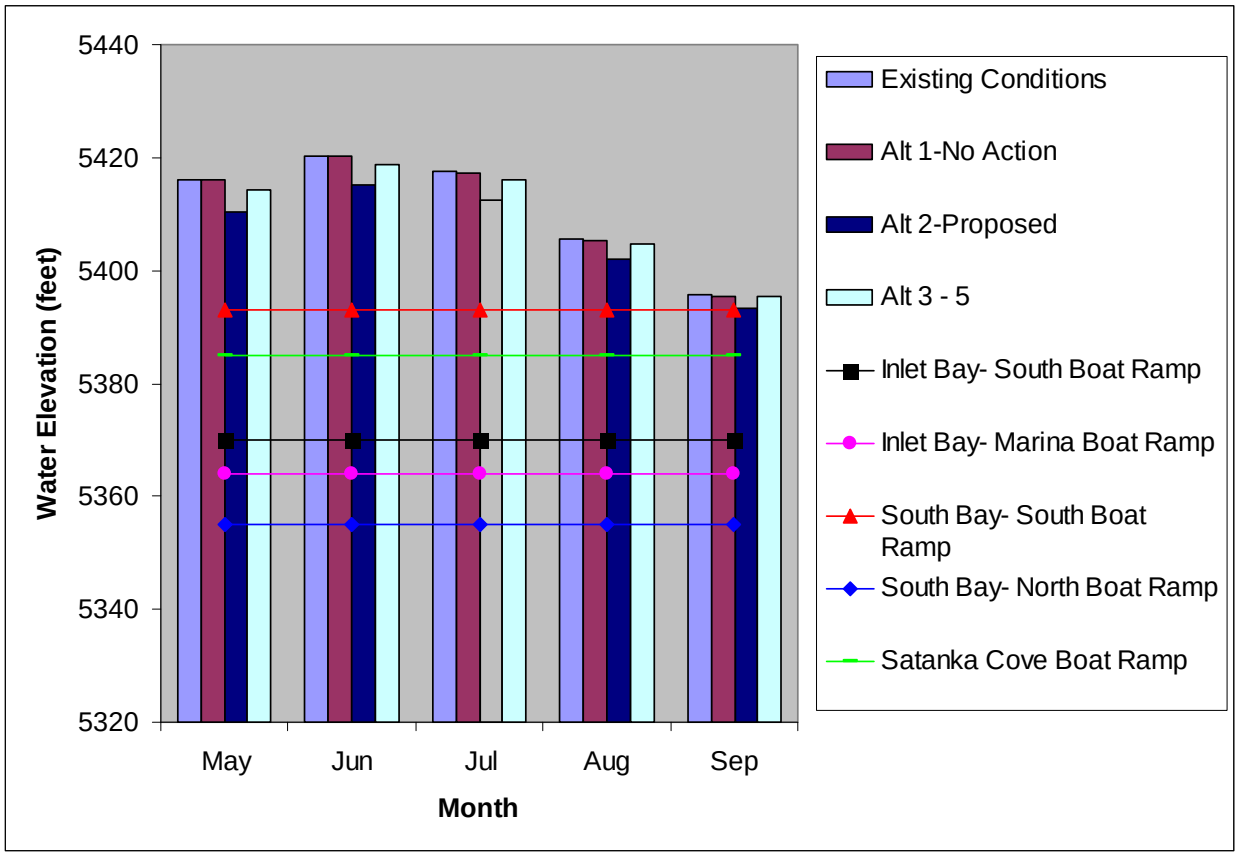
8.3.2.5. Fishing

Projected changes in reservoir elevations and water quality under all of the alternatives would have minimal affect on the fish habitat at Horsetooth Reservoir and therefore fishing opportunities would experience a minimal impact (Miller Ecological 2008).

8.3.2.6. Camping and Hiking

Land-based recreation activities such as camping and hiking would not be affected by any of the alternatives in average, wet, or dry years. Large declines in lake levels after several consecutive dry years could diminish the overall quality of the user experience by increasing the distance between land-based facilities and the water surface and potentially reducing the overall aesthetics of the experience.

Figure 20. Average Monthly Water Levels at Horsetooth Reservoir Boat Ramps under Cumulative Effects.



8.3.3. Potential New East Slope Reservoirs

8.3.3.1. Chimney Hollow Reservoir

Larimer County Parks and Open Lands plans to develop many land-based recreational facilities and trails that would enhance opportunities in the Chimney Hollow area. These two actions combined would provide the northern Front Range with new recreational opportunities in the area. Other recreation effects would be the same as described in Section 7.3.4.1.

8.3.3.2. Dry Creek Reservoir

Dry Creek Reservoir has the potential to have a fishery similar to Carter Lake or Horsetooth Reservoir (Miller Ecological 2008); therefore, recreational fishing would have a potential regional benefit. The future development of nearby Larimer County Parks and Open Lands property in Chimney Hollow could result in similar recreation opportunities as described for Chimney Hollow Reservoir.

8.4. West Slope River Recreation

8.4.1. Colorado River

Potential cumulative effects to recreation on the Colorado River were evaluated based on projected changes in hydrology with implementation of the WGFP alternatives and reasonably foreseeable future water-based developments.

8.4.1.1. Granby Reservoir to Windy Gap Reservoir

Summary of Streamflow Changes. Streamflow would be lower for all alternatives in all months of the year. The largest percent changes in average monthly streamflow under all alternatives would occur in June, July, and August (Table 41).

Table 41. Average Monthly Changes to Colorado River Flow above Windy Gap Reservoir under Cumulative Effects in Average Conditions.

Alternative	May		June		July		August		September	
	cfs	**%***	**cfs**	**%***	**cfs**	**%***	**cfs**	**%***	**cfs**	**%***
Existing Conditions	**545**	**—**	**1,137**	**—**	**519**	**—**	**168**	**—**	**83**	**—**
Alt 1 – No Action	510	-6%	981	-14%	441	-15%	144	-14%	76	-8%
Alt 2 – Proposed Action	505	-7%	903	-21%	425	-18%	141	-16%	72	-12%
Alt 3 – 5	506	-7%	930	-18%	429	-17%	141	-16%	75	-9%

*Percent change in streamflow from existing conditions.

In wet years (Table 42), the largest decrease in flows is projected in August for all alternatives. The No Action Alternative would decrease flows by 28 percent, the Proposed Action by 32 percent, and Alternatives 3 to 5 by 33 percent. During dry years, none of the alternatives would vary from existing conditions.

Table 42. Average Monthly Changes to Colorado River Flow above Windy Gap Reservoir under Cumulative Effects in Wet Years.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**1,041**	**—**	**2,660**	**—**	**1,730**	**—**	**462**	**—**	**124**	**—**
Alt 1 – No Action	989	-5%	2,440	-8%	1,457	-16%	374	-19%	122	-1%
Alt 2 – Proposed Action	992	-5%	2,454	-8%	1,377	-20%	354	-23%	124	0%
Alt 3 – 5	997	-4%	2,439	-8%	1,402	-19%	348	-253%	118	-5%

*Percent change in streamflow from existing conditions.

Boating. This reach of the Upper Colorado River is not a destination for boating. Streamflow reductions would slightly decrease the suitability for boating activities in an average runoff year, but the effects on recreational boating would be minimal as there is little boating use.

Fishing. Projected changes in streamflow and water quality below Granby Reservoir would be similar to direct effects with minor impacts to fish habitat and recreational fishing opportunities under any of the alternative (Miller Ecological 2008).

8.4.1.2. Windy Gap Reservoir to Williams Fork River

Summary of streamflow changes. Average monthly decreases in Colorado River streamflow would be greatest in the months of June, July, and August for all alternatives (Table 43). Streamflow under No Action would decrease up to 26 percent in July at Hot Sulphur Springs. The Proposed Action would reduce the flow by an average of 28 percent in the month of June. Under Alternatives 3 to 5, the river flow would be reduced by an average of 30 percent in July.

Table 43. Average Monthly Changes to Colorado River Flow at Hot Sulphur Springs under Cumulative Effects in Average Conditions.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**278**	**—**	**953**	**—**	**482**	**—**	**170**	**—**	**87**	**—**
Alt 1 – No Action	245	-12%	803	-16%	355	-26%	137	-19%	80	-8%
Alt 2 – Proposed Action	218	-22%	689	-28%	365	-24%	136	-20%	76	-13%
Alt 3 – 5	216	-22%	719	-25%	336	-30%	133	-22%	79	-10%

*Percent change in streamflow from existing conditions.

During wet years (Table 44), Colorado River streamflow changes would be the greatest in August for all alternatives. Streamflows would be reduced by 37 percent under the No Action Alternative, 33 percent under the Proposed Action, and 34 percent under Alternatives 3 to 5. During dry years, all alternatives would have the same effects upon streamflow through Byers Canyon (Table 45). The largest decrease in flow would be experienced in August at 13 percent.

Table 44. Average Monthly Changes to Colorado River Flow at Hot Sulphur Springs under Cumulative Effects in Wet Years.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**730**	**—**	**2,414**	**—**	**1,709**	**—**	**468**	**—**	**127**	**—**
Alt 1 – No Action	672	-8%	2,132	-12%	1,196	-30%	294	-37%	124	-2%
Alt 2 – Proposed Action	552	-24%	2,073	-14%	1,154	-32%	313	-33%	125	-1%
Alt 3 – 5	554	-24%	2,066	-14%	1,132	-34%	311	-34%	120	-5%

*Percent change in streamflow from existing conditions.

Table 45. Average Monthly Changes to Colorado River Flow at Hot Sulphur Springs under Cumulative Effects in Dry Years.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**137**	**—**	**139**	**—**	**142**	**—**	**101**	**—**	**67**	**—**
Alt 1 – No Action	149	9%	154	11%	136	-4%	88	-13%	61	-!0%
Alt 2 – Proposed Action	149	9%	154	11%	135	-4%	88	-13%	61	-10%
Alt 3 – 5	149	9%	154	11%	135	-4%	88	-13%	61	-10%

*Percent change in streamflow from existing conditions.

Boating. Byers Canyon provides Class IV to V kayaking at streamflows above 400 cfs. Flows in the canyon currently exceed 400 cfs in June and a portion of July (Figure 21). In average conditions, flows in Byers Canyon would continue to exceed 400 cfs under all alternatives during the month of June. Average monthly flow in July under all alternatives would be less than 400 cfs and below acceptable kayaking flows. Dry years would reduce kayak recreation in the canyon, as is currently the case. Kayaking flows are currently possible from May through August in wet years. Under any of the alternatives, acceptable kayak conditions would be found from May through July; however, August would no longer provide flows above 400 cfs in wet years.

Estimated daily flow data indicate that in 22 years of the 47-year period of record, there would be no change in the number of days that flow exceeds 400 cfs for any of the alternatives. In the remaining 25 years, there would be an estimated average decrease of 11 days with flows less than the preferred kayaking minimum of 400 cfs under the No Action alternative and an estimated 12 to 13 fewer days for the action alternatives (Table 46). The greatest single year decrease in the number of days with preferred flows for kayaking would be 56 days under all the alternatives, with an increase of up to 1 day under the action alternatives.

Although Byers Canyon does not support commercial boating and is infrequently used for kayaking, these changes would reduce the availability of whitewater flows in Byers Canyon primarily during July. If Byers Canyon is not boatable due to low water, kayakers would likely be displaced to lower stretches of the Upper Colorado River, such as Gore Canyon, for the Class IV to V experience.

Fishing. Reduced flow and the frequency of flow reductions could have a minor effect on adult rainbow trout habitat and to a lesser extent brown trout habitat under all the alternatives. A slight reduction in fish habitat in this reach is unlikely to affect the Gold Medal fishery in this reach of the river from the west end of Byers Canyon to the Williams Fork River (Miller Ecological 2008). Angling opportunities would not be adversely impacted under the alternatives based on the projected effects on fish habitat.

Figure 21. Average Monthly Streamflows on the Colorado River through Byers Canyon and Preferred Kayaking Flows under Cumulative Effects.

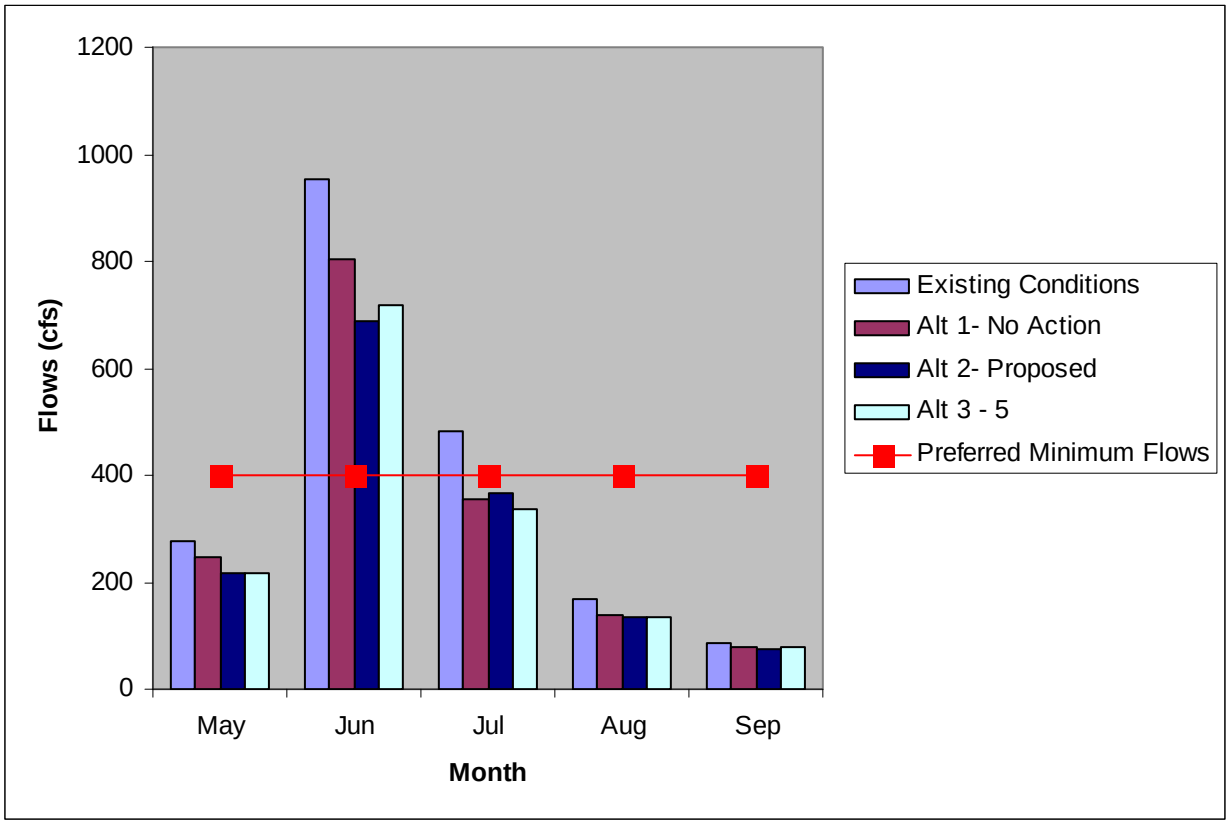


Table 46. Comparison of Preferred Kayaking Flow Days (flows above 400 cfs) in Byers Canyon (June 1 through July 26) between Existing Conditions and the Alternatives—Cumulative Effects.

Alternative	Total days in 47-year period flows are >400 cfs	Average change in preferred flow days per year from EC during the 25 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 25 years when flow changes occur
Existing Conditions (EC)	1,012		
Alt 1 – No Action	768	-11.0	-56 to 0
Alt 2 – Proposed Action	725	-11.6	-56 to +1
Alt 5	703	-12.7	-56 to +1

*There would be no change in the number of days when kayaking flows exceed 400 cfs between EC and any of the alternatives in 22 of the 47 years.

Other Recreation Activities. None of the proposed alternatives would affect other recreation activities that occur along the Colorado River in this reach. These activities include

camping, hiking, mountain biking, hunting, scenic driving, and OHV riding. Some visitors may discern a reduction in aesthetic value and the quality of the recreation experience from periodic lower flows in the Colorado River. Headwaters Trails Alliance has plans to construct a trail near the Colorado River from Granby to State Bridge. A formal plan for the exact location of this trail has not yet been decided and actual construction of it would not occur for many years. Activities along this trail would include only non-motorized activities and would not be affected by any of the alternatives.

8.4.1.3. Williams Fork River to Kremmling

Summary of Streamflow Changes. The largest percent change in average monthly streamflows under the alternatives would occur from May through July (Table 47). In average conditions from May through July, flows would decrease from existing conditions under the No Action Alternative between 9 to 19 percent, the Proposed Action Alternative would decrease flows between 17 to 20 percent, and Alternatives 3 to 5 would decrease flows between 16 to 21 percent.

Table 47. Average Monthly Changes to Colorado River Flow below Williams Fork under Cumulative Effects in Average Conditions.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**308**	**—**	**1,194**	**—**	**735**	**—**	**276**	**—**	**191**	**—**
Alt 1 – No Action	273	-11%	1,085	-9%	597	-19%	265	-4%	200	-5%
Alt 2 – Proposed Action	246	-20%	971	-19%	607	-17%	264	-4%	196	-3%
Alt 3 – 5	244	-21%	1,000	-16%	578	-21%	261	-5%	199	-4%

*Percent change in streamflow from existing conditions.

In wet years (Table 48), streamflow will decrease 22 to 23 percent in May, July, and August under all of the action alternatives. Under the No Action Alternative, streamflow will decrease 20 percent in July and 25 percent in August. In dry years (Table 49), a 24 percent decrease in streamflow would occur in July under all of the alternatives.

Table 48. Average Monthly Changes to Colorado River Flow below Williams Fork under Cumulative Effects in Wet Years.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**803**	**—**	**2,695**	**—**	**2,314**	**—**	**639**	**—**	**215**	**—**
Alt 1 – No Action	737	-8%	2,728	-8%	1,844	-20%	482	-25%	215	0%
Alt 2 – Proposed Action	616	-23%	2,668	-10%	1,802	-22%	501	-22%	216	1%
Alt 3 – 5	619	-23%	2,662	-10%	1,780	-23%	498	-22%	211	-2%

*Percent change in streamflow from existing conditions.

Table 49. Average Monthly Changes to Colorado River Flow below Williams Fork under Cumulative Effects in Dry Years.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**148**	**—**	**146**	**—**	**338**	**—**	**266**	**—**	**178**	**—**
Alt 1 – No Action	160	8%	162	10%	258	-24%	274	3%	198	11%
Alt 2 – Proposed Action	160	8%	161	10%	258	-24%	274	3%	198	11%
Alt 3 – 5	160	8%	161	10%	258	-24%	274	3%	198	11%

*Percent change in streamflow from existing conditions.

Boating. Boating is not a popular recreation activity on this reach of the Colorado River. Much of the land surrounding it is private and the water is flat. Potential for boating on this section would decrease with lower flows, mainly during the months of May through July across all alternatives.

Fishing. Projected minor decreases in fish habitat and changes in water quality downstream of the Williams Fork River under all the alternatives is not expected to substantially affect the fish community along this reach of the Colorado River (Miller Ecological 2008). Fish productivity should remain high and impacts to the Gold Medal fishery would be minor.

Other Recreation Activities. None of the proposed alternatives would affect other recreation activities that occur along the Colorado River in this reach. These activities include camping, hiking, mountain biking, hunting, scenic driving, and OHV riding. Some visitors may discern a reduction in aesthetic value and the quality of the recreation experience from periodic lower flows in the Colorado River. Headwaters Trails Alliance has plans to construct a trail near the Colorado River from Granby to State Bridge. A formal plan for the exact location of this trail has not yet been decided and actual construction of it would not occur for many years. Activities along this trail would include only non-motorized activities and would not be affected by any of the alternatives.

8.4.1.4. Kremmling to Pumphouse (Big Gore Canyon)

Summary of Streamflow Changes. All alternatives are similar in their streamflow reductions for average conditions (Table 50), wet years (Table 51), and dry years (Table 52). The highest percent of change occurs in July for average and wet years and June for dry years.

Table 50. Average Monthly Changes to Colorado River Flow near Kremmling under Cumulative Effects in Average Conditions.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**1,145**	**—**	**2,619**	**—**	**1,745**	**—**	**1,026**	**—**	**909**	**—**
Alt 1 – No Action	975	-15%	2114	-19%	1303	-25%	953	-7%	864	-5%
Alt 2 – Proposed Action	948	-17%	2002	-24%	1313	-25%	953	-7%	859	-5%
Alt 3 – 5	945	-17%	2030	-22%	1286	-26%	948	-8%	862	-5%

*Percent change in streamflow from existing conditions.

Table 51. Average Monthly Changes to Colorado River Flow near Kremmling under Cumulative Effects in Wet Years.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**2,231**	**—**	**5,885**	**—**	**4,725**	**—**	**1,694**	**—**	**945**	**—**
Alt 1 – No Action	2,015	-10%	4,956	-16%	3,930	-17%	1,430	-16%	924	-2%
Alt 2 – Proposed Action	1,894	-10%	4,897	-17%	3,888	-18%	1,439	-14%	924	-2%
Alt 3 – 5	1,896	-15%	4,891	-17%	3,866	-18%	1,446	-15%	919	-3%

*Percent change in streamflow from existing conditions.

Table 52. Average Monthly Changes to Colorado River Flow near Kremmling under Cumulative Effects in Dry Years.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**422**	**—**	**473**	**—**	**924**	**—**	**923**	**—**	**866**	**—**
Alt 1 – No Action	388	-8%	353	-25%	748	-19%	914	-3%	826	-5%
Alt 2 – Proposed Action	388	-8%	348	-26%	748	-19%	914	-3%	826	-5%
Alt 3 – 5	388	-8%	348	-26%	748	-19%	914	-3%	826	-5%

*Percent change in streamflow from existing conditions.

Boating. The preferred flow through Big Gore Canyon for rafters is around 1,000 cfs. Commercial companies will do trips at a minimum of 850 cfs and a high limit of 1,250 cfs for this Class V stretch of the Colorado River (Figure 22). Kayakers use a wide range of flows. However, kayakers prefer flows in the Colorado River, both in Big Gore Canyon and down to State Bridge, of around 1,100 cfs (Figure 23) (Sommerhoff 2006).

Figure 22. Average Monthly Streamflow on the Colorado River through Big Gore Canyon and Preferred Rafting Flows under Cumulative Effects.

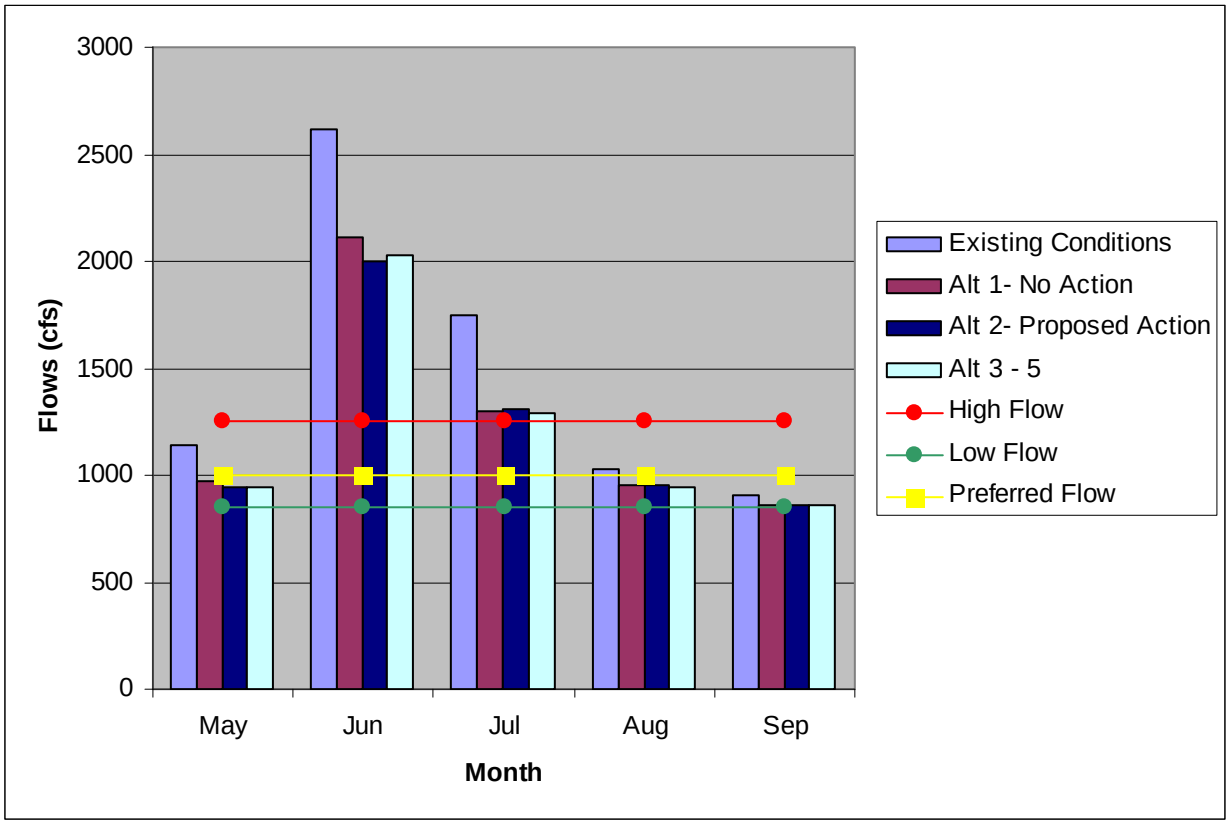
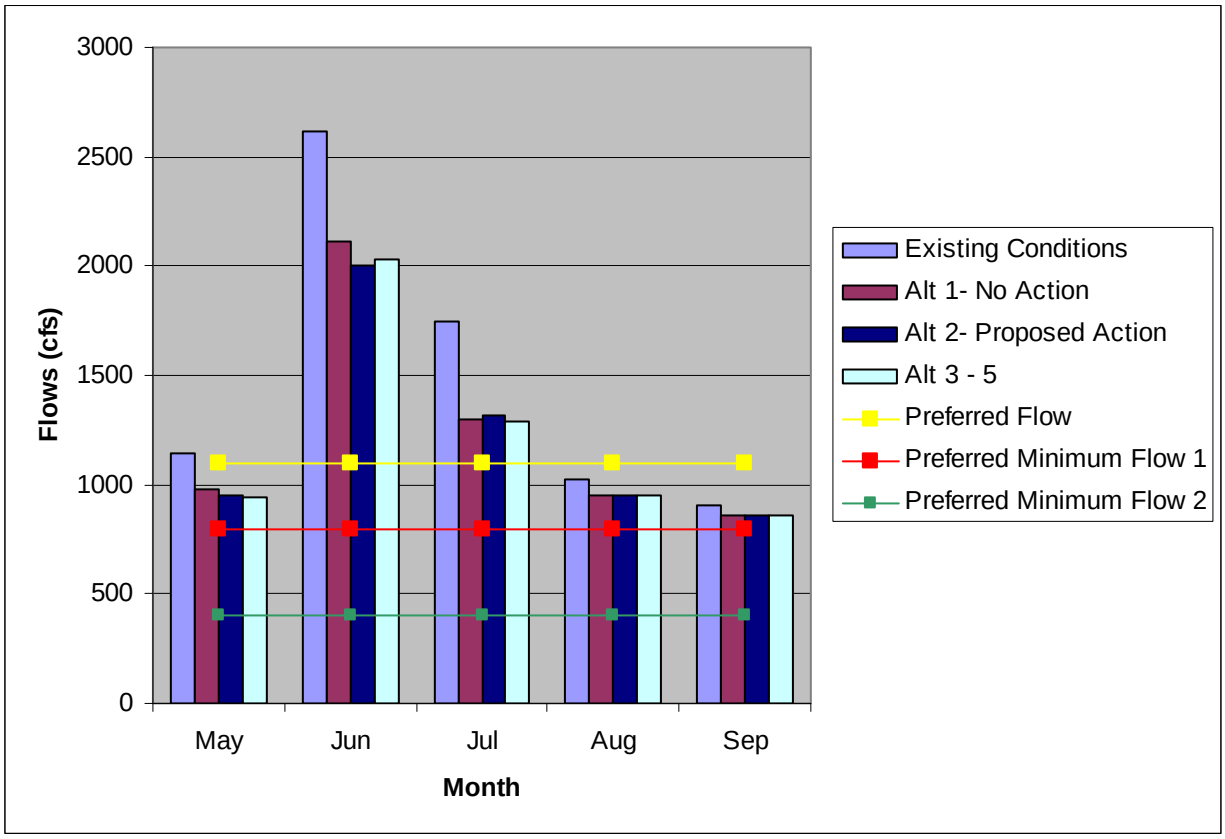


Figure 23. Average Monthly Streamflows on the Colorado River through Big Gore Canyon to State Bridge and Preferred Kayaking Flows under Cumulative Effects.



Streamflow through Big Gore Canyon, with reasonably foreseeable future water developments in place, indicates fewer days with preferred rafting flows between 850 cfs and 1,250 cfs in average conditions (Figure 22). Rafting in Gore Canyon primarily occurs during August when temperatures are warmer, with limited use in May and late September (Borski 2007). In wet years, flows are substantially higher and diversions may slightly increase the number of suitable days within the prime boating season. In dry years, existing conditions hydrology provides flows from 850 to 1,250 cfs for most of July compared to the alternatives where these flows would not be available until the first of August.

Table 53 and Table 54 demonstrate the number of days in the 47-year period when flows would be within the preferred range for rafting and kayaking in August based on the preferred flow ranges for commercial and recreational boating discussed in Section 6.1.4.4. The upper flow limit of 2,200 cfs was based on the limited number of kayakers that use the river when flows reach a Class V+ rating through the canyon.

Estimated daily flow data indicate that in 13 years of the 47-year period of record, there would be no change in the number of days that preferred rafting flows of 850 to 1,250 cfs occur for any of the alternatives. Preferred rafting flows in Gore Canyon would occur about 40 days less under the No Action alternative compared to existing conditions over the 47-year study period (Table 53). Under the Proposed Action, preferred rafting flows would occur about 56

days less than existing conditions over the 47 years. On average, this would be about 1 to 2 days fewer with preferred rafting flows during the 34 years when flows fall outside of the preferred range. The greatest decrease in the number of days with preferred rafting flows in a single year would be 23 days under the No Action alternative and up to 31 days for the Proposed Action and other alternatives. There would also be years when the number of rafting days increases. The No Action alternative would increase the number of days with preferred rafting flows by up 17 days in a single year and the action alternatives up to 22 days. Projected flows for all of the alternatives would allow commercial outfitters to continue to run trips through Big Gore Canyon in August most of the time. In some years, there would be more days with preferred rafting flows than currently occur and in other years there could be fewer.

Table 53. Comparison of Preferred Rafting Flow Days (850 to 1,250 cfs) in Big Gore Canyon between Existing Conditions and the Alternatives in August—Cumulative Effects.

Alternative	Total days in 47-year period were between 850 and 1,250 cfs	Average change in preferred flow days per year from EC during the 34 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 34 years when flow changes occur
Existing Conditions (EC)	848		
Alt 1 – No Action	808	-1.2	-23 to +17
Alt 2 – Proposed Action	792	-1.7	-31 to +22
Alt 3 – 5	786	-1.8	-31 to +22

*There would be no change in the number of days when preferred flows for rafting are between 850 and 1,250 cfs in 13 of 47 years.

Estimated daily flow data indicates there would be no change in the in the number of days that flows fall within the preferred range of 400 to 2,200 cfs for kayaking in 43 years out of the 47-year study period in Big Gore Canyon and Pumphouse (Table 54). During the 4 years when flow changes fall outside this range, there would be an average of about 1 less day of preferred flow for the No Action alternative and about 2 fewer days for the action alternatives. In those years when there is a change in the number of days when flows are between 400 and 2,200 cfs, the estimated change varies from 3 more days to 11 fewer days. There would be no substantial change in kayaking opportunities in Big Gore Canyon under any of the alternatives, with an overall net change of 5 fewer days of kayaking over the 47-year study period.

Table 54. Comparison of Preferred Kayaking Flow Days (400 to 2,200 cfs) in Big Gore Canyon and Pumphouse to State Bridge between Existing Conditions and the Alternatives in August—Cumulative Effects.

Alternative	Total days in 47-year period flows were between 400 and 2,200 cfs	Average change in preferred flow days per year from EC during the 4 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 4 years when flow changes occur
Existing Conditions (EC)	1,421		
Alt 1 – No Action	1,416	-1.3	-11 to +3
Alt 2 – Proposed Action	1,416	-1.3	-11 to +3
Alt 3 – 5	1,416	-1.3	-11 to +3

*There would be no change in the number of days when preferred flows for kayaking are between 400 and 2,200 cfs in 43 of the 47 years.

A change in the number of days of preferred kayaking flows between 1,100 and 2,200 cfs in Big Gore Canyon and Pumphouse to State Bridge was also evaluated based on daily data for the period from June to August (Table 55). There would be no change in the number of days in this flow range in 7 years out of the 47-year study period. Results also indicate that over the 47-year study period, there would be about 190 fewer days of preferred kayaking flows under the No Action alternative compared to existing conditions, and about 207 fewer days under the Proposed Action. On average, this would be about 5 less days per year of preferred kayaking flows during the 40 years where flow changes occur. In those years when there is a change in the number of days with flows between 1,100 and 2,200 cfs, the estimated change varies from 31 more days to 56 fewer days. Based on the information in Table 54 and Table 55, sufficient flows would be available for the annual Gore Race (usually held the third week in August) in most years, but flows may be below the preferred levels. The WGFP under all of the alternatives would rarely divert water in late August except in wet years and, therefore, would have minimal effects on the Gore Race. Reduced flows from other reasonably foreseeable alternatives, including future reductions in Blue River flows to the Colorado River, would have the greatest impact on Colorado River flows in August.

Table 55. Comparison of Preferred Kayaking Flow Days (1,100 to 2,200 cfs) in Big Gore Canyon and Pumphouse to State Bridge between Existing Conditions and the Alternatives from June to August—Cumulative Effects.

Alternative	Total days in 47-year period flows were between 1,100 and 2,200 cfs	Average change in preferred flow days per year from EC during the 40 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 40 years when flow changes occur
Existing Conditions (EC)	1,034		
Alt 1 – No Action	844	-4.3	-56 to +31
Alt 2 – Proposed Action	827	-4.5	-56 to +31
Alt 3 – 5	834	-4.5	-56 to +29

*There would be no change in the number of boating days when flows are between 1,100 and 2,200 cfs in 7 of the 47 years.

Fishing. The Gore Canyon Class V rapids prevent any boating-fishing activities, and the canyon itself is too narrow and steep to provide streamside fishing opportunities.

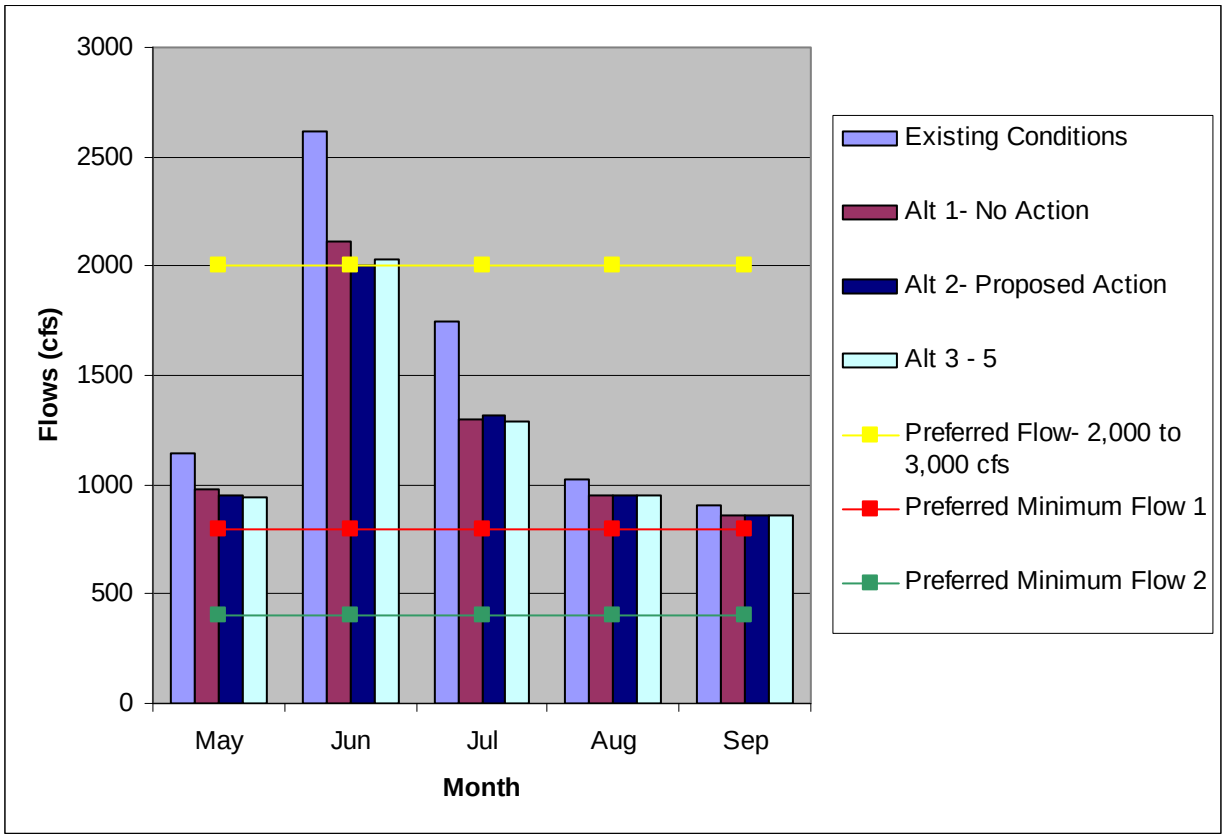
Other Recreation Opportunities. Gore Canyon does not support many other recreational activities, due to the steepness of the canyon. The Gore Hiking Trail once was a complete trail with foot bridges that was originally constructed by the railroad crews to investigate the feasibility of a rail line through Gore Canyon (Arkins 2006). The trail is now incomplete, as foot bridges have deteriorated and the trail was not maintained. The trail could be reconstructed with the help of a large-scale volunteer project in the future (Id.). If this trail work were pursued, additional recreational opportunities in Big Gore Canyon would exist. Some visitors may discern a reduction in aesthetic value and the quality of the recreation experience from periodic lower flows in the Colorado River.

8.4.1.5. Pumphouse to State Bridge

Boating. This reach of the Colorado River provides a very popular Class II to Class III rafting and kayaking experience. Average monthly streamflow under cumulative effects through this reach are the same as listed above in Table 50, however, the preferred level for rafting is 2,000 to 3,000 cfs.

In average conditions, the flows on the Colorado River between Pumphouse and State Bridge would remain above the preferred minimum flow for rafting of 400 to 800 cfs during the prime summer season under all alternatives (Figure 24). Flows of more than 2,000 cfs primarily occur only during June under existing conditions and the alternatives.

Figure 24. Average Monthly Streamflows on the Colorado River, Pumphouse to State Bridge, and Preferred Rafting Flows under Cumulative Effects.



Dry year streamflow in the Pumphouse reach would be substantially lower under all alternatives (Figure 25). Reasonably foreseeable future actions would be responsible for the majority of changes in flow in dry years because dry year flows would not change from existing conditions under the WGFP. Streamflow under existing conditions is below acceptable rafting conditions during dry years in May and June. Flows of 400 cfs, which is acceptable for kayakers, would be met July through September for all alternatives. The rafting season would be reduced in July for all the alternatives in dry years.

Figure 25. Dry Year Average Monthly Streamflows on the Colorado River, Pumphouse to State Bridge, and Preferred Rafting Flows under Cumulative Effects.

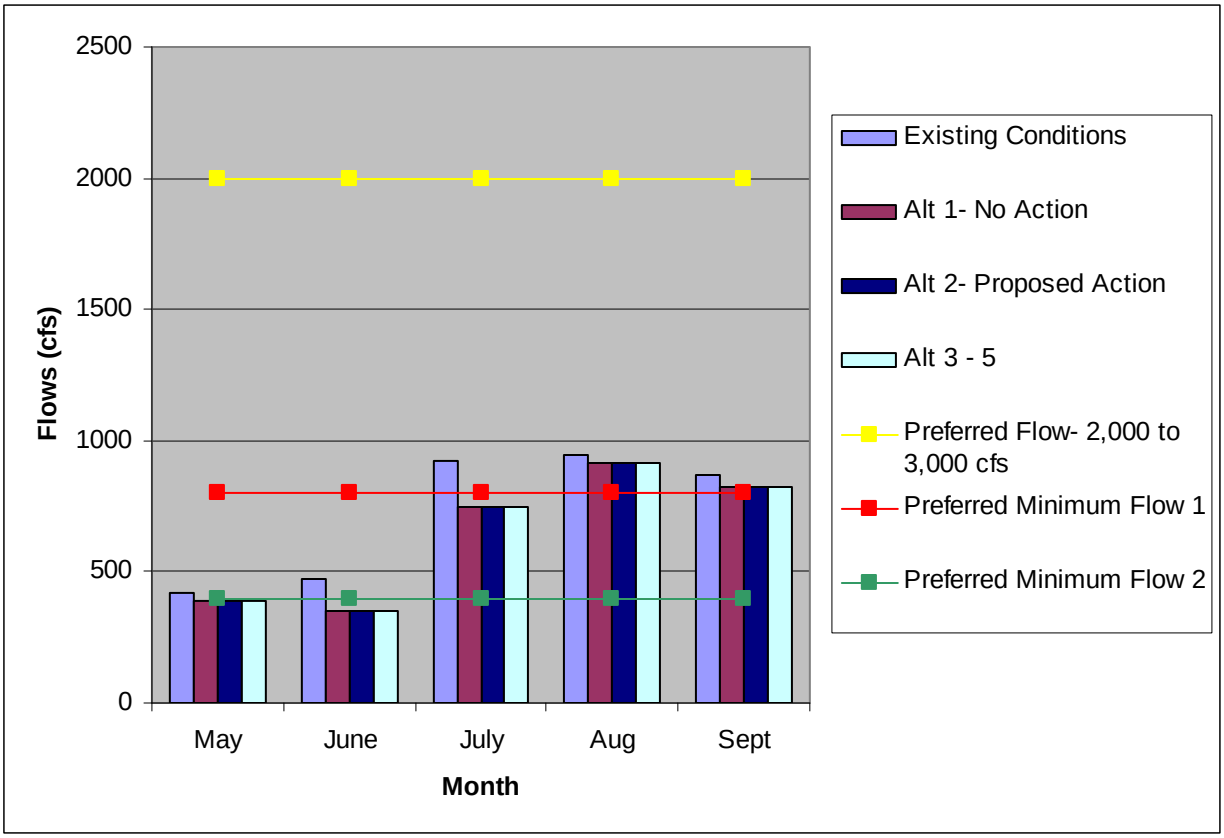


Table 56 and Table 57 demonstrate the number of days in a 47-year period where rafting flows were within the preferred range for both rafting and kayaking in June through August in the Pumphouse reach of the Colorado River. The preferred flow range for rafting was based on commercial outfitter and user preference data as discussed in Section 6.1.4.4.

Estimated daily flow data indicate that in 15 years out of the 47-year period of record there would be no change in the number of days that flows in the Pumphouse reach of the Colorado River are between 40 and 3,000 cfs for any of the alternatives (Table 56). Over the 47-year study period, there would be 65 more days with flows in this range under the No Action alternative compared to existing conditions. Under the Proposed Action and other alternatives, there would be a total of about 81 more days in the preferred flow range as a result of diversions that reduce flow below 3,000 cfs. On average, this would be an increase of about 2 to 3 days per year during the 32 years when flow changes occur. In those years when there is a change in the number of days with flows greater than 400 cfs, the estimated change varies from 30 more days to 19 fewer days under all the alternatives.

Table 56. Comparison of Preferred Rafting and Kayaking Flow Days (400 to 3,000 cfs) from Pumphouse to State Bridge between Existing Conditions and the Alternatives for June through August—Cumulative Effects.

Alternative	Total days in 47-year period flows were between 400 and 3,000 cfs	Average change in preferred flow days per year from EC during the 32 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 32 years when flow changes occur
Existing Conditions (EC)	3,498		
Alt 1 – No Action	3,563	+2.0	-19 to +30
Alt 2 – Proposed Action	3,579	+2.8	-19 to +30
Alt 5	3,580	+2.6	-19 to +30

*There would be no change in the number of boating days when flows are between 400 and 3,000 cfs in 15 of the 47 years.

There would be no change from existing conditions in the number of days when rafting flows in the Pumphouse reach are between 2,000 and 3,000 cfs in 21 years out the 47-year study period under the alternatives (Table 58). Over the 47-year study period, there would be 206 fewer days of preferred flows under the No Action alternative and 190 fewer days under the Proposed Action. On average during the 26 years where flow changes occur, there would be about 9 less days per year in the preferred rafting flow range. The greatest decrease in the number of days in the preferred flow range in a single year would be 17 days under all of the action alternatives except Alternative 5, which would have 15 fewer days. The greatest increase in the number of days in the preferred flow range in a year would be 31 days under the No Action and Proposed Action alternatives. Although overall there would be more rafting days available between 400 and 3,000 cfs as shown in Table 54, there would be fewer days in the preferred higher flow range of 2,000 to 3,000 cfs. This could reduce the number boaters or diminish the boating experience in years when flows drop below 2,000 cfs.

Table 57. Comparison of Preferred Rafting Flow Days (2,000 to 3,000 cfs) from Pumphouse to State Bridge between Existing Conditions and the Alternatives for June through August—Cumulative Effects.

Alternative	Total days in 47-year period flows were between 2,000 and 3,000 cfs	Average change in preferred flow days per year from EC during the 26 years when flow changes occur*	Greatest change in the number of preferred flow days in a single year compared to EC during the 26 years when flow changes occur
Existing Conditions (EC)	441		
Alt 1 – No Action	235	-8.8	-15 to +31
Alt 2 – Proposed Action	251	-9.0	-14 to +31
Alt 5	232	-8.3	-14 to +27

*There would be no change in the number of boating days when flows are between 2,000 and 3,000 cfs in 21 of 47 years.

Fishing. Projected minor changes to fish habitat in the Pumphouse reach of the Colorado River from changes in streamflow and water quality under all the alternatives is unlikely to affect recreational fishing use (Miller Ecological 2008).

Other Recreation Activities. None of the proposed alternatives would affect other recreation activities such as camping, hiking, mountain biking, hunting, scenic driving, and OHV riding that occur along the Colorado River in this reach. The Radium Hot Spring exists in this reach on the Colorado River. Visitors access this spring via boat or hiking in from the Trough Road. Some visitors may discern a reduction in aesthetic value and the quality of the recreation experience from periodic lower flows in the Colorado River. Camping and other non-water-based recreation would not be directly impacted by the alternatives. There could be a decrease in camping in upper Colorado River campgrounds during periods when streamflows are less than preferred for boating.

Headwaters Trails Alliance has plans to construct a trail near the Colorado River from Granby to State Bridge. A formal plan for the exact location of this trail has not yet been decided and actual construction of it would not occur for many years. Activities along this trail would include only non-motorized activities and would not be affected by any of the alternatives.

8.4.2. Willow Creek

There are no current recreational boating opportunities along Willow Creek. Fishing opportunities are limited to private lands. Projected minor effects to fish habitat and water quality under all the alternatives would have negligible impact on the limited recreational fishing on Willow Creek (Miller Ecological 2008).

8.5. East Slope River Recreation

8.5.1. Big Thompson River

All alternatives are estimated to increase flows on the Big Thompson River during the May through September recreation season in average years below Lake Estes (Table 58). The largest average monthly increase in flows would be 17 cfs (7 percent) in the month of July and 14 cfs (6 percent) in the month of May under the Proposed Action (Alternative 2). Other alternatives would see an average monthly flow increase of between 0 and 3 percent.

Table 58. Average Monthly Changes in Streamflows on the Big Thompson River under Cumulative Effects.

Alternative	May		June		July		August		September	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**228**	**—**	**515**	**—**	**249**	**—**	**158**	**—**	**81**	**—**
Alt 1 – No Action	228	0%	519	1%	251	1%	158	0%	81	0%
Alt 2 – Proposed Action	242	6%	526	2%	266	7%	161	2%	81	1%
Alt 3 – 5	235	3%	519	1%	253	2%	159	0%	81	0%

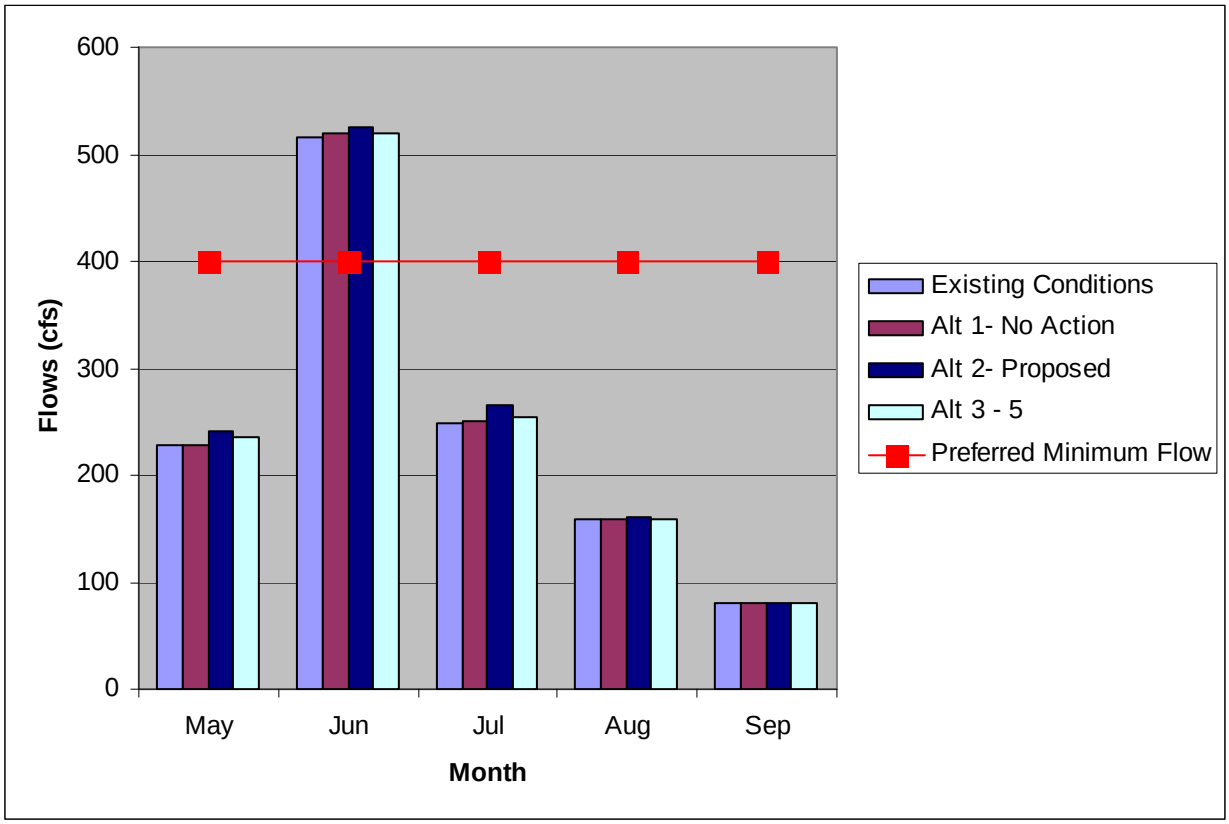
*Percent change in streamflow from existing conditions.

Boating. Kayakers use the lower portion of the Big Thompson Canyon when flows exceed 400 cfs. This stretch is considered a Class IV whitewater run. Existing conditions allow for this activity during June only during average conditions and June through July in a wet year. None of these alternatives would change the availability of the kayaking opportunities on the Big Thompson River during wet years, dry years, or average conditions (Figure 26).

Fishing. The minor flow changes under any of the alternatives are not expected to alter fish habitat or recreational fishing opportunities along the Big Thompson River (Miller Ecological 2008).

Other Recreation Activities. Larimer County Parks and Open Lands plans to construct a new trail from the Loveland Sports Complex to the Big Thompson Ponds State Wildlife Area by the year 2017. Future activities along this trail would not be affected under all alternatives.

Figure 26. Average Monthly Streamflows on the Big Thompson River and Preferred Kayaking Flows under Cumulative Effects.



8.5.2. North St. Vrain Creek and St. Vrain Creek

North St. Vrain Creek flows below Longmont Reservoir would only be affected by the No Action alternative between the months of May to October (Table 59). Other alternatives would not have any affect on North St. Vrain Creek.

Table 59. Average Monthly Changes in Streamflows on the North St. Vrain Creek under Cumulative Effects.

Alternative	May		June		July		Aug		Sept		Oct	
	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*	cfs	%*
Existing Conditions	**133**	**—**	**250**	**—**	**147**	**—**	**59**	**—**	**19**	**—**	**8**	**—**
Alt 1 – No Action	118	-11%	250	0%	109	-25%	59	0%	32	65%	14	81%

*Percent change in streamflow from existing conditions.

Boating. Flows on the stretch of Class V and the two stretches of Class III whitewater between Longmont Reservoir and Lyons would be affected in May and July. The preferred minimum flows for kayakers on the North St. Vrain are between 150 and 500 cfs. Kayakers currently expect potential preferable conditions during some of the month of July, which currently has an average streamflow of 147 cfs. A 25 percent reduction in average July

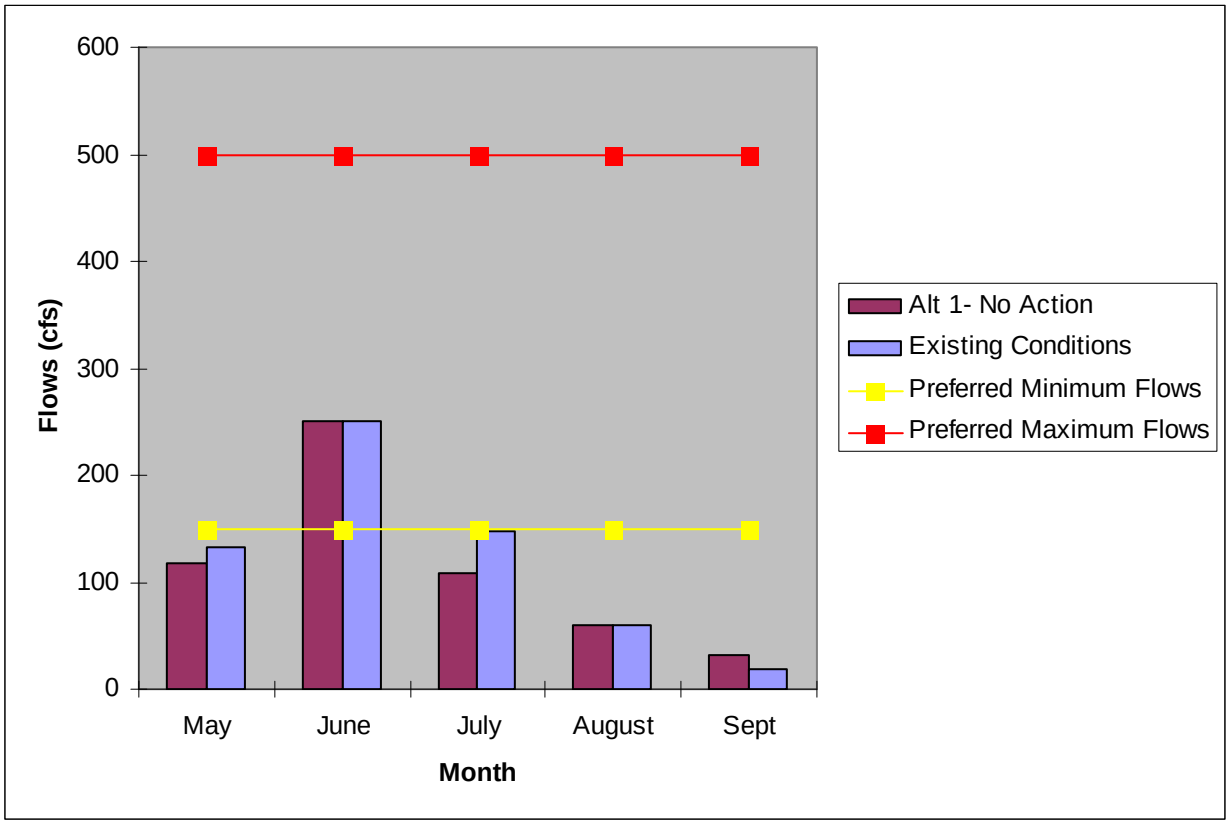
streamflow under No Action would reduce kayak recreation opportunities. There would be no effect to June flows when the majority of kayaking occurs. None of the other alternatives would affect kayak recreation on the North St. Vrain (Figure 27). Less than a 13 percent decrease in average monthly streamflow on St. Vrain Creek near Lyons would not reduce preferred flows for kayaking (>200 cfs) from May to July.

Fishing. Projected seasonal decreases and increases in flow in North St. Vrain Creek and St. Vrain Creek under the No Action Alternative would have minor positive and negative effects on fish habitat, but is unlikely to adversely impact recreational fishing opportunities (Miller Ecological 2008).

8.5.3. Other East Slope Streams

Under all alternatives, other East Slope streams would receive increased flow from below the wastewater treatment plants (Big Thompson River at Loveland, St. Vrain Creek below Longmont, Coal Creek, and Big Dry Creek) between 0 and 7.6 cfs during the months of April through October dependent upon the stream. Flow increases would not negatively affect and may improve the fish habitat on these streams during dry years (Miller Ecological 2008). These flow increases are not expected to impact the infrequent water-based recreation that occurs on these streams.

Figure 27. Average Monthly Streamflows and Preferred Kayaking on the North St. Vrain under Cumulative Effects.



9.0 REFERENCES

AMEC (AMEC Earth & Environmental, formerly Hydrosphere Resource Consultants). 2008. Windy Gap Firming Project Lake and Reservoir Water Quality Technical Report. Prepared for U.S. Bureau of Reclamation.

Arkins, J. 2004. Outdoor Recreation Planner, Bureau of Land Management. Personal communication with Scott Babcock, ERO Resources Corporation. August 24.

Arkins, J. 2006. Outdoor Recreation Planner, Bureau of Land Management. Personal communication with Stacey Antilla, ERO Resources Corporation. September 15.

Banks and Eckardt. 1999. Colorado Rivers and Creeks. Second Edition.

BLM (Bureau of Land Management). 1982. U.S. Bureau of Land Management Resource Management Plan for the Kremmling Resource Area.

BLM (Bureau of Land Management). 2006. Wild and Scenic River Inventory/Eligibility Process. BLM – Kremmling Field Office. Available at: <http://www.co.blm.gov/kra/WildScenicInventoryProcess.htm>.

BLM (Bureau of Land Management). 2007a. Final Wild and Scenic River eligibility report for Kremmling and Glenwood Springs, Field Offices, Colorado.

BLM (Bureau of Land Management). 2007b. Monthly Commercial Boating Numbers on the Upper Colorado River between Kremmling and State Bridge. Provided by John Arkins, BLM Outdoor Recreation Planner. March.

Boulder Outdoor Center. 2006. Lyons Playpark. Available at: <http://www.boc123.com/Kayak/PlayparkLyons.cfm>.

Borski, C. 2007. Lakota Rafting. Personal communication with Stacey Antilla, ERO Resources Corporation. January 5.

Boyle Engineering and Northern Colorado Water Conservancy District. 2005. Draft Windy Gap EIS Alternatives Descriptions Report. May.

Cassel, S. 2005. Bureau of Land Management, Kremmling Field Office. Email communication with Scott Babcock, ERO Resources Corporation. August 31.

Coffman, M. 2005. Larimer County Parks. Personal communication with Scott Babcock, ERO Resources Corporation. January 26.

Cosby, M. 2008. Colorado Division of Wildlife. Personal communication with Stacey Antilla, ERO Resources Corporation. February 27.

Costlow, D. 2006. Rocky Mountain Adventures (RMA). Personal communication with Stacey Antilla, ERO Resources Corporation. September 20.

CROA (Colorado River Outfitters Association). 2008. 1998 - 2007 Commercial River Use in the State of Colorado. http://www.croa.org/pdf/2007_Commercial_Rafting_Use_Report.pdf. Accessed May 28, 2008

Earthinfo. 2005. U.S. Geological Survey Daily Values CD, West 1. Boulder, CO.

ERO (ERO Resources Corporation). 2005a. Windy Gap Firming Project Purpose and Need Report. Prepared for U.S. Bureau of Reclamation and Municipal Subdistrict, Northern Colorado Water Conservancy District.

ERO (ERO Resources Corporation). 2005b. Windy Gap Firming Project Alternatives Report. Prepared for U.S. Bureau of Reclamation and Municipal Subdistrict, Northern Colorado Water Conservancy District.

ERO and AMEC (ERO Resources Corporation and AMEC Earth and Environmental, formerly Hydrosphere Resource Consultants). 2008. Windy Gap Firming Project Stream Water Quality Technical Report. Prepared for U.S. Bureau of Reclamation.

ERO and Boyle (ERO Resources Corporation and Boyle Engineering). 2007. Windy Gap Firming Project Water Resources Technical Report. Prepared for U.S. Bureau of Reclamation and Municipal Subdistrict, Northern Colorado Water Conservancy District.

Farr, D. 2006. MAD Adventures. Personal communication with Bill Mangle, ERO Resources Corporation. June 7.

Fleming, C. 2003. Larimer County, Carter Lake Senior Ranger. Personal communication with Aleta Powers, ERO Resources Corporation. January 29.

Flenniken, M. 2006. Larimer County Parks and Open Lands. Email communication with Scott Babcock, ERO Resources Corporation. January 26.

Huson, K. 2005. Public Utilities Director, City of Longmont. Personal communication with Scott Babcock, ERO Resources Corporation. August 31.

Hydrosphere Consultants. 2003. Upper Colorado River Basin Study, Phase II: Final Report. Prepared for Grand County, Summit County, Colorado River Water Conservancy District, Denver Water, Colorado Springs Utilities, Middle Park Water Conservancy District, Northern Colorado Water Conservancy District, NWCCOG's Water Quality/Quantity Committee. May 29.

Larimer County. 2003. Carter Lake. Available: co.larimer.co.us/parks/carter.html.

Larimer County. 2006. Chimney Hollow Open Space. Available at: <http://www.co.larimer.co.us/parks/openlands/os_chimney_hollow.htm>.

Lively, D. 2006. Executive Director, Grand Lake Chamber of Commerce. Personal communication with Stacey Antilla, ERO Resources Corporation. November 13.

Lund, M. 2004. Administrative Clerk, Town of Grand Lake. Personal communication with Scott Babcock, ERO Resources Corporation, June 8.

Mathews, D. 2004. Recreation Specialist, U.S. Forest Service. Personal communication with Scott Babcock, ERO Resources Corporation. April 7.

Miller Ecological. 2008. Windy Gap Firming Project Aquatic Resources Technical Report. –.

Oldham, K. 2005. District Wildlife Manager, Colorado Division of Wildlife. Personal communication with Scott Babcock, ERO Resources Corporation. January 20.

Orr, B. 2008. Recreation Program Manager, U.S. Forest Service. Personal communication with Stacey Antilla, ERO Resources Corporation. February 28.

Rieves, D. 2005. Park Manager of Blue Mountain District, Larimer County Parks and Open Lands. Email communication with Scott Babcock, ERO Resources Corporation. August 3.

Smith and Hill. 2000. Arkansas River Water Needs Assessment. Prepared by the Bureau of Land Management, Bureau of Reclamation, USDA Forest Service, and Colorado Department of Natural Resources. July.

Sommerhoff, S. 2006. Co-owner of Colorado River Center. Personal communication with Stacey Antilla, ERO Resources Corporation. August 10.

Stahl, K.J. and E. Crabtree. 2005. Grand Lake and Shadow Mountain Reservoir: Degrading water quality and request for mitigation. Greater Grand Lake Shoreline Association and Three Lakes Watershed Association.

Sterin, B. 2006. Outdoor Recreation Planner, Bureau of Land Management. Personal communication with Stacey Antilla, ERO Resources Corporation. August 9, December 7.

Windsor, A. 2008. Recreation Planner, Bureau of Reclamation, Kremmling Field Office. Personal communication with Stacey Antilla, ERO Resources Corporation. March 26.