RECLAMATION

Managing Water in the West

Windy Gap Firming Project

Socioeconomic Resources Technical Report

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Great Plains Region

Socioeconomic Resources Technical Report

Windy Gap Firming Project

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WINDY GAP FIRMING PROJECT
SOCIOECONOMIC 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 from the existing Windy Gap Project water supply 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 identify the potential socioeconomic effects 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 Granby Reservoir. This water is then 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 WGFP 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 and 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. MPWCD can store 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.

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; NCWCD 2005).

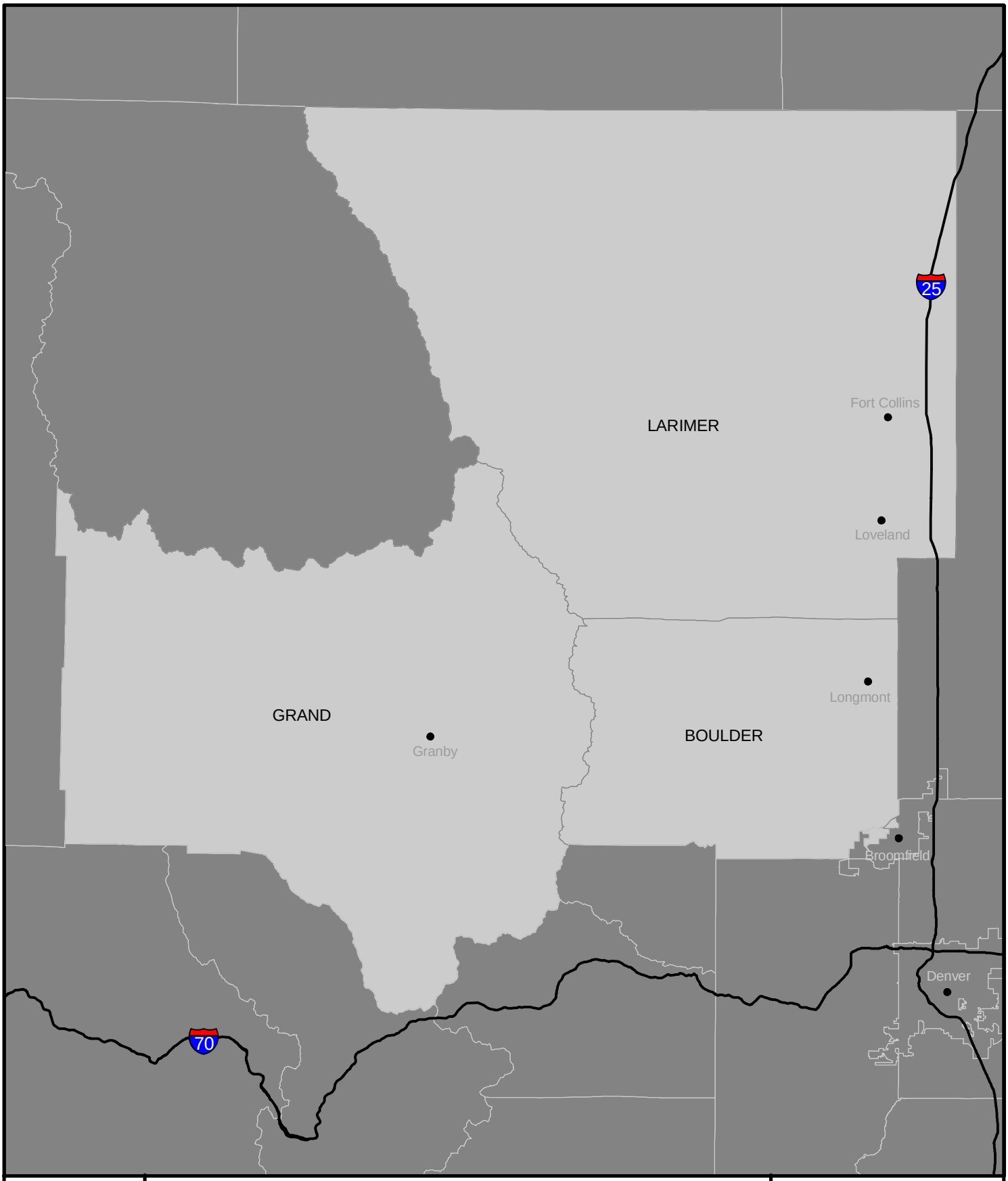
2.1. Study Area

Because socioeconomic data are primarily available for political jurisdictional boundaries (e.g., counties, cities), the socioeconomic study area is broader than the immediate area of the potential reservoir sites. The socioeconomic resource study area was defined to include areas that could experience socioeconomic effects from implementation of the No Action or Action alternatives. The study area is based on comments received during the public scoping process related to potential socioeconomic concerns, as well as changes in C-BT and Windy Gap operations, the geographic locations of project facilities, and areas that would receive water supplies from the proposed project. Specifically, the study area includes counties where potential reservoirs and associated facilities would be located (Grand, Larimer, and Boulder counties) as well as major towns along the Colorado River corridor below the Windy Gap diversion (Figure 1). Section 4.1 provides a detailed discussion of socioeconomic resources in these counties. The study area also includes the service areas of 14 WGFP Participants that could incur socioeconomic effects associated with delivery of firmed Windy Gap water.

3.0 DATA SOURCES

The best available information was used to describe the potentially affected socioeconomic environment and the effects of the WGFP alternatives. ERO gathered information from local, state, and federal data sources to characterize the overall baseline and future economic and demographic conditions in the study area. This report describes historical trends, current conditions, and future projections using measures such as population, total employment, employment and earnings by sector, labor force, unemployment rate, household income, wage rates, property ownership adjacent to planned facilities, and other economic and demographic variables. Supplemental socioeconomic data on population, water supply and demand, and water rates and rate structures are provided for these Participants. Any planned expansions of public facilities and infrastructure were also documented. Sources of data for this information included—

- The WGFP Purpose and Need Report (ERO 2005a)
- County and municipal planning department documents
- Reports from regional planning organizations
- Data from the Colorado Department of Local Affairs and State Demographer's Office
- Colorado Department of Labor
- U.S. Department of Commerce, Bureau of Economic Analysis
- U.S. Department of Commerce, Bureau of Labor Statistics
- U.S. Department of Commerce, Census Bureau



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0 6.5 13 Miles

1 Inch = 13 Miles

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Figure 1
Study Area

Prepared for: Windy Gap Firming Project
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Date: March 2006

ERO compiled additional information for specific economic sectors and activities that might be particularly affected by the WGFP alternatives. These sectors and activities include recreation and projected future municipal water demands. Additional socioeconomic information was obtained through personal interviews with key individuals in the study area, such as city and county planners, local business leaders, recreation specialists, and utility planners. Additional information on Participant population growth and development trends, water supply, and current and projected water demands are discussed in detail in the WGFP Purpose and Need Report (ERO 2005a).

Some of the socioeconomic effects were determined based on the results of related resources studies completed for the WGFP. The Aquatic Resources Technical Report (Miller Ecological 2008) provided information on the potential effects to fishing and the Recreation Resources Technical Report (ERO 2008a) provides information on impacts to recreational use and opportunity.

4.0 POTENTIALLY AFFECTED ENVIRONMENT

As discussed in Section 2.1, the study area includes counties where potential reservoirs and associated facilities would be located (Grand, Larimer, and Boulder counties) as well as major towns along the Colorado River below the Windy Gap diversion. For this reason, much of the following discussion centers on countywide socioeconomic baseline data for each of these counties. For the 14 WGFP Participants that could incur socioeconomic effects associated with delivery of firmed Windy Gap water, supplemental baseline data is provided at the municipal level (if available) or county level. For this reason, some supplemental socioeconomic data is provided for Weld and Broomfield counties.

4.1. Population

Grand County. Grand County's permanent population increased substantially between 1990 and 2003, growing from 7,966 people to 13,732 people (Table 1). The population is expected to continue to increase by an average of 2.7 percent annually and reach 28,800 people by 2030 (DOLA 2004a). While much of this growth will occur in the Upper Fraser Valley, growth also is expected to occur in Grand Lake, Granby, and the Town of Kremmling.

During the winter tourist season, the population of Grand County doubles with an additional 15,000 to 18,000 persons (Grand County 1998). In the summer tourist season, the population in the Town of Grand Lake and the unincorporated Three Lakes Area increases by about 5,000 additional seasonal residents (Grand County 1998). Key trends influencing the seasonal population include more tourists and second home residents visiting the county during the off-seasons (i.e., summer and fall in the Upper Fraser Valley and fall and winter in the Grand Lake area). More growth in off-season visitation and use is projected as concerted efforts by the resorts, towns, chambers, and merchants strive to stabilize the economy in the off-season (Id.). In addition to the seasonal and permanent growth in population, Grand County receives more than 1 million ski visitors per year and many of the almost 3 million tourists that visit Rocky Mountain National Park annually.

Larimer County. Larimer County's population grew from 186,136 people in 1990 to 266,610 people in 2003. Larimer County's population is expected to continue increasing and reach 440,675 people by 2030. Much of this growth is expected to occur within existing urban growth areas surrounding the cities of Fort Collins, Loveland, and the Town of Berthoud (DOLA 2004a).

Boulder County. Boulder County's population increased 29.3 percent from 1990 to 2000. The 4.7 percent population decrease between 2000 and 2003 was attributed to Broomfield seceding from the County to become the City and County of Broomfield. Boulder County's population is expected to continue increasing and reach 386,634 people by 2030 (DOLA 2004a). The City and County of Broomfield's 2004 population of 46,400 is projected to reach 83,300 by 2025 (City and County of Broomfield 2004).

Table 1. Historical population trends by county, 1990 to 2030.

	Grand County				Larimer County				Boulder County			
	1990	2000	2003	2030	1990	2000	2003	2030	1990	2000	2003*	2030
Total Population	7,966	12,442	13,732	28,800	186,136	251,494	266,610	440,675	225,339	291,288	277,467	383,634
Change	-	4,476	1,290	15,068	-	65,358	15,116	174,065	-	65,949	-13,821	106,167
Percent Change	-	56.2%	10.4%	109%	-	35.1%	6.0%	65%	-	29.3%	-4.7%	38%

*Boulder County population decrease between 2000 and 2003 is attributed to the City and County of Broomfield seceding from Boulder County.

Source: DOLA 2004a.

4.1.1. Major Communities

Grand County. Most people in Grand County reside in unincorporated portions of the county, which had a 2003 population of 13,732. Major towns along the Colorado River corridor include Granby, Kremmling, Hot Sulphur Springs, and Grand Lake. Granby and Kremmling are the most populated towns in the County with 1,670 people in Granby and 1,650 people in Kremmling. The population of Hot Sulphur Springs is 569 and the population of Grand Lake is 484, which is the least populated town in the county (DOLA 2004b).

Larimer County. Fort Collins is the most populous municipality in Larimer County. In 2003, 125,461 people (about 47 percent of all Larimer County residents) resided in Fort Collins. About 68,825 people resided in unincorporated Larimer County. Loveland was the next largest municipality, with a population of 55,905 (DOLA 2004b).

Boulder County. In Boulder County, most people reside in Boulder, which had a 2003 population of 97,763, and Longmont, which had a population of 79,119. Unincorporated Boulder County has a population of 44,676 (DOLA 2004b).

4.1.2. Race and Ethnicity

According to the 2000 Census, white persons comprise about 95.2 percent of Grand County, 91.4 percent of Larimer County, and 89.5 percent of Boulder County. The statewide average percentage of white persons was 82.8 percent. The largest minority

group in all three counties is Hispanic, which account for about 4.4 percent of Grand County's population, 8.3 percent of Larimer County's population, and 10.5 percent of Boulder County's population (Census 2000a).

4.1.3. Participant Population Data

While Larimer, Boulder, and Grand counties encompass most of the Participant service areas, the service areas of the 14 municipalities, water districts, and power companies also extend to other counties (Table 2). All of the East Slope Participants are located north of Denver along the I-25 corridor within Broomfield, Boulder, Larimer, and Weld counties. The MPWCD serves Grand and Summit counties.

Table 2. Participants and respective service areas.

• Lafayette (Boulder County)	• Loveland (Larimer County)
• Superior (Boulder County)	• Greeley (Weld County)
• Erie (Boulder County)	• Central Weld County Water District (Weld County)
• Little Thompson Water District (Larimer, Weld, and Boulder counties)	• Fort Lupton (Weld County)
• Longmont (Boulder County)	• Evans (Weld County)
• Louisville (Boulder County)	• Platte River Power Authority (Larimer, and Boulder counties)
• Broomfield (City and County of Broomfield)	• Middle Park Water and Conservation District (Grand and Summit counties)

Much like county trends, the population of each Participant's jurisdiction or service area has increased substantially in recent years (ERO 2005a). Participants are planning for and expecting future population growth from 25 to 334 percent in the next 20 to 25 years (Table 3). While many of these Participants are expected to reach build-out by 2020 to 2030, several (such as Evans, Fort Lupton, and Greeley) will continue to experience population increases beyond these dates. By the year 2030, Greeley, Loveland, Longmont, and Broomfield will represent the majority of population among the Project Participants, accounting for about 58 percent of total population. Each Participant anticipates considerable growth.

Table 3. Present and future participant population estimates.

Participant	2003 Population[1]	Projected Population[2]	Date of Projected Population	% Increase
Broomfield	43,484	97,000*	2025	123
Erie	8,758	38,000*	2020	334
Evans	15,052	32,347	2030	115
Fort Lupton	7,132	14,446	2030	103
Greeley	84,519	154,000	2030	82
Lafayette	23,539	36,190*	2030	54
Longmont	77,725	104,000*	2025	34
Louisville	18,443	23,000*	2030	25
Loveland	55,905	137,000*	2042	145
Superior	10,212	15,400*	2014	51
LTWD	19,500[a]	n/a	n/a	n/a
CWCWD	24,280[b]	n/a	n/a	n/a
MPWCD	40,846[c]	n/a	n/a	n/a
Platte River	264,667[d]	n/a	n/a	n/a

(a) The Little Thompson Water District (LTWD) provides treated water to homes and businesses in northern Colorado. The 300-square mile LTWD service area is generally bounded by the City of Loveland on the north, Longs Peak Water District on the south, the City of Greeley, the South Platte River and the St. Vrain River on the east, and the foothills on the west.

(b) Central Weld County Water District (CWCWD) supplies water to rural customers and residents within Dacono, Firestone, Frederick, Gilcrest, Kersey, LaSalle, Milliken, and Platteville, which have a combined total 2003 population of 24,280 people. For several of these communities, CWCWD only provides water treatment services, not the water supply.

(c) Middle Park Water Conservancy District (MPWCD) is a wholesale water supplier that provides a portion of the water supply for 67 water providers and users in Grand and Summit Counties that represent about 80 percent of the total population in the counties (about 40,846 people).

(d) Platte River Power Authority provides electrical power to the communities of Estes Park, Fort Collins, Longmont and Loveland, which have a combined current population of 264,667. Platte River does not provide water supplies to these communities, but uses water for power plant cooling.

* Estimated population at build-out.

[1]*Source*: DOLA 2004a.

[2]*Source:* ERO 2005a.

4.2. Employment

4.2.1. County Employment

The 2002 average labor force in Grand County was 6,462, an increase of 49.6 percent from 1990 (DOLA 2004b) (Table 4). Almost half of Grand County's labor force resides in Granby, Kremmling, Grand Lake, and Hot Sulphur Springs. Grand County's overall unemployment rate was 4 percent in 2002.

Table 4. Labor force statistics for Grand, Larimer, and Boulder counties, 2002.

Counties	Labor Force	Total Employed	Total Unemployed	Unemployment Rate (%)
Grand	6,462	6,222	240	4
Larimer	156,630	148,558	8,072	5
Boulder	164,364	156,178	8,186	5

Source: DOLA 2004c.

Larimer County's 2002 labor force was 156,630, an increase of 50.7 percent from 1990 (DOLA 2004c). Loveland accounted for about 18.9 percent of Larimer County's overall labor force. Larimer County's overall unemployment rate was 5 percent in 2002.

Boulder County's 2002 labor force of 164,364 was the highest of the three counties in the study area. The overall unemployment rate in Boulder County was 5 percent in 2002 (DOLA 2004c).

Together, Grand, Larimer, and Boulder counties accounted for about 13.4 percent of Colorado's total labor force in 2002. All of the county unemployment rates were below the state average of 6 percent.

In 2002, wage and salary employment (people that work for someone else) accounted for the majority of jobs in Grand County (69 percent), Larimer County (77 percent), and Boulder County (78 percent). Self-employment accounted for the remaining 31 percent of all jobs in Grand County, 23 percent of all jobs in Larimer County, and 22 percent of all jobs in Boulder County. The top three industries per the North American Industry Classification System (NAICS) in each of the counties and the percentages of total employment that these industries account for are provided in Table 5. State and local government is also a large employer in Grand County and provides about 10 percent of the employment. Arts, entertainment, and recreation provide employment related to skiing, rafting, outfitting, and other recreation activities. As reported in Coley/Forrest (2007) from a study of the *Economic Impact of Travel on Colorado*, jobs directly related to visitors accounted for 39 percent of the jobs in the County in 2003.

Table 5. Top industries in Grand, Larimer, and Boulder counties.

Counties	Industries	Combined Percent of Total Countywide Employment
Grand	Arts, Entertainment, Recreation, and Accommodation and Food Services; Construction; and Retail Trade	42%
Larimer	State and Local Government; Retail Trade; and Manufacturing	35%
Boulder	Retail Trade, Manufacturing; and Educational Services	23%

Source: BEA 2002a.

4.3. Income

4.3.1. County Income

Per capita personal income in Grand, Larimer, and Boulder counties ranged from 88 percent to 119 percent of the state average in 2002. Per capita personal income in Grand County increased from $18,194 to $29,560 between 1992 and 2002, reflecting an average annual growth rate of 5.0 percent. The per capita personal income in Grand County ranked 19th in the state and was 88 percent of the state average, and 96 percent of the national average.

In Larimer County, per capita personal income increased from $18,898 to $31,420 between 1992 and 2002, reflecting an average annual growth rate of about 5.2 percent. The 2002 per capita personal income ranked 14th in the state and was 93 percent of the state average, and 102 percent of the national average.

Boulder County's per capita personal income increased from $24,162 to $34,228 between 1992 and 2002, reflecting an average annual growth rate of about 5.3 percent (BEA 2002b). The per capita personal income ranked 5th in the state and was 119 percent of the state average, and 132 percent of the national average.

Individual poverty levels in 2000 were 5.4 percent in Grand County, 9.2 percent in Larimer County, and 9.5 percent in Boulder County. The statewide individual poverty level was 9.3 percent (Census 2000a).

4.4. Agricultural and Residential Land Use

Similar to statewide trends, agricultural employment in Grand, Larimer, and Boulder counties has declined in comparison to other sectors of the economy. Today, agriculture is a relatively small component of Grand County's economy, accounting for 219 jobs in 2002 and a loss of $1.5 million in net cash farm income.[1] In Larimer County, agriculture accounted for a total of 2,067 jobs in 2002 and $1.2 million in net cash farm income. Agriculture in Boulder County accounted for 1,090 jobs in 2002 and $4.7 million in net cash farm income (USDA 2002).

Agricultural and residential land uses at the potential reservoir sites are described below.

Ralph Price Reservoir. Ralph Price Reservoir is located in unincorporated Boulder County on land owned and managed by the City of Longmont for water supply storage and recreation. Two private residences are located on the north side of the reservoir. The City of Longmont's caretaker for the site has a home near the reservoir. There is no agricultural use of the land.

Chimney Hollow Site. The Municipal Subdistrict, Northern Colorado Water Conservancy District owns the land for the Chimney Hollow Reservoir site. The land is

[1] Net cash farm income is one of the primary indicators of regional farm well being. Net cash income compares cash receipts to cash expenses. As such, it is a cash flow measure representing the funds that are available to farm operators to meet family living expenses and make debt payments.

undeveloped and there no homes present at the site or agricultural activity. Larimer County owns land designated as open space east of the reservoir site. A 115-kV electric transmission line operated by the Western Area Power Administration runs the length of the site. This site is undeveloped and provides wildlife habitat.

Jasper East Site. Agriculture is the primary land use at the Jasper East Reservoir site. Approximately 313 acres are flood irrigated for cultivation of hay and cattle grazing; however, no prime farmland is present (SCS 1982). The Willow Creek Pump Station, forebay, and portions of the Willow Creek pump canal, which is used to carry water from Willow Creek Reservoir to Granby Reservoir, are located at the site. The remainder of the site is undeveloped and provides wildlife habitat. No homes are present at Jasper East.

Income generated from agricultural production at Jasper East is primarily associated with annual sale of calves. Each year, cattle grazed on the Jasper East site produce about 45 calves (assuming a 10 percent death loss), contributing to about $27,000 in annual income (assuming a price of about $600/calf) (Alexander 2005).

Rockwell/Mueller Creek. The Rockwell/Mueller Creek Reservoir site includes meadows used as pastureland for horses, a small stockpond, and four private residences. No prime farmland is present at the site (SCS 1982). The undeveloped portions of this site provide wildlife habitat.

Dry Creek Reservoir. The Dry Creek area is mostly undeveloped and provides habitat for a variety of wildlife species. Several private dirt roads traverse the area and provide access to homes. Like Chimney Hollow, Larimer County has identified the Dry Creek site as part of the Blue Mountain Project and as high priority open space (Larimer County 1998). Included on the site are three private residences, one of which includes a small llama operation. This business specializes in breeding, showing, and packing llamas, and had about 13 animals in 2005. Access to the site is via Highway 36, unpaved County Road 71, and other private roads northwest of Lyons. The state owns a portion of the site that currently has a mining lease for selling moss rock (Routen, pers. comm. 2006) and that in the past has included livestock grazing.

4.5. Recreation

A brief discussion on recreation in Grand, Larimer, and Boulder counties is provided below. For a more detailed discussion of recreational opportunities and recreational use in the study area refer to the Recreation Resources Technical Report (ERO 2008a).

Grand County. Tourism is an important component of the Grand County economy. In 2003, about 12.5 percent of Grand County's jobs were attributed to recreation, arts, and entertainment, which includes recreation activities such as rafting, skiing, and other activities related to tourism (BEA 2003). Winter visitation associated with downhill skiing is the largest contributor to the Grand County recreation and tourism industry, contributing about 27 percent ($162.3 million) of countywide sales in 2002 (Lloyd Levy Consulting 2004). The direct impact of spending by visitors in Grand County in 2003 was estimated at about $170 million (Coley/Forrest 2007). Expenditures included travel,

lodging, food and beverages, recreation, and other visitor-related commodities, but did not include the secondary economic benefits.

Boating and angling are also popular attractions, particularly during the summer recreation season at Shadow Mountain Reservoir, Grand Lake, and Granby Reservoir, and various reaches of the Colorado River affected by the proposed project. Boating is most popular on the Colorado River below Kremmling, and angling is popular along the Colorado River except for Gore Canyon. CDOW has rated the Colorado River between Windy Gap Reservoir and Troublesome Creek as a Gold Medal fishery because of the outstanding fishing opportunities.

No complete statistics are available on the amount of angling use on the Colorado River; however, BLM records permits for commercial fishing use in the Pumphouse reach of the Colorado River. These records indicate an average of 2,040 user days per year between 1999 and 2004 (BLM 2007). The average annual economic value of this angling activity is estimated to be about $108,000 based on outdoor recreation use values for fishing in the Intermountain region of $53.04 per user day (indexed to 2007 dollars) (Loomis 2005). Additional angling activity occurs on publicly accessible lands at State Wildlife Areas, BLM land, as well as fishing from privately held property and resorts along the Colorado River. Information on boating (rafting and kayaking) is available through the Colorado River Outfitters Association (CROA). In 2007, the CROA calculated that commercial boating on the Upper Colorado River generated the sixth highest level of direct economic impact (about $3.4 million) and total economic impact (about $8.7 million) when compared to all other Colorado rivers (CROA 2008). There were about 32,000 commercial user boating days in 2007 (CROA 2008).

Larimer County and Boulder County. Recreation is a much smaller component of the Larimer County and Boulder County economies. In 2003, recreation, arts, and entertainment accounted for about 2.4 percent of Larimer County's employment and 2.7 percent of Boulder County's employment (BEA 2003). Carter Lake and Horsetooth Reservoirs are the primary reservoirs within the Larimer County portion of the study area. Both reservoirs provide year-round water- and land-based recreation opportunities including boating, angling, camping, and other land-based recreation. Ralph Price Reservoir is located in Boulder County and provides opportunities for angling, hiking, and wildlife viewing between May and October. Ralph Price is a walk-in only site and boating and camping are not permitted.

4.6. Community Services

Each of the counties where reservoir storage sites would be located and construction activities would occur have developed school, medical, fire, and police services supporting local communities. Schools and community services in the portion of the counties near project facilities are briefly outlined below.

Grand County. Grand County has four elementary schools, two middle schools, two high schools, and one private school. Emergency services nearest the potential West Slope reservoir sites include the St. Anthony Granby Medical Center and the Kremmling

Memorial Hospital. Fire services near these sites base out of Kremmling, Granby, Hot Sulphur Springs, and Grand Lake. The Colorado State Patrol has a base office in Granby.

Larimer County. Larimer County's Thompson School District encompasses schools in Berthoud and Loveland near the project area. The District includes 18 elementary schools, five middle schools, and five high schools. District wide enrollment in 2003-2004 was over 14,600 students. Emergency medical services are available at Poudre Valley Hospital, Longmont United Hospital, and Boulder Community Hospital. Fire and police services nearest the potential reservoir sites are located in Loveland and Berthoud.

Boulder County. Boulder County's St. Vrain School District encompasses schools in Lyons, Longmont, and Erie. District wide enrollment in 2003-2004 was 22,180 students. Emergency medical services are available at Longmont United Hospital, and Boulder Community Hospital. Fire and police services are located in Lyons, Longmont, and Erie.

4.7. Participant Water Supply and Demand

Each Project Participant has developed a unique portfolio of water supply sources to meet existing and anticipated water needs. There are numerous reasons for these diverse portfolios, including the physical availability of water for diversion, legal priority of a given water right, and limitations such as monthly, seasonal, and annual diversion restrictions. Participants typically prefer a diversity of water supply sources to ensure reliable deliveries (ERO 2005a).

The existing firm water supply, current demand, as well as projected future water demand was determined for each of the WGFP Participants in the WGFP: Purpose and Need Report (ERO 2005a). Estimates of the firm yield water supply, also referred to as the dry year yield, indicate the amount of water that is available during a defined period or condition that includes several dry years. Extreme droughts are excluded from firm yield planning because the amount of water and cost associated with meeting these needs are typically not feasible. Firm yield for the WGFP is the yield that can be provided in each year of the 47-year study period (1950-1996) without any shortages. The five driest years in the study period were 1954, 1966, 1977, 1981, and 1989. Because water yield from the various water supply sources can fluctuate substantially from year to year, water providers require adequate storage to capture flows during wet years to meet their dry year water needs. The WGFP Purpose and Need Report revealed that several Participants have water demands close to exceeding their firm water supply. Projected future water demands also revealed that additional water supplies along with conservation and other measures are needed to meet the demand associated with future increases in population. The most rapid increases in water needs are expected to occur for the Town of Erie, City of Evans, and Little Thompson Water District. Platte River's water need to meet existing power facility requirements is expected to remain constant, but additional power generation in the future is likely. Firmed Windy Gap water is one of the sources Participants expect to use to meet these anticipated future demands.

4.8. Participant Project Financing and Water Rates

Participants set residential and non-residential prices for retail water via water rates and established water rate structures. Water rates and water rate structures are typically formulated to recover expenses such as annual operating and maintenance expenditures associated with water delivery and treatment, projected debt service, and capital improvements. Most WGFP Participants use inclining block rate pricing, with ten Participants having either implemented or are implementing inclining block rate pricing. Under this rate structure, water rates increase as consumption levels increase, with initial blocks designed to provide a basic level of service to water users at a base cost. Other Participants have found that a uniform water rate adequately covers the expenses of providing water to their customers and use other measures to encourage water conservation.

Each Participant has planned for the cost of WGFP storage (and for several Participants this includes the purchase of additional Windy Gap units). Some Participants, such as Longmont, Greeley, Lafayette, and Louisville, have already set aside funding for the purchase of WGFP storage. Other Participants, such as Broomfield, have set aside a portion of the necessary funding for the project and plan to acquire additional needed funds through development fees or bonding measures. Still others, such as Erie, Fort Lupton, and Evans, are financing the purchase of the Windy Gap units and storage through a combination of development fees including tap fees and bonding measures. A breakdown of the anticipated funding mechanisms for each Participant in the WGFP is provided in Table 6.

Table 6. WGFP financing breakdown by Participant.

Participant	Cash Financing	Cash and Debt Financing	All Debt Financing
Broomfield		X	
Erie			X
Evans			X
Fort Lupton			X
Greeley	X		
Lafayette	X		
Longmont	X		
Louisville	X		
Loveland	X		
Superior		X	
LTWD			X
CWCWD	X		
Platte River	X		
MPWCD*	n/a	n/a	n/a

*MPWCD financing for WGFP has not been determined.
Source: Correspondence with individuals from each Participant group.

5.0 ENVIRONMENTAL EFFECTS

5.1. Methods

The effects analysis considered the probable changes to socioeconomic resources that would result from the proposed project. The socioeconomic technical report also included an evaluation of environmental justice—whether the alternative actions disproportionately impact low income or minority populations.

The impact analysis relies on qualitative and semi-quantitative techniques. Municipalities, water districts, and power generation entities that comprise the 14 WGFP Participants were broadly evaluated to determine effects associated with delivery of firmed Windy Gap water. Regional Input-output Modeling System (RIMS II) multipliers were used to estimate secondary effects to regional earnings and employment as a result of construction, operation, and maintenance of the alternatives. RIMS II multipliers are commonly used to estimate the total regional effects on industrial output, earnings, and employment for any county or group of contiguous counties resulting from any industry activity.[2] Socioeconomic data related to expected employment and direct employment costs resulting from construction are based on information provided in the Windy Gap EIS Alternatives Descriptions Report (Boyle 2005a).

Calculations of regional economic effects including output, earnings, and employment assume that certain percentages of construction, operation, and maintenance spending will occur within the region that each reservoir site is located. The three RIMS II data regions relevant to the study area include the "Scenic and Resort Region" in Grand County (which includes Jasper East and Rockwell/Mueller Creek reservoir sites), "Larimer and Weld Region" (which includes Chimney Hollow and Dry Creek reservoir sites) and the "Denver Metro Region" (which includes Ralph Price Reservoir). For West Slope reservoirs such as Jasper East and Rockwell/Mueller Creek, it is assumed that 25 percent of the total project cost will be spent in the Scenic and Resort Region. This is consistent with the anticipated percentage of the work force that would be hired locally (Bandy, pers. comm. 2005a) and the fact that the regional economy is not highly diversified and is unlikely to include all of the necessary construction inputs necessary to construct a reservoir. For East Slope reservoir sites such as Chimney Hollow and Dry Creek, it is assumed that 50 percent of the total project cost will be spent in the local region. This is consistent with the anticipated percentage of the work force that would be hired locally (Id.) and the fact that a substantial portion of the construction inputs would need to be brought in from the Denver Metro Region or other surrounding regions. For expansion of Ralph Price Reservoir, which is part of the No Action alternative, it is assumed that 100 percent of the project spending would occur within the Denver Metro

[2] Industrial output is a measure of the economic activity created by spending associated with a project. Earnings (sometimes referred to as wages and salaries) are a subset of total economic output. More specifically, earnings refer to a measure, expressed in millions of dollars, of the change in the value of earnings that are received by households from the production of regional goods and services. Employment is expressed as full-time person years of employment.

Region. For alternatives with multiple reservoir sites, secondary economic benefits are highlighted for each region in which a reservoir would be located.

Potential economic effects to recreation associated with changes in rafting and kayaking opportunities as a result of different hydrologic conditions on the Colorado River were based on the estimated changes in the number of days preferred flows would occur, as described in the Recreation Resources Technical Report (ERO 2008a). Available data on commercial boating use and user permits from the BLM provided estimates of annual boating and recreation use in the Big Gore Canyon and Pumphouse reaches of the Colorado River downstream from Kremmling. No detailed records on visitor use are available, but the BLM provided estimates on the location and season of use.

The analysis of effects to boating was based on changes in the number of days that streamflow fell within preferred flow ranges for rafting and kayaking in the Colorado River. The following flow ranges for the three river segments evaluated were:

- Byers Canyon: >400cfs
- Big Gore Canyon: 850 to 1,250 cfs for kayaking and rafting
- Pumphouse: 1,200 to 2,200 cfs for kayaking and 2,000 to 3,000 cfs for rafting

These flow ranges represent preferred flows, but boaters currently use the river at flows as low as 400 cfs, with the exception of commercial rafting in Big Gore Canyon, which only occurs at flows between 850 and 1,250 cfs. The economic analysis provides somewhat of a worst-case scenario because all changes in the number of days outside of the preferred range were considered a loss in visitor days and the associated recreation value. Boating would likely continue, as it currently does, outside of the preferred flow ranges as long as minimum boating flows are available, but there could be a decrease in the quality of the experience for some boaters.

Daily hydrology data for the 47-year hydrologic period of record (1950 to 1996) were used for the evaluation of changes in the number of days with preferred boating and kayaking flows during the summer boating season from June to August. Daily data indicated the number of days when flows fell within a preferred boating range, the frequency of changes in preferred boating flows, and the maximum range of change in the number of days in a year that preferred flows for boating would occur compared to existing conditions.

Recreation economic impacts were based on the unit-day approximation of willingness to pay. This valuation is common for this type of analysis and can be applied to the limited existing data. Under this approach, the value of the recreation impact is the unit-day value, expressed in terms of dollars per visitor day, multiplied by the estimated gain or loss in visitors. Baseline unit-day values used in the analysis were derived from Loomis (2005). The Loomis study shows a range of values per visitor day for outdoor recreation activities on Forest Service lands and other public lands in the U.S. Census Intermountain Region, which includes Colorado. The visitor day values are based on an

average of studies using either contingent valuation or travel cost methods. The Loomis unit-day value for nonmotorized boating was escalated from 2004 dollars to 2007 dollars using the Consumer Price Index and rounded up to $73. The dollars per visitor day are assumed to apply equally to all boating locations and for both private and commercial boating. The unit-day value of $37 for camping from the Loomis study was escalated to 2007 dollars and used to estimate impacts from potential changes in camping. All of the direct recreational value would not accrue to Grand County because not all of the expenditures would occur there.

The Colorado River Outfitters Association has estimated the direct expenditures for commercial rafting in 2007 at about $111 per user day using 1988 data inflated to 2007 prices (CROA 2008). Commercial rafting has a higher economic value than private boating because of the payment for services. When averaged with the lower economic value for non-commercial boating, the CROA estimate would approach the Loomis estimate. For this reason, and because the Loomis study incorporates numerous recent studies and average values over different types of recreation uses, the Loomis study was used in this analysis.

There may be other indirect costs or benefits associated with recreation that accrue to Grand County or other locations. Indirect economic impacts associated with commercial rafting have been estimated by the Colorado River Outfitters Association to be about 1.56 times direct expenditures for all commercial boating in the state (CROA 2008). The secondary impacts associated with changes in recreation expenditures were not explicitly quantified for this analysis because accurate estimates of the percentage of those expenditures in the study area were not available. As discussed above, some of the direct impact and, therefore, indirect impacts would occur outside of the study area. For simplicity, this analysis assumes that using the full direct economic impact as accruing to the study area encompasses both the direct and indirect impacts that might occur within the study area. Also, because the analysis conservatively assumes a total loss of boating user days when preferred flows are not met, no additional estimates of indirect economic impacts were made.

The water delivered from Grand Lake through Reclamation hydropower facilities from increased Windy Gap diversions would generate additional power under all of the alternatives. Estimates of the net change in power generation were based on hydrologic data and estimates of what similar amounts of energy would cost.

This report does not address how the availability of a water supply affects population growth. Colorado has experienced an average growth rate of 2.8 percent in the 1990s and is projected to continue growing at a rate of about 1.5 to 1.9 percent for the next 30 years (DOLA 2005). Water providers in the WGFP respond to population growth by trying to meet the projected need for water supplies and other utility and infrastructure requirements. Municipalities typically develop comprehensive land use plans to direct the location and types of land use and development within their jurisdiction. Public works and water utility departments respond to the comprehensive plan by seeking to secure reliable sources of water and the efficient use of this water to meet community needs. As several studies have indicated (Nichols et al. 2001; Harvey 2000), water is

needed to support population growth, but does not necessarily encourage growth. Some of the fastest growing areas in the West, including portions of Colorado, Arizona, and Nevada are also some of the driest areas. Conversely, areas with abundant water areas do not necessarily attract growth (e.g., rural areas of the Pacific Northwest). This evaluation focuses on the local and regional economic effects associated with the alternative actions, but does not attempt to evaluate the effects associated with population growth that are expected to occur with or without the proposed project.

5.2. Energy Production

The water delivered from Grand Lake through Reclamation hydropower facilities from increased Windy Gap diversions would generate additional power under all of the alternatives. Estimates of the net change in power generation were based on hydrologic data and estimates of what similar amounts of energy would cost.

All of the alternatives would result in additional energy production by routing increased Windy Gap water through Reclamation C-BT hydropower facilities on the East Slope. Table 7 indicates the net increase in energy that would be generated considering the additional power generated at Mary's Lake, Estes, Pole Hill, Flatiron, and the Big Thompson Power Plants less the additional energy costs for pumping water at the Willow Creek Pump Canal, Granby Pump Canal, and Flatiron No. 3 at Carter Lake. The estimated value of the additional energy generation was based on the power production costs for an equivalent amount of energy generated from a coal power plant in 2015 adjusted to 2005 dollars, which would be about $56 per megawatt hour or $56,000 per gigawatt hour (GWH) (Energy Information Administration 2007). The retail value of generated energy would have a higher value.

The Western Area Power Administration (Western) anticipated greater hydropower generation following construction of the Windy Gap Project based on the original diversion projections. Western entered into agreements to provide energy based on those original projections; however, because diversions were less than anticipated and hydropower generation was less than projected, Western has had to purchase replacement power to meet commitments. The replacement power that Western purchased is generally from coal fired power plants. If Windy Gap diversions increase as a result of the WGFP, Western would be able to reduce its purchase of replacement power from coal fired power plants.

The Municipal Subdistrict would be responsible for the power costs associated with pumping additional water from Windy Gap Reservoir to Granby Reservoir. These costs vary with the amount of pumping and other factors, but average about $25 per AF. Based on average year diversions of 43,573 AF under the No Action alternative, energy costs for pumping to Granby Reservoir would be about $1.09 million. Energy costs for the action alternatives would range from about $1.15 million for the Proposed Action to $1.21 million for Alternative 5. The Municipal Subdistrict is also responsible for paying Reclamation for the pumping costs associated with delivery of Windy Gap water from Granby Reservoir to Grand Lake and from Grand Lake to Flatiron Reservoir. The repayment is only for water delivered through the Adams Tunnel and varies depending on the ration of C-BT and Windy Gap water pumped.

Table 7. Net increase in energy generation and production value over existing conditions.

Alternative	Energy Generation (GWH)	Production Value
No Action	18.95	$1,062,500
Proposed Action	26.03	$1,459,500
Alternative 3	25.79	$1,446,000
Alternative 4	25.83	$1,448,300
Alternative 5	29.57	$1,658,000

5.3. Effects Similar to All Alternatives

All of the alternatives would result in similar types of effects to recreation on the Colorado River and at Grand Lake, Shadow Mountain Reservoir, and Granby Reservoir from changes in hydrologic conditions and water quality. Potential effects to the recreation economy include changes in recreational boating, fishing opportunities, and other related land-based activities such as camping and sightseeing. The WGFP Recreation Resources Technical Report (ERO 2008a) provides additional information on recreation impacts.

5.3.1. Colorado River Rafting and Kayaking

Potential effects to rafting and kayaking on the Colorado River were evaluated for three sections of the Colorado River — Byers Canyon downstream of Hot Sulphur Springs, Big Gore Canyon (an advanced white water reach of the river), and the Pumphouse downstream of Big Gore Canyon, which provides more intermediate levels of boating.

5.3.1.1. Byers Canyon

Byers Canyon provides Class IV to V whitewater kayaking at streamflows above 400 cfs. This reach of the river is not a popular boating destination and is used infrequently by private boaters. No commercial boating occurs in this reach. No formal statistics are available on boater use, but currently about 15 boaters per year are estimated to use this reach of the river (Crosby, pers. comm. 2008). Flows sufficient for kayaking under existing conditions are available primarily in June and July.

Daily flow data indicate that in June and July there would be no change in the number of days that flow exceeds 400 cfs in 29 years of the 47-year period of record (Table 8). In years when there is a change in flow, there would be an average decrease of 8 kayaking days per year under the No Action alternative and about 12 fewer kayaking days per year for the action alternatives. The greatest decrease in boating days in a single year would be 34 days under the No Action alternative and 49 days under the Proposed Action and other alternatives. Up to 1 additional boating day could occur in some years under the action alternatives. Assuming the maximum loss of 49 boating days would eliminate all kayaking activity in the year with the lowest available flow, this would

represent a loss of about 15 user days with a per unit day value of about $73 or about $1,095.

Table 8. 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		
No Action	870	8.0	-34 to 0[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

[1] 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.
[2] There would be no increase in flows during any of the years when flow changes occur.

5.3.1.2. Big Gore Canyon

Big Gore Canyon provides Class V whitewater used by commercial rafting companies at flows from 850 to 1,250 cfs and for kayakers at flows from 400 cfs to about 2,200 cfs. Preferred kayaking flows are around 1,100 to 2,200 cfs. 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). Both kayakers and rafters use this reach of the river. Participants in the Gore Race are kayakers.

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 in 37 out of the 47-year study period under all of the alternatives (Table 9). 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 3.5 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 flow days in a single year would be 11 days under each of the alternatives, with an increase of 1 day in some years for the action alternatives. Projected flows for each alternative would allow commercial outfitters to continue to run trips through Big Gore Canyon in the month of August most of the time, but reduced flow in 10 of 47 years

would decrease boating opportunities for commercial rafting for an average of several days in those years.

The potential impact to kayaker use of Big Gore Canyon would likely be less because kayakers can run the river at flows between 400 and 2,200 cfs. An analysis of daily flow data from June to August indicates that there would be a slight net increase in the number of days when flows fall within 400 and 2,200 cfs. However, at the higher preferred kayaking flows of 1,100 to 2,200 cfs from June to August there would be an average decrease in flows of about 1 day under each alternative in about 15 out of the 47-year study period, but up to a 15-day decrease in preferred flows in a single year and a 6- to 10-day increase in some years depending on the alternative (Table 10). Effects to kayaking in this flow range are discussed more for the Pumphouse reach in Section 5.3.1.3.

To simplify the economic effect analysis and provide a conservative estimate, it was assumed that the change in preferred flow days between 850 and 1,250 cfs applies to both rafting and kayaking in Big Gore Canyon. Daily boating in August through Big Gore Canyon would average 39 visitors per day based on 1,200 boaters annually. The net economic effect from the loss of about 3 boating days on average per year during 10 out of 47 years under the No Action alternative would be about 117 visitor days (39 visitors per day x 3 days) with an annual value of about $8,541. For the Proposed Action and other alternatives, there would be a loss of about 4 boating days per year 15 of the 47-year study period on average or a loss of 156 visitor days with a value of $11,388. A maximum loss of 11 boating days in a single year under each alternative would result in a loss of 429 visitor days with a value of $31,317. A beneficial effect from 1 additional day in some years would provide 39 additional visitor days with a value of $2,847 under the action alternatives.

Table 9. 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 are 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		
No Action	824	-2.4	-11 to 0[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

[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.
[2] There would be no increase in flows during any of the years when flow changes occur.

5.3.1.3. Pumphouse

The reach of the Colorado River between the Pumphouse and State Bridge provides generally flat water with Class II and III rapids. Rafters in this reach of the river prefer flows from 2,000 to 3,000 cfs, but will boat at flows from 400 to 3,000 cfs. Kayakers prefer flows of around 1,100 cfs, but will also boat at flows to 400 cfs.

Detailed boating use information for this reach of the river is not available, but BLM data on total visitor use to the Pumphouse and Radium Recreation Area from 2004 and 2005 indicate an average of 43,406 users for those two years (BLM 2007). This includes boaters, campers, and day use visitors. BLM data on commercial boating indicates an average of 34,714 visitor days from 1999 to 2005. This includes the approximate 1,200 visitors that use the Big Gore Canyon reach of the river discussed above. Assuming private boaters and campers make up the difference between total users and commercial boating permits, the total would indicate about 8,692 private visitor days. It is estimated that about 10 percent of these visitors are campers or day use visitors and do not boat; the remainder are assumed to be private boaters. Thus, a total of about 41,337 boaters are assumed to use this reach of the river annually. 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. To simplify the analysis and derive a daily use value, it was assumed that all of the visitor days occurred from June to August and that visitors per day were evenly distributed during that period. Thus, boating use per day would be about 450 visitors (41,337/92 days), and camping and nonboating use would be about 10 visitors per day (869/92 days). No data are available on the ratio of kayakers and rafters; therefore, it was assumed that boating use is split evenly between the two (225 visitors per day for both rafting and kayaking).

A change in the number of days of preferred kayaking flows between 1,100 and 2,200 cfs in the Pumphouse reach was evaluated based on daily data for the period from June to August (Table 10). There would be no change in the number of days in this flow range in 32 of the 47-year study period. 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 and about 4 fewer days under the Proposed Action. On average, there would be about 1 less day of preferred kayaking flows during the 15 years where flow changes affect kayaking. The greatest decrease in preferred kayaking flow days in a single year would be 15 days under each alternative with an increase of up to 7 days under the No Action alternative, 6 days under the Proposed Action, and 10 days for other alternatives. 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 the alternatives would rarely divert water in late August and thus would have minimal effect on the Gore Race. As discussed in the Recreation Resources Technical Report (ERO 2008a), all of the alternative would result in a small increase in the number of days when flows acceptable for kayaking fall between 400 and 2,200 cfs. Thus, although there could be some reduction in the preferred higher flow levels in some years, the range of acceptable flows for kayaking would remain similar to existing conditions.

The net economic effect from the loss of 1 day per year of preferred kayaking flows during the 15 years when flow changes affect kayaking under all of the alternatives would be a loss of about 225 visitor days (225 visitors per day x 1 day) with an annual value of about $16,425. A maximum loss of 15 kayaking days in a single year under all of the alternatives would result in a loss of 3,375 visitor days with a value of $246,375. Beneficial effects from 6 to 10 additional days in some years for the alternatives would provide 1,350 to 2,250 additional visitor days with a value of $98,550 to $164,250. The net increase of 1 kayaking day over the 47-year study period under the No Action alternative, and a net decrease of 4 kayaking days over 47 years for the Proposed Action would result in a minor long-term economic effect. Similar small changes in kayaking days would occur for Alternatives 3, 4, and 5.

Table 10. 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 are 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		
No Action	1,035	+<1	-15 to +7
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.

The potential economic effects of a change in preferred rafting flows in the Pumphouse reach were also evaluated. There would be no change from existing conditions in the number of days when preferred rafting flows in the Pumphouse reach are between 2,000 and 3,000 cfs in 28 of the 47-year study period under the all the alternatives (Table 11). Over the 47-year period, there would be 6 more days of preferred flows under the No Action alternative and 20 fewer days under the Proposed Action. On average, during the 19 years where flow changes occur, there would be about 1 less day per year in the preferred rafting flow range. The greatest decrease in preferred flow days in a single year would be 17 days under each action alternative except Alternative 5, which would decrease 5 days. The greatest increase in the number of days in a single year with preferred flows would be 11 days under the No Action alternative and 8 days under Alternative 5. Acceptable rafting flow between 400 and 3,000 cfs would increase over existing conditions under all of the alternatives, but there would be fewer rafting

days available at higher flows. This could reduce the number of boaters or diminish the boating experience when flows drop below 2,000 cfs, but the overall range of flows would be similar to existing conditions.

The net economic effect from the loss of 1 rafting day on average per year during the 19 years when flow changes affect rafting under all of the alternatives would be a loss of about 225 visitor days (225 visitors per day x 1 day) with an annual value of about $16,425. A maximum loss of 17 rafting days in a single year under the Proposed Action and Alternatives 3 and 4 would result in a loss of 3,825 visitor days with a value of $279,225. Beneficial effects from 3 to 11 additional days in some years for the alternatives would provide 675 to 2,475 additional visitor days with a value of $49,275 to $180,675.

Table 11. 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 are 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		
No Action	447	+0.3	-4 to +11
Proposed Action	421	-1.0	-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 preferred flows for rafting are between 2,000 and 3,000 cfs in 28 of 47 years.

5.3.1.4. Comparison of Effects to Boating

To provide a common basis for comparing the economic effects to boating on the Colorado River, the change in the number of boating days over the 47-year study period were used to annualize gains or losses in boating recreational values (Table 12). The average cost per year for reduced boating opportunities in Byers Canyon would be $416 for each of the alternatives. A reduction in the number of rafting and kayaking days in Big Gore Canyon would result in an average annual loss in recreation value ranging from $1,151 for Alternative 4 to $1,651 for Alternative 5. In the Pumphouse reach, the No Action alternative would result in a slight increase in average annual recreation value for kayaking and rafting, while other alternatives would result in an average annual loss in value of about $2,100 for Alternative 5 to about $10,500 for Alternative 4. As previously stated, this analysis assumes a complete loss of boating days when flows fall outside of preferred ranges; however, the range of flows acceptable for boating would not change substantially from existing conditions, and actual economic effects are likely to be less.

Table 12. Annualized cost or benefit to recreational boating on the Colorado River by alternative.

Alternative	Byers Canyon (kayaking)	Big Gore Canyon (rafting and kayaking)	Pumphouse	
			Kayaking	Rafting
No Action	-$416	-$1,458	+$349	+$2,097
Proposed Action	-$416	-$1,393	-$1,397	-$6,989
Alt 3	-$416	-$1,393	-$1,397	-$7,339
Alt 4	-$416	-$1,151	-$1,048	-$9,437
Alt 5	-$416	-$1,635	-$349	-$1,747

5.3.1.5. Colorado River Camping

It is possible that camping, sightseeing, and other recreation use in the Pumphouse and Radium areas would also change as a result of changes in streamflow. Assuming that nonboating recreation changes in a pattern similar to that of rafting, then an average decrease of 1 day of rafting would result in the loss of about 10 nonboating visitor days with an economic value of about $370. This loss would occur in 28 years of the 47-year study period. A maximum annual loss of nonboating recreation from 17 fewer rafting days under the Proposed Action and Alternatives 3 and 4 would translate to a loss of 170 nonboating user days with a value of $6,290. The estimated increase in nonboating recreation would range from 30 to 110 visitor days with a value of $1,100 to $4,070 when streamflow changes increase rafting opportunities.

5.3.2. Colorado River Angling

Angling opportunities along the Colorado River are an important component of the local economy. Fishing occurs on BLM lands, State Wildlife Areas, and on private lands and resorts. Projected changes in streamflow on the Colorado River below Granby Reservoir under all of the alternatives would result in a loss of fish habitat (Miller 2008). An increase in water temperature also would occur below the Windy Gap Reservoir diversion under some conditions. The anticipated reduced flows, which are greatest during the high runoff period, are not expected to adversely impact fish populations or fishing opportunities. High stream flushing flows sufficient for channel and fish habitat maintenance and sediment transport would still occur (ERO and Boyle 2007). No Windy Gap diversions would occur when flows reach the minimum streamflow requirement under all of the alternatives. Projected effects to fish habitat are not predicted to translate to loss in angling opportunities or fishing success. No flow preferences for angling are available for the Colorado River, but fly fisherman typically like lower to moderate flows for wading (Smith and Hill 2000). Windy Gap diversions during high flow periods could increase the suitability for wading. Lower flows in some months could diminish the aesthetic value of the river for some visitors and possibly affect the quality of the recreation experience. The WGFP would not increase the potential for production or distribution of whirling disease, which affects rainbow trout populations throughout the Colorado River and numerous locations throughout the State (Miller 2008). No

measurable effect to angler user days on the Colorado River or associated economic effects were identified for any of the alternatives.

5.3.3. Colorado River Water Flow and Quality

The WGFP would be subject to downstream senior water rights that have the ability to place a call on the river if flows are not sufficient, so there would be no economic effect to senior water right holders. The WGFP would not reduce Colorado River streamflow downstream of Windy Gap Reservoir below the 90 cfs minimum instream flow and would have no effect on flows when natural conditions or actions by others reduce flows below 90 cfs. Municipal and agricultural diversions downstream from Windy Gap Reservoir, per Colorado water law (C.R.S. § 37-92-102(2)(b)), would remain responsible for developing a reasonable means of diversion for their water. Streamflows below Windy Gap Reservoir, at or below the minimum flow, have occurred historically without Windy Gap diversions; however, the WGFP would slightly increase the frequency of flows at 90 cfs. The Municipal Subdistrict paid $500,000 to upgrade diversion structures for ranches on the Colorado River below Windy Gap Reservoir as part of the original construction of Windy Gap Reservoir.

None of the WGFP alternatives are projected to result in the exceedance of water quality standards that would affect municipal water diversions or discharges. The Municipal Subdistrict paid the Town of Hot Sulphur Springs $150,000 for assistance in improving its water treatment facility and $270,000 for improving its WWTP as mitigation for the original Windy Gap Project, which was intended to divert more water than the proposed WGFP.

5.3.4. Three Lakes Recreation

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 be no change in water quality parameters that exceed water quality standards for recreation use. Reduced water clarity and algal growth has been an issue of concern in Grand Lake and Shadow Mountain Reservoir, which 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. It is unknown whether these water clarity issues would translate to a loss in visitors and associated economic effects. Aquatic weeds in Shadow Mountain Reservoir are also an issue that Reclamation, the Northern Colorado Water Conservancy District, and numerous entities from Grand County are cooperating in an attempt to address. None of the alternatives are anticipated to result in changes to the conditions that contribute to the aquatic weed problem and, therefore, the WGFP is unlikely to exacerbate the problem (AMEC 2008).

There also have been concerns related to algal toxins in Grand Lake including an advisory issued in the summer of 2007 related to use of the lake for drinking water.

Microtoxin levels did not exceed concern levels, but ongoing monitoring and accurate analysis would help determine if production of toxins is a problem. Chronic toxin levels could have an economic effect, but there is currently not enough information to determine that this would occur.

Projected relatively small reductions in boatable area for Granby Reservoir in most years are 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 recreation experience at Granby Reservoir. Camping, hiking, and shoreline activities could decrease during periods of low water levels, when boat ramp access declines, or from a perceived decrease in aesthetic values. 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 or weather (Orr 2008). Sufficient information is unavailable to determine if lower Granby Reservoir water levels would directly affect visitor use.

The Aquatic Resources Technical Report (Miller Ecological 2008) concluded that predicted minor changes in dissolved oxygen levels would not affect the trophic status of Grand Lake, Shadow Mountain Reservoir, and Granby Reservoir (AMEC 2008) and would not likely affect the fish communities in Grand Lake and Shadow Mountain Reservoir. Thus, there would be no effect to recreational fishing opportunities at the Three Lakes for any of the alternatives.

5.3.5. Carter Lake and Horsetooth Reservoir Recreation

The small projected changes in Carter Lake water surface area (an average monthly decrease of less than 6 acres) under all of the alternatives is unlikely to adversely affect visitor numbers or recreation activities. Larger reductions 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 by potentially reducing the overall aesthetics of the experience. No measurable economic impact to local economies is likely from predicted changes in reservoir storage.

Projected changes in Horsetooth Reservoir 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 (up to 83 acres on average in May), could diminish the overall quality of the user experience by increasing the distance between land-based facilities and the water surface, and by potentially reducing the overall aesthetics of the experience. Average monthly water levels would decrease less than 30 acres for other action alternatives, and less than 6 acres under No Action. A larger decline in lake levels after several consecutive dry years (35 to 40 feet), primarily under the Proposed Action, would impact access to boat ramps, reduce boating capacity, and diminish the quality of the recreation experience. A decrease in recreation value is

possible during periods when Horsetooth Reservoir water levels are substantially lower, such as sequential dry years.

5.4. Alternative 1 – No Action Alternative

Under the No Action alternative, WGFP Participants would maximize their delivery of Windy Gap water through existing facilities and the City of Longmont would enlarge the existing Ralph Price Reservoir, which is situated in Boulder County about six miles west of Lyons.

5.4.1. Population, Employment, and Income

The peak size of the contractor work force needed for construction of Ralph Price Reservoir is estimated to be about 100 people (Boyle 2005b). An average workforce of about 50 people would be required (Table 8). Temporary, localized population increases may occur during the expansion of Ralph Price Reservoir in nearby towns where workers may reside, such as Lyons.

Expansion of Ralph Price Reservoir would have a temporary beneficial effect on local employment and income throughout construction. Based on various storage capacity increases at Ralph Price Reservoir provided in the City of Longmont Raw Water Master Plan Update, construction costs associated with the 13,000 AF Ralph Price Reservoir expansion is estimated to cost about $31 million (in 2003 dollars). Of this total, the direct labor cost would be about $8 million assuming an average employment of 50 people (Bandy pers. comm. 2005a; Boyle 2005b). Existing operations and maintenance costs would not change.

Table 13. Ralph Price expansion – work force and costs.

Ralph Price Reservoir			
Project Component	**Average Work Force**	**Direct Labor Cost**	**TOTAL COST**
Reservoir and Facility Construction	50	$8 million	$31 million

Source: Boyle 2005a.

RIMS II multipliers for general construction generated for the "Denver Metro Region" region (which includes Boulder County) were used to estimate total economic output, earnings, and jobs associated with expansion of Ralph Price Reservoir. If the entire project cost ($31 million) were spent locally in the Denver Metro Region, enlarging Ralph Price Reservoir would generate an estimated $73 million[3] in total economic output including local government (e.g., sales tax revenues) and secondary effects resulting from spending in the region (Colorado Division of Local Government 2005). Applying an earnings multiplier to direct labor costs, indirect labor would

[3] Total economic output at Ralph Price Reservoir: $31 million x 2.37 multiplier = $73 million.

contribute about $8.7 million in additional regional earnings.[4] Using average employment figures shown in Table 8 and applying an employment multiplier to the expected number of workers from the Denver Metro Region, about 69 additional jobs would be developed in the region (Id.).[5] These construction-related effects would be temporary and would not be sustained after construction is completed. As a result, many newly created jobs would be lost and regional employment would likely return to pre-construction levels. To the extent that construction spending takes place outside of the region, such as materials purchased elsewhere, additional direct and secondary benefits would accrue to other regions.

5.4.2. Agricultural and Residential Land Use

No agriculture occurs on lands adjacent to Ralph Price Reservoir. The two private residences near Ralph Price Reservoir and the existing ranger residence would not be affected by reservoir expansion.

Projected changes in streamflows would not affect agriculture production along the Colorado River. Exercise of Windy Gap water rights on the Colorado River would not impact senior agricultural water rights downstream of the Windy Gap diversion and existing agricultural water use (see Land Use Technical Report ERO 2008b). The WGFP would not typically divert water under low flow conditions and would not divert water below the minimum bypass flows identified in its water rights. Irrigation water rights senior to upstream water rights have the ability to place a call on the river if flows are insufficient. Thus, there would be no effect to agricultural production or farm income in Grand County. Under Colorado water law, irrigators have the responsibility to develop operating structures to divert water from the stream.

5.4.3. Recreation

Recreation at Ralph Price Reservoir would be temporarily affected during the 30-month construction timeframe. The reservoir would probably be drained during construction, and recreation access for angling and hiking would be suspended. Most anglers and hikers would likely seek alternative recreation areas.

5.4.4. Community Services

Construction of the enlarged reservoir should not substantially increase the need for police, fire, medical, education, or other community resources in the study area. Although construction activities could temporarily increase the local population during construction, existing community services should be sufficient to serve this short-term increase.

[4] Applying the earnings multiplier for the Denver Metro Region, each dollar spent on direct labor in the region ($8 million) would contribute an additional $1.12 increase in regional earnings (about $8.7 million in additional earnings).

[5] Additional jobs created in the region: 50 jobs (average work force) x 1.37 multiplier = 69 new jobs.

5.4.5. Environmental Justice

Expansion of Ralph Price Reservoir would occur on lands currently owned and managed by the City of Longmont and no minority or low-income populations are known to reside in the project area. While U.S. Census Tract and Block Group data for areas adjacent to Ralph Price Reservoir indicate there are small numbers of minority or low-income populations within the Census Tract and Block Group survey areas (Census 2000b) expansion of Ralph Price Reservoir would not disproportionately affect minority of low-income populations. During construction, the availability of construction jobs would likely provide some opportunities for minority or low-income populations in Boulder County or nearby locations.

5.5. Alternative 2 - Chimney Hollow (90,000 AF)

5.5.1. Population, Employment, and Income

The peak size of the contractor work force at Chimney Hollow is dependent on many factors, including construction duration and construction methodologies. Assuming a 3- to 5-year construction period, an average workforce of about 235 people would be required (Boyle 2005a). It is estimated that the contractor's work force could more than double to about 500 people during the peak months of construction.

Construction activities would have a temporary beneficial effect to local employment and income in nearby cities and towns such as Loveland and Berthoud. While at least half of the construction workers would consist of skilled laborers, it's likely that as many as 50 percent of the jobs to be offered would include unskilled positions such as laborers, truck drivers, and equipment operators (Bandy, pers. comm. 2005b).

Total construction costs for Chimney Hollow Reservoir would be $223 million (Table 9). Direct labor costs would be about $47 million and would provide an average of 235 jobs during the 48-month construction period (Boyle 2005a, 2005b). After construction, annual operation and maintenance costs for Chimney Hollow are estimated to be $795,000.

Table 14. Alternative 2 – average work force and project cost.

Chimney Hollow (90,000 acre-feet)			
Project Component	**Average Work Force**	**Direct Labor Cost**	**TOTAL COST**
Construction			
Reservoir, dam conveyance, and other facility construction costs	235	$47 million	$223 million
Operations and Maintenance			
Reservoir	4	n/a	$500,000 annually
Conveyance facilities	Variable number of subcontractors	n/a	$295,000 annually

Source: Boyle 2005a.

It is estimated that about 50 percent of the workers (118) for construction of Chimney Hollow would commute from existing residences near Loveland, Berthoud, and other northern Front Range communities (Bandy, pers. comm. 2005a). The remaining 50 percent would be drawn from other areas, including the Denver Metro Area. Some workers may temporarily relocate to towns and cities near the project area (e.g., Loveland and Berthoud). Temporary population increases in these areas would be relatively small in contrast with the overall population, and the existing supply of housing would likely be sufficient to meet temporary worker needs. Following construction of the reservoirs, workers temporarily residing in the area would likely move on in search of other employment.

A portion of construction dollars (wages, equipment, materials, and supplies) would be spent locally, creating secondary income and jobs in the region. RIMS II multipliers for general construction generated for the "Larimer and Weld" Region were used to estimate total economic output, earnings, and jobs associated with construction of Chimney Hollow. Assuming that 50 percent of the project cost ($112 million) was spent locally; Chimney Hollow would generate an estimated $292 million in total economic output[6] including local government effects (e.g., sales tax revenues) and secondary economic effects resulting from spending in the region (Colorado Division of Local Government 2005). Applying the earnings multipliers for the Larimer and Weld Region to direct labor costs ($24 million) associated with construction of Chimney Hollow; indirect labor would contribute $20 million in additional regional earnings.[7] Using average employment figures shown in Table 9 and applying an employment multiplier to the expected number of workers from the Larimer and Weld Region, about 127 additional jobs would be developed in the region (Id.).[8] These construction-related effects would be temporary and would not be sustained after construction is completed. As a result, many newly created jobs would be lost and regional employment would likely return to pre-construction levels. To the extent that construction spending takes place outside of the Weld and Larimer County regions, the direct and secondary benefits would accrue to other regions.

Annual operation and maintenance of the reservoirs and associated facilities would require a total of four employees. Long-term salaries for operators would generate small positive economic effects. Periodic maintenance activities such as annual inspections, removal of brush or weeds, painting, and other types of maintenance would likely be contracted out to local companies. These activities would also generate small positive economic effects. Annual operation and maintenance costs for Chimney Hollow are estimated to be $795,000.

[6] Total economic output at Chimney Hollow: $112 million x 2.62 = $292 million.

[7] Applying the earnings multiplier for the Larimer and Weld Region, each dollar spent on direct labor in the region ($24 million) would contribute an additional $0.83 increase in regional earnings (about $20 million in additional regional earnings).

[8] Additional jobs created in the region: 118 jobs (50 percent of average work force at Chimney Hollow) x 1.07 multiplier = 127 new jobs.

In addition to the economic output, earnings, and employment estimates described above, recreational development at Chimney Hollow would produce small positive economic effects. The costs of construction, operation and maintenance, and management of recreation facilities at Chimney Hollow, and projected visitor use is described in Section 5.4.3.

5.5.2. Agricultural and Residential Land Use

Construction of Chimney Hollow would not adversely affect agricultural production because no agricultural land uses occur at Chimney Hollow (ERO 2008b). None of the property is used for farming or ranching, although the land has historically been used for livestock grazing.

Projected changes in stream flows would not affect agriculture along the Colorado River. Exercise of Windy Gap water rights on the Colorado River would not affect other senior agricultural water rights downstream of the Windy Gap diversion and existing agricultural water use (ERO 2008b). The WGFP would not typically divert water under low flow conditions and would not divert water below the minimum bypass flows established in its water rights. Irrigation water rights senior to upstream water rights have the ability to place a call on the river if flows are insufficient. Thus, there would be no effect to agricultural production or farm income in Grand County. Under Colorado water law, irrigators have the responsibility to develop operating structures to divert water from the stream.

No residences are located at the Chimney Hollow site. However, several residents are located on the hogback east of the reservoir site. During construction, demand for properties near construction activity could decrease due to noise and visual disturbances. Following construction, nearby landowners may benefit from increased property values due to potential recreation or scenic amenities associated with the new reservoir.

5.5.3. Recreation

No recreation currently occurs on private lands located at the reservoir site, and planned future recreation at the reservoir and adjacent proposed Chimney Hollow Open Space would be limited to hiking, angling, and non-motorized boating (ERO 2008a). No visitor use fees are anticipated at Chimney Hollow Open Space. Currently, Larimer County has set aside $1,000,000 toward the estimated development costs of planned facilities at the site. Annual management costs for staff, facility and trails maintenance, weed control, patrol, vehicles, and administration are estimated to be $265,000 (Flenniken, pers. comm. 2006).

It is anticipated that future visitor use at Chimney Hollow would be about 50,000 annual visitors, which is substantially lower than the 300,000 annual visitors to Carter Lake (Flenniken, pers. comm. 2006; Rieves, pers. comm. 2005). However, local businesses in the vicinity of Chimney Hollow may experience a slight increases in revenues associated with recreational visitor expenditures.

5.5.4. Community Services

Construction of Chimney Hollow reservoir should not substantially increase the need for police, fire, medical, education, or other community resources in the study area. Although reservoir construction would slightly increase the local population during the 3- to 5-year construction period, existing community services should be sufficient to serve this short-term increase. Similarly, existing community services should be sufficient for the additional recreation use in the area.

5.5.5. Environmental Justice

Construction of Chimney Hollow reservoir would mostly occur on private owned by the Subdistrict and no minority or low-income populations are known to reside in the project area. While U.S. Census Tract and Block Group data for areas adjacent to Chimney Hollow indicate there are small numbers of minority or low-income populations within the Census Tract and Block Group survey areas (Census 2000b), construction of Chimney Hollow Reservoir would not disproportionately affect minority or low-income populations. During construction, the increase in construction jobs would likely provide temporary employment opportunities for some minority or low-income populations. These employment opportunities would provide wages that are higher than many local service jobs.

5.6. Alternative 3 – Chimney Hollow Reservoir (70,000 AF) and Jasper East Reservoir (20,000 AF)

5.6.1. Population, Employment, and Income

The simultaneous construction of Chimney Hollow Reservoir (70,000 AF) and Jasper East Reservoir (20,000 AF) would take about 2.5 to 5 years (Boyle 2005a). Chimney Hollow and Jasper East reservoirs would require an average combined workforce of about 255 people (190 people at Chimney Hollow and 65 people at Jasper East) (Table 10). It is estimated that the contractor's work force could more than double to about 570 people during the peak months of construction.

Construction activities would have a temporary beneficial effect to local employment and income in local cities and towns such as Loveland and Berthoud on the East Slope and Grand Lake, Granby, Kremmling, Fraser, and Hot Sulphur Springs on the West Slope. While at least half of the construction workers will consist of skilled laborers, it's likely that the other half of the jobs to be offered include unskilled positions such as laborers, truck drivers, and equipment operators (Bandy, pers. comm. 2005b).

Construction, operation, and maintenance costs for Chimney Hollow and Jasper East reservoirs are listed in Table 10. Construction costs associated with Chimney Hollow and Jasper East would be $240 million (including conveyance construction costs). Of this total, the direct labor cost would be about $49 million.

Table 15. Alternative 3 – average work force and project cost.

Chimney Hollow (70,000 acre-feet)				Jasper East (20,000 acre-feet)				
Project Component	**Average Work Force**	**Direct Labor Cost**	**Cost**	**Project Component**	**Average Work Force**	**Direct Labor Cost**	**Cost**	**TOTAL COST**
Construction								
Reservoir, dam, conveyance, and other facility construction costs	190	$37 million	$180 million	Reservoir, dam, conveyance, and other facility construction costs	65	$12 million	$60* million	$240 million
Operations and Maintenance								
Reservoir	4	n/a	$500,000 annually	Reservoir	2	n/a	$250,000 annually	$750,000
Conveyance Facilities	Variable number of subcontractors	n/a	$295,000 annually	Conveyance	Variable number of subcontractors	n/a	$167,000 annually	$462,000
Power	n/a	n/a	n/a	Power	n/a	n/a	$162,000 annually	$162,000

*Cost includes $15 million to relocate the Willow Creek Pump Station and Canal.
Source: Boyle 2005a.

It is estimated that about 50 percent of the workers needed for construction of Chimney Hollow Reservoir (95) would commute from existing residences near Loveland, Berthoud, and other northern Front Range communities (Bandy, pers. comm. 2005a). The remaining 50 percent would be drawn from other areas, including the Denver Metro Area. Some workers may temporarily relocate to towns and cities near the project area (e.g., Loveland and Berthoud). At Jasper East, it is estimated that about 25 percent of the workers (16) would be drawn from local communities in Grand County and another 25 percent would be drawn from the Denver Metro Area or the northern Front Range (Bandy, pers. comm. 2005a). The remaining workforce would be drawn from outside these areas. Construction activity at Jasper East would likely occur during the spring, summer, and fall. Any increases in rental housing demand in towns such as Granby, Hot Sulphur Springs, or Kremmling would likely be beneficial since rental and hotel occupancy rates are often lower during the tourism shoulder seasons (spring and fall). Temporary population increases in these areas would be relatively small in contrast with the overall population, and the existing supply of housing would likely be sufficient to meet temporary worker needs. Following construction of the reservoirs, workers temporarily residing in the area would likely move on in search of other employment.

A portion of construction dollars (wages, equipment, materials, and supplies) would be spent locally, creating secondary income and jobs. RIMS II multipliers for general

construction generated for the "Larimer and Weld" and "Scenic and Resort" regions were used to estimate total economic output, earnings, and jobs associated with construction of Chimney Hollow (70,000 AF) and Jasper East, respectively. Assuming that 50 percent of the total construction cost of Chimney Hollow would be spent locally in the Larimer and Weld Region and 25 percent of the total construction cost of Jasper East would be spent in the Scenic and Resort Region, both reservoirs together would generate an estimated $271 million in total economic output[9] including local government effects (e.g., sales tax revenues) and secondary economic effects resulting from spending within these regions (Colorado Division of Local Government 2005). Applying the earnings multiplier for each region to direct labor costs within each region ($19 million at Chimney Hollow and $3 million at Jasper East), indirect labor would contribute $16 million in additional earnings in the Larimer and Weld Region and about $2 million in additional earnings in the Scenic and Resort Region.[10] Using average employment figures shown in Table 10 and applying employment multipliers to expected numbers of workers from each region, about 102 jobs would be created in the Larimer and Weld Region and about 30 additional jobs would be created in the Scenic and Resort Region (Id.).[11] These construction-related effects would be temporary and would not be sustained after construction is completed. As a result, many newly created jobs would be lost and regional employment would likely return to pre-construction levels. To the extent that construction spending takes place outside of the regions, the direct and secondary benefits would accrue to other regions.

Following construction, total operation and maintenance costs for Chimney Hollow and Jasper East are estimated to be about $1.37 million annually. Annual operation and maintenance of the reservoirs and associated facilities would require a total of six employees. Long-term salaries for operators would generate small positive secondary economic effects. Periodic maintenance activities such as annual inspections, removal of brush or weeds, painting, and other types of maintenance would likely be contracted out to local companies. These activities would also generate small positive economic effects. Possible recreational use at Chimney Hollow and Jasper East would produce additional small positive economic effects.

[9] Total economic output at Chimney Hollow: $90 million x 2.62 = $236 million.
Total economic output at Jasper East: $15 million x 2.3 multiplier = $35 million.
Total economic output: $236 million +$35 million = $271 million.

[10] Applying the earnings multiplier for the Larimer and Weld Region, each dollar spent on direct labor in the region ($19 million) would contribute and additional $0.83 increase in regional earnings (about $16 million in additional regional earnings). In the Scenic and Resort Region, each dollar spent on labor in the region ($3 million) would contribute an additional $0.63 increase in regional earnings (about $2 million in additional regional earnings).

[11] Additional jobs created in the Larimer and Weld Region: 95 jobs (50 percent of average work force at Chimney Hollow) x 1.07 multiplier = 102 new jobs. Additional jobs created in the Scenic and Resort Region: 16 jobs (25 percent of average work force at Jasper East) x 1.84 multiplier = 30 new jobs.

5.6.2. Agricultural and Residential Land Uses

The effect to agriculture and residential land use at Chimney Hollow Reservoir would be the same as discussed for Alternative 2. The loss of grazing land and hay production from construction of Jasper East Reservoir would result in a decrease in agricultural output. It is estimated that about 45 calves would no longer be produced and sold. Costs to the rancher that leases the property would amount to $27,000 gross profit per year assuming each calf costs about $600 per head (Alexander 2005). In addition, Northern Colorado Water Conservancy District would forego lease revenue associated with the site and state and local governments would experience a small loss in tax revenue associated with a reduction in agricultural activity.

Projected changes in streamflows would not affect agriculture along the Colorado River. Exercise of Windy Gap water rights on the Colorado River would not affect other senior agricultural water rights downstream of the Windy Gap diversion and existing agricultural water use (ERO 2008b). The WGFP would not typically divert water under low flow conditions and would not divert water below the minimum bypass flows established in its water rights. Irrigation water rights senior to upstream water rights have the ability to place a call on the river if flows are insufficient. Thus, there would be no effect to agricultural production or farm income in Grand County. Under Colorado water law, irrigators have the responsibility to develop operating structures to divert water from the stream.

During construction of Jasper East Reservoir, property values near construction activity could decrease due to noise and visual disturbances. Following construction, nearby landowners may benefit from increased property values if recreation is developed or from scenic values associated with the new reservoir.

5.6.3. Recreation

Recreation-related effects at Chimney Hollow are similar to those described for Alternative 2.

No recreation currently occurs on private lands located at the Jasper East site. Construction of Jasper East Reservoir and associated facilities would not affect recreation at nearby Willow Creek Reservoir. Initial stages of construction would include the relocation of County Road 40, which would maintain access to Willow Creek Reservoir during and following construction of Jasper East Reservoir and is unlikely to impact recreation use.

Recreation development, such as fishing and boating is possible at Jasper East; however, no local, state, or federal agency has committed to providing for or managing recreation at this time. Should an agency agree to manage recreational use in the future, small positive benefits from increased spending attributed to recreational activities such as angling or boating may occur to the local communities. There would be no measurable adverse impacts to recreation-related expenditures from construction of Jasper Reservoir.

5.6.4. Community Services

Construction, operation, and maintenance of Chimney Hollow and Jasper East reservoirs should not substantially increase the need for police, fire, medical, educational, or other community resources in the study area. Although construction of the Project would slightly increase the local population during the 2.5- to 5-year construction period, existing community services should be sufficient to serve this temporary increase. Similarly, existing community services should be sufficient for the additional recreation use at both reservoir sites.

5.6.5. Environmental Justice

Construction of Chimney Hollow and Jasper East would occur mostly on private or public lands and no minority or low-income populations are known to reside in the project areas. While U.S. Census Tract and Block Group data for areas adjacent to Chimney Hollow and Jasper East indicate there are small numbers of minority or low-income populations within the Census Tract and Block Group survey areas (Census 2000b), construction of these reservoirs would not disproportionately affect minority or low-income populations. During construction, the increase in construction jobs would likely provide temporary employment opportunities for some minority or low-income populations. These employment opportunities would provide wages that are higher than many local service jobs.

5.7. Alternative 4 – Chimney Hollow Reservoir (70,000 AF) and Rockwell/Mueller Creek Reservoir (20,000 AF)

5.7.1. Population, Employment, and Income

The average combined work force for the construction of Chimney Hollow (70,000 AF) and Rockwell/Mueller Creek (20,000 AF) would be about 266 people (190 people at Chimney Hollow and 76 people at Rockwell/Mueller Creek) (Boyle 2005a). It is estimated that the contractor's work force could more than double to about 585 people during the peak months of construction.

Construction activities would have a temporary beneficial effect to local employment and income in local cities and towns such as Loveland and Berthoud on the East Slope and Grand Lake, Granby, Kremmling, Fraser, and Hot Sulphur Springs on the West Slope. While at least half of the construction workers would consist of skilled laborers, it's likely that the other half of the jobs to be offered would include unskilled positions as laborers, truck drivers, and equipment operators (Bandy, pers. comm. 2005b).

Construction, operation, and maintenance costs for both Chimney Hollow and Rockwell/Mueller Creek reservoirs are depicted in Table 11. Construction costs for Chimney Hollow and Rockwell/Mueller Creek reservoirs would amount to $252 million including conveyance construction costs. Of this total, the direct labor cost would be about $52 million.

Table 16. Alternative 4 – average work force and project cost.

Chimney Hollow (70,000 acre-feet)				Rockwell/Mueller (20,000 acre-feet)				
Project Component	**Average Work Force**	**Direct Labor Cost**	**Cost**	**Project Component**	**Average Work Force**	**Direct Labor Cost**	**Cost**	**TOTAL COST**
Construction								
Reservoir, dam, conveyance, and other facility construction costs	190	$37 million	$180 million	Reservoir, dam, conveyance, and other facility construction costs	76	$15 million	$72 million	$252 million
Operations and Maintenance								
Reservoir	4	n/a	$500,000 annually	Reservoir	2	n/a	$250,000 annually	$750,000
Conveyance	Variable number of subcontractors	n/a	$295,000 annually	Conveyance	Variable number of subcontractors	n/a	$478,000 annually	$773,000
Power	n/a	—	—	Power	n/a	n/a	$207,000 annually	$207,000

* Includes cost of connection to C-BT facilities

Source: Boyle 2005a.

As with Alternative 3, it is estimated that about 50 percent of the workers (95) needed for construction of Chimney Hollow Reservoir would commute from existing residences near Loveland, Berthoud, and other northern Front Range communities (Bandy, pers. comm. 2005a). The remaining 50 percent would be drawn from other areas, including the Denver Metro Area. Some workers may temporarily relocate to towns and cities near the project area (e.g., Loveland and Berthoud). At Rockwell/Mueller Creek, it is estimated that about 25 percent of the workers (19) would be drawn from local communities in Grand County and another 25 percent would be drawn from the Denver Metro Area or the northern Front Range (Bandy, pers. comm. 2005a). The remaining workforce would be drawn from outside these areas. Construction activity at Rockwell/Mueller Creek would likely occur during the spring, summer, and fall. Any increases in rental housing demand in towns such as Granby, Hot Sulphur Springs, or Kremmling would likely be beneficial since rental and hotel occupancy rates are often lower during the tourism shoulder seasons (spring and fall). Temporary population increases in these areas would be relatively small in contrast with the overall population, and the existing supply of housing would likely be sufficient to meet temporary worker needs. Following construction of the reservoirs, workers temporarily residing in the area would likely move on in search of other employment.

A portion of construction dollars (wages, equipment, materials, and supplies) would be spent locally, creating secondary income and jobs. RIMS II multipliers for general construction generated for the “Larimer and Weld” and “Scenic and Resort” regions were

used to estimate total economic output, earnings, and jobs associated with construction of Chimney Hollow (70,000 AF) and Rockwell/Mueller Creek. Assuming that 50 percent of the total construction cost of Chimney Hollow would be spent locally in the Larimer and Weld Region and 25 percent of the total construction cost of Rockwell/Mueller Creek would be spent in the Scenic and Resort Region, both reservoirs together would generate an estimated $277 million in total economic output including local government effects (e.g., sales tax revenues) and secondary economic effects (Colorado Division of Local Government 2005).[12] Applying the earnings multiplier for each region to direct labor costs within each region ($19 million at Chimney Hollow and $4 million at Rockwell/Mueller Creek), indirect labor would contribute $15 million in additional earnings in the Larimer and Weld Region and about $3 million in additional earnings in the Scenic and Resort Region.[13] Using average employment figures shown in Table 11 and applying earnings multipliers to expected numbers of workers from each region, about 102 additional jobs would be developed in the Larimer and Weld Region and about 30 additional jobs in the Scenic and Resort Region (Id.).[14] These construction-related effects would be temporary and would not be sustained after construction is completed. As a result, many newly created jobs would be lost and regional employment would likely return to pre-construction levels. To the extent that construction spending takes place outside of the regions, the direct and secondary benefits would accrue to other regions.

After construction, total operation and maintenance costs for Chimney Hollow and Rockwell/Mueller Creek reservoirs would be about $1.73 million. Annual operation and maintenance of the reservoirs and associated facilities would require a total of six employees. Long-term salaries for operators would generate small positive economic effects. Periodic maintenance activities such as annual inspections, removal of brush or weeds, painting, and other types of maintenance would likely be contracted out to local companies. These activities would also generate small positive economic effects.

5.7.2. Agricultural and Residential Land Uses

Construction of Chimney Hollow would not adversely affect agricultural production because no agricultural land uses occur at Chimney Hollow (ERO 2006) as described for Alternative 2. Construction of Rockwell/Mueller Reservoir would inundate pastureland

[12] Economic output at Chimney Hollow: $90 million x 2.62 multiplier= $236 million; Economic out put at Rockwell/Mueller: $18 million x 2.3 multiplier = $41 million; Total economic output: $236 million + $41 million = $277 million.

[13] Applying the earnings multiplier for the Larimer and Weld Region, each dollar spent on direct labor in the region ($19 million) would contribute an additional $0.83 increase in regional earnings (about $15 million in additional regional earnings). In the Scenic and Resort Region, each dollar spent on direct labor in the region ($4 million) would contribute an additional $0.63 in regional earnings (about $3 million in additional regional earnings).

[14] Additional jobs created in the Larimer and Weld Region: 95 jobs (50 percent of average work force at Chimney Hollow) x 1.07 multiplier = 102 new jobs. Additional jobs created in the Scenic and Resort Region: 19 jobs (25 percent of average work force at Rockwell/Mueller Creek) x 1.84 multiplier = 30 new jobs.

currently supporting several horses. Landowners would have to purchase or lease alternative locations for grazing or sell these horses.

Projected changes in streamflows would not affect agriculture along the Colorado River. Exercise of Windy Gap water rights on the Colorado River would not affect other senior agricultural water rights downstream of the Windy Gap diversion and existing agricultural water use (ERO 2008b). The WGFP would not typically divert water under low flow conditions and would not divert water below the minimum bypass flows established in its water rights. Irrigation water rights senior to upstream water rights have the ability to place a call on the river if flows are insufficient. Thus, there would be no effect to agricultural production or farm income in Grand County. Under Colorado water law, irrigators have the responsibility to develop operating structures to divert water from the stream.

Construction of Rockwell/Mueller Creek would result in the permanent displacement of four residences located within the reservoir disturbance area. The Subdistrict would have to pay just compensation for these properties. Adjacent landowners could experience a decrease in property value during construction from noise and visual disturbances. Following construction, nearby landowners are likely to benefit from increased property values due to potential recreational or scenic amenities associated with the new reservoir.

5.7.3. Recreation

Recreation-related effects at Chimney Hollow are the same as those described for Alternative 2. Construction of Rockwell/Mueller Creek Reservoir and associated facilities would not affect recreation because no recreation currently occurs at the site. Following construction, some recreation such as fishing and boating may occur. However, no local, state, or federal agency has committed to providing for or managing recreation at either reservoir at this time. Should an agency agree to manage recreational use in the future, small positive benefits from increased spending attributed to recreational activities such as angling or boating may occur to nearby communities. There would be no measurable adverse impacts to recreation-related expenditures from construction of Rockwell/Mueller Creek Reservoir.

5.7.4. Community Services

Construction, operation, and maintenance of Chimney Hollow and Rockwell/Mueller Creek reservoirs should not substantially increase the need for police, fire, medical, educational, or other community resources in the study area. Although construction of the Project would slightly increase the local population during the 2.5- to 5-year construction period, existing community services should be sufficient to serve this temporary increase. Similarly, existing community services should be sufficient for the additional recreational at both reservoir sites.

5.7.5. Environmental Justice

Construction of Chimney Hollow and Rockwell/Mueller Creek would occur on private or public lands having no known minority or low-income populations. While

U.S. Census Tract and Block Group data for areas adjacent to Chimney Hollow and Rockwell/Mueller Creek indicate there are small numbers of minority or low-income populations within the Census Tract and Block Group survey areas (Census 2000b), construction of these reservoirs would not disproportionately affect minority or low-income populations. During construction, the increase in construction jobs would likely provide temporary employment opportunities for some minority or low-income populations. These employment opportunities would provide wages that are higher than many local service jobs.

5.8. Alternative 5 – Dry Creek Reservoir (60,000 AF) and Rockwell/Mueller Creek Reservoir (30,000 AF)

5.8.1. Population, Employment, and Income

The construction period for Dry Creek Reservoir (60,000 AF) and Rockwell/Mueller Creek (30,000 AF) would be about 2.5 to 4.5 years. The average combined work force would be 302 people (210 people at Dry Creek and 92 people at Rockwell/Mueller Creek) (Boyle 2005a, 2005b). It is estimated that the contractor's work force could more than double to about 657 people during the peak months of construction.

Construction activities would have a temporary beneficial effect to local employment and income in local cities and towns such as Loveland and Berthoud on the East Slope and Grand Lake, Granby, Kremmling, Fraser, and Hot Sulphur Springs on the West Slope. While at least half of the construction workers would consist of skilled laborers, it's likely that the other half of the jobs to be offered would include unskilled positions as laborers, truck drivers, and equipment operators (Bandy, pers. comm. 2005b).

Construction, operation, and maintenance costs for both Dry Creek and Rockwell/Mueller Creek reservoirs are depicted in Table 12. Construction costs for Dry Creek and Rockwell/Mueller Creek reservoirs would amount to $288 million including conveyance construction costs. Of this total, the direct labor cost would be about $60 million.

It is estimated that about 50 percent of the workers (105) needed for construction of Dry Creek Reservoir would commute from existing residences near Loveland, Berthoud, and other northern Front Range communities (Bandy, pers. comm. 2005a). The remaining 50 percent would be drawn from other areas, including the Denver Metro Area. Some workers may temporarily relocate to towns and cities near the project area (e.g., Loveland and Berthoud). At Rockwell/Mueller Creek, it is estimated that about 25 percent of the workers (23) would be drawn from local communities in Grand County and another 25 percent would be drawn from the Denver Metro Area or the northern Front Range (Bandy, pers. comm. 2005a). The remaining workforce would be drawn from outside these areas. Construction activity at Rockwell/Mueller Creek would likely occur during the spring, summer, and fall. Temporary population increases in these areas would be relatively small in contrast with the overall population, and the existing supply of housing would likely be sufficient to meet temporary worker needs. Following construction of the reservoirs, workers temporarily residing in the area would likely move on in search of other employment. Any increases in rental housing demand in Grand

County during the tourism shoulder seasons (spring and fall) would likely be beneficial since rental and hotel occupancy rates are often lower during this time.

Table 17. Alternative 5 – average work force and project cost.

Dry Creek (60,000 acre-feet)				Rockwell/Mueller (30,000 acre-feet)				
Project Component	**Average Work Force**	**Direct Labor Cost**	**Cost**	**Project Component**	**Average Work Force**	**Direct Labor Cost**	**Cost**	**TOTAL COST**
Construction								
Reservoir, dam, conveyance, and other facility construction costs	210	$42 million	$180 million	Reservoir, dam, conveyance, and other facility construction costs	92	$18 million	$88 million	$288 million
Operations and Maintenance								
Reservoir	4	n/a	$500,000 annually	Reservoir	2	n/a	$250,000 annually	$750,000
Conveyance	Variable number of subcontractors	n/a	$495,000 annually	Conveyance	Variable number of subcontractors	n/a	$478,000 annually	$973,000
Power	—	—	$314,000	Power	n/a	n/a	$207,000 annually	$521,000

*Includes cost of connection to C-BT facilities
Source: Boyle 2005a.

A large portion of construction dollars (wages, equipment, materials, and supplies) would be spent locally, creating secondary income and jobs. RIMS II multipliers for general construction generated for the "Larimer and Weld" and "Scenic and Resort" regions were used to estimate total economic output, earnings, and jobs associated with construction of Dry Creek and Rockwell/Mueller Creek. Assuming that 50 percent of the total construction cost of Dry Creek would be spent locally in the Larimer and Weld Region and 25 percent of the total construction cost of Rockwell/Mueller Creek would be spent in the Scenic and Resort Region, both reservoirs together would generate an estimated $287 million in total economic output[15] including local government effects (e.g., sales tax revenues) and secondary economic effects resulting from spending within the regions (Department of Local Government 2005). Applying the earnings multiplier for each region to direct labor costs within each region ($21 million at Dry Creek and $5 million at Rockwell/Mueller Creek), direct labor would contribute to $17 million in earnings in the Larimer and Weld Region and about $3 million in earnings in the Scenic

[15] Economic output at Dry Creek: $90 million x 2.62 multiplier= $236 million; Economic out put at Rockwell/Mueller Creek: $22 million x 2.30 multiplier = $51 million; Total economic output: $236 million +$51 million = $287 million.

and Resort Region.[16] Using average employment figures shown in Table 12 and applying employment multipliers specific to each region, about 112 additional jobs would be created in the Larimer and Weld Region and about 45 additional jobs in the Scenic and Resort Region would be created (Id.).[17] These construction-related effects would be temporary and would not be sustained after construction is completed. As a result, many newly created jobs would be lost and regional employment would likely return to pre-construction levels. To the extent that construction spending takes place outside of the regions, the direct and secondary benefits would accrue to other regions.

After construction, total operation and maintenance costs for Chimney Hollow and Rockwell/Mueller Creek reservoirs would be about $2.24 million. Operation and maintenance of the reservoirs and associated facilities would require a total of six employees. Long-term salaries for operators would generate small positive economic effects. Periodic maintenance activities such as annual inspections, removal of brush or weeds, painting, and other types of maintenance would likely be contracted out to local companies. These activities would also generate small positive economic effects.

5.8.2. Agriculture and Residential Land Uses

Construction of Dry Creek and Rockwell/Mueller Creek reservoirs would negatively affect livestock operations located at both sites. Construction of Dry Creek Reservoir would displace the Rancho Lobo y Mariposa Llama Ranch. Construction of Rockwell/Mueller Reservoir would inundate pastureland currently supporting several horses. The loss of these relatively small agricultural operations would not have a substantial effect on overall agricultural activity in Grand or Larimer counties. The negative economic effects associated with relocation of these small-scale agricultural operations would not extend beyond these local landowners.

Projected changes in streamflows would not affect agriculture along the Colorado River. Exercise of Windy Gap water rights on the Colorado River would not affect other senior agricultural water rights downstream of the Windy Gap diversion and existing agricultural water use (ERO 2008b). The WGFP would not typically divert water under low flow conditions and would not divert water below the minimum bypass flows established in its water rights. Irrigation water rights senior to upstream water rights have the ability to place a call on the river if flows are insufficient. Thus, there would be no effect to agricultural production or farm income in Grand County. Under Colorado water law, irrigators have the responsibility to develop operating structures to divert water from the stream.

[16] Applying the earnings multiplier for the Larimer and Weld Region, each dollar spent on direct labor in the region ($21 million) would contribute an additional $0.83 increase in regional earnings (about $17 million in additional regional earnings). In the Scenic and Resort Region, each dollar spent on labor in the region ($5 million) would contribute an additional $0.63 in regional earnings (about $3 million in additional regional earnings).

[17] Additional jobs created in the Larimer and Weld Region: 105 jobs (50 percent of average work force at Dry Creek) x 1.07 multiplier = 112 new jobs. Additional jobs created in the Scenic and Resort Region: 23 jobs (25 percent of average work force at Rockwell/Mueller Creek) x 1.84 multiplier = 42 new jobs.

Construction of Dry Creek Reservoir would result in the permanent displacement of three residences located within the reservoir disturbance area. Construction of Rockwell/Mueller Creek Reservoir would result in the permanent displacement of four residences located within the reservoir footprint. The Subdistrict would have to negotiate just compensation to acquire these properties and landowners would have to relocate to another location.

Property values near the reservoir sites could decrease during construction due to noise and visual disturbances. Following construction, nearby landowners are likely to benefit from increased property values due to potential recreation or scenic amenities associated with the new reservoir.

Revenues associated with the lease of state lands at the Dry Creek site for selling moss rock would be lost.

5.8.3. Recreation

No recreation currently occurs on private lands located at the Dry Creek or Rockwell/Mueller Creek sites. Following construction, some recreation such as fishing and boating is possible at these reservoirs; however, no local, state, or federal agency has committed to providing for or managing recreation at this time. Should an agency agree to manage recreational use in the future, small positive economic benefits from increased spending attributed to recreational activities such as angling or boating may occur to nearby communities.

5.8.4. Community Services

Construction, operation, and maintenance of Dry Creek and Rockwell/Mueller Creek reservoirs should not substantially increase the need for police, fire, medical, educational, or other community resources in the study area. Although construction of the Project would slightly increase the local population during the 2.5- to 4.5-year construction period, existing community services should be sufficient to serve this temporary increase. Similarly, existing community services should be sufficient for any additional recreation at both reservoirs.

5.8.5. Environmental Justice

Construction of Dry Creek and Rockwell/Mueller Creek would occur on private or public lands having no known minority or low-income populations. While U.S. Census Tract and Block Group data for areas adjacent to Chimney Hollow and Rockwell/Mueller Creek indicate there are small numbers of minority or low-income populations within the Census Tract and Block Group survey areas (Census 2000b), construction of these reservoirs would not disproportionately affect minority or low-income populations. During construction, the increase in construction jobs would likely provide temporary employment opportunities for some minority or low-income populations. These employment opportunities would provide wages that are higher than many local service jobs.

5.9. Other Socioeconomic Effects to Participants Common to All Action Alternatives

5.9.1. Water Supply and Demand

The percent of the future water demand in 2050 that would be met by Windy Gap water stored in reservoirs is provided in Table 13. Firmed Windy Gap water would be one of the water sources Participants expect to use to meet these anticipated future demands. For most Participants, additional sources of water will need to be developed to meet projected future demand. This could entail spending to acquire additional water rights, building additional storage or conveyance infrastructure, and implementing additional conservation measures. As mentioned previously, future water demands are projected to increase with or without the WGFP or construction of reservoirs included in the no action and action alternatives.

Table 18. Windy Gap water as a percentage of future supply, 2050.

Participant	Windy Gap as a % of Future Supply
Broomfield	25
Erie	16
Evans	4
Fort Lupton	6
Greeley	4
Lafayette	9
Longmont	21
Louisville	13
Loveland	53
Superior	67
LTWD	11
CWCWD	2
Platte River	100
MPWCD	9*

* Date of projected water demand is 2030

5.9.1.1. WGFP Financing and Water Rates

No Action Alternative. Longmont would fund expansion of Ralph Price Reservoir (the No Action Alternative) with funds already appropriated for the WGFP. Other Participants that have already accumulated funds for financing the WGFP (i.e., Lafayette, Louisville, Greeley, and Loveland) would likely allocate funds to other water development projects. Participants would likely fund potential future water develop projects through a combination of cash and debt financing or all debt financing. These Participants would recoup costs of funding various projects through increases in base

water rates, tap fees, cash-in-lieu for water rights, and/or a number of other funding mechanisms.

Action Alternatives. A breakdown of anticipated WGFP Participant financial contributions for constructing Chimney Hollow Reservoir is provided in Table 14. Broomfield, Longmont, and Platte River would likely be the largest contributors, and would account for over 50 percent of the WGFP total costs. A summary of total construction, operation, and maintenance costs associated with the WGFP action alternatives is provided in Table 15. These costs range from $223.4 million for Alternative 2 (the Proposed Action) to $287.7 million for Alternative 5 (Dry Creek and Rockwell Mueller Creek) in 2005 dollars. A recent cost estimate indicates that project costs in 2007 dollars for Alternative 2 have increased about 17 percent since the 2005 estimate. Other alternatives have probably increased by a similar amount. As mentioned in Section 4.8, Participants would fund construction, operation, and maintenance of reservoirs through a variety of means including cash, a combination of cash and debt financing, or all debt financing. In some cases, Participants that have already accumulated funds for financing the project through these and other measures (i.e., Lafayette, Longmont, Louisville, Greeley, and Loveland) would not experience any changes in water rates. Other Participants would likely recoup costs of funding the project through increases in base water rates, tap fees, cash-in-lieu for water rights, and/or a number of other funding mechanisms.

Table 19. Participant financial contribution toward WGFP.

Participant	Expected Contribution to WGFP*	Percentage of Total Cost
Broomfield	$61,000,000	28%
Erie	$15,000,000	7%
Evans	$4,000,000	2%
Fort Lupton	$2,000,000	1%
Greeley	$18,000,000	8%
Lafayette	$4,000,000	2%
Longmont	$32,000,000	15%
Louisville	$7,000,000	3%
Loveland	$15,000,000	7%
Superior	$11,000,000	5%
LTWD	$11,000,000	5%
CWCWD	$1,000,000	<1%
Platte River	$32,000,000	14%
MPWCD	$7,000,000	3%

* Cost allocation based on percent of total requested storage volume for Proposed Action (Chimney Hollow 90,000 AF) and is rounded to the nearest million.

Table 20. Estimated action alternative costs.

Alternative Feature	Alternative 2 Chimney Hollow (Proposed Action)	Alternative 3 Chimney Hollow/Jasper East		Alternative 4 Chimney Hollow/Rockwell		Alternative 5 Dry Creek/Rockwell	
	Chimney Hollow	Chimney Hollow	Jasper East	Chimney Hollow	Rockwell	Dry Creek	Rockwell
Construction Cost*							
Dam And Reservoir	$208,600,000	$165,200,000	$31,100,000	$165,200,000	$37,400,000	$157,000,000	$53,200,000
Conveyance Facilities	$14,800,000	$14,800,000	$29,000,000	$14,800,000	$35,000,000	$42,500,000	$35,000,000
Total Capital Cost	$223,400,000	$180,000,000	$60,100,000	$180,000,000	$72,400,000	$199,500,000	$88,200,000
Total Alternative Cost	**$223,400,000**	**$240,100,000**		**$252,400,000**		**$287,700,000**	
Annual Operation and Maintenance Cost							
Dam And Reservoir	$500,000	$500,000	$250,000	$500,000	$250,000	$500,000	$250,000
Conveyance	$295,000	$295,000	$167,000	$295,000	$478,000	$495,000	$478,000
Power	—	—	$162,000	—	$207,000	$314,000	$207,000
Total O&M Cost	$795,000	$795,000	$579,000	$795,000	$935,000	$1,309,000	$935,000
Total Alternative O&M Cost	**$795,000**	**$1,375,000**		**$1,730,000**		**$2,240,000**	

* Costs are in 2005 dollars.

6.0 CUMULATIVE EFFECTS

Cumulative impacts are those resulting from the incremental impact of an alternative 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.

Several reasonably foreseeable actions are anticipated to occur in the future regardless of the implementation of any of the WGFP action alternatives or the no action alternative. Reasonably foreseeable actions were divided into water-based actions that affect portions of the Colorado River where Windy Gap diversions would occur and land-based actions that include ground disturbances or other activities near potential WGFP facilities. Water and land-based reasonably foreseeable actions are defined below.

Water-Based Reasonably Foreseeable Actions

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. The population of Grand and Summit counties is expected to grow substantially in the future, which would increase water use and wastewater discharges. Future water use in Grand County would primarily occur in the Fraser River Basin upstream of the Windy Gap diversion; future water use in Summit County would occur primarily in the Blue River Basin, a tributary to the Colorado River downstream of the Windy Gap diversion. Further information on these reasonably foreseeable actions can be found in the Windy Gap Firming Project Water Resources Report (ERO and Boyle Engineering 2007).

Land-Based Reasonably Foreseeable Actions

New land developments are expected to occur in the vicinity of the potential reservoir sites in Larimer, Grand, and Boulder counties. On the West Slope this includes residential and commercial developments. In addition, Western is proposing to rebuild the existing transmission line between the Granby Pumping Plant and the Windy Gap Substation. This action is independent of the WGFP. On the East Slope this future land use is primarily additional residential development. Larimer County Parks and Open Lands plans to develop open space lands adjacent to the proposed Chimney Hollow Reservoir site. The County intends to manage this property for recreation use regardless of whether Chimney Hollow Reservoir is constructed. Continued population growth and development is expected to occur in the Northern Front Range Colorado communities served by many of the WGFP Participants.

6.1. Methods for Cumulative Effects Analysis

Cumulative socioeconomic effects were evaluated for both water-based and land-based reasonably foreseeable actions. Potential cumulative socioeconomic effects include the

overlapping effects that might occur to population, employment, income, agricultural and residential land uses, recreation, and community services from the combination of the WGFP alternative actions with reasonably foreseeable future actions. Potential effects to recreation, including boating in the Colorado River were based on the hydrologic conditions with reasonably foreseeable actions in place using the same method as direct effects as discussed in Section 5.1. The additional net hydropower production and value was calculated the same as direct effects using cumulative effects hydrology. The discussion in the Affected Environment section provides the baseline for evaluating the incremental socioeconomic effects from these actions. The following discussion focuses only on WGFP alternatives that may contribute to potential cumulative socioeconomic effects.

6.2. Water-Based Reasonably Foreseeable Actions

Implementation of the Moffat Collection System Project (MCSP) would result in additional water diversions out of the Fraser River basin resulting in lower streamflows in the Colorado River. Anticipated future population growth and increased water use in Grand and Summit counties would reduce the amount of water in the Colorado River. Other water developments also would affect the volume and or timing of water flows in the Colorado River.

6.2.1. Population, Employment, and Income

The MCSP does not involve construction of new West Slope infrastructure and would not directly affect population, employment, and income in Grand County. Population in Grand and Summit Counties is expected to approximately double by 2030 resulting in additional employment and an increase in gross income to the region. Other foreseeable future water-based actions do not require new infrastructure. Construction of either Jasper East Reservoir or Rockwell/Mueller Creek Reservoir under Alternative 3, 4, or 5 would result primarily in short-term changes in population, employment, and income in Grand County during construction. No long-term cumulative socioeconomic effects to population, employment, and income would occur with implementation of alternatives with West Slope storage or for the Proposed Action and No Action alternatives, where all the construction activities are located on the East Slope.

Construction of MCSP water storage facilities on the East Slope would contribute additional short-term employment and income effects and add to the total economic output from implementation of any of the WGFP alternatives. Both projects would have positive short-term employment and income effects in the Denver Metro region since potential MCSP reservoirs include locations in Jefferson and Boulder counties.

6.2.2. Energy Production

The additional net energy production and estimated value compared to existing conditions for each of the alternatives is shown in Table 20. Energy production would be lower than under direct effects because less water Windy Gap water would be delivered to the East Slope. Likewise the additional pumping from Windy Gap Reservoir to Granby Reservoir and from Granby Reservoir to Grand Lake and the East Slope would be slightly

less than as described for direct effects because less water would be available for diversion with reasonably foreseeable actions in place.

Western's plan to rebuild the transmission line from the Granby Pumping Plant to the Windy Gap Substation would improve the reliability and quality of electric service to the region. The existing transmission line and associated infrastructure currently serving the Windy Gap pumping plant is adequate to meet current and future needs if the WGFP is implemented. The rebuilt transmission line could improve reliability for Windy Gap pumping, but is not necessary for continued operation of the existing pumps. The Municipal Subdistrict would pay a portion of the costs associated with the line upgrade per existing agreements with Western and Reclamation. Implementation of the WGFP would not result in additional costs to Grand County for transmission line improvements.

Table 21. Net increase in energy generation and production value over existing conditions—cumulative effects.

Alternative	Energy Generation (GWH)	Production Value
No Action	15.16	$850,000
Proposed Action	21.42	$1,201,000
Alternative 3	20.94	$1,174,100
Alternative 4	20.99	$1,176,900
Alternative 5	24.69	$1,384,400

6.2.3. Agricultural and Residential Land Uses

The exercise of water rights by Denver Water for the MCSP, Grand and Summit County water providers, and those for the WGFP are subject to the State's priority system for allocation of water rights. The MCSP water rights are subject to any senior agricultural water rights in the Colorado River basin and thus the exercise of these rights would have no cumulative effect to existing agricultural production or farm income in Grand County. The expiration of the Big Lake Ditch contract in 2013 would reduce irrigated agriculture in the Reeder Creek drainage. The loss of irrigated lands with construction of Jasper East Reservoir in Alternative 3 along with the reduction in irrigated land in the Reeder Creek drainage would result in a cumulative impact to agriculture in Grand County.

6.2.4. Recreation

Reasonably foreseeable water-based actions in addition to diversions for the WGFP would reduce or change flows in the Colorado River. All of the alternatives would result in similar effects to recreation on the Colorado River and at Grand Lake, Shadow Mountain Reservoir, and Granby Reservoir from changes in hydrologic conditions and water quality. Alternatives would have similar effects to Carter Lake and Horsetooth Reservoir on the East Slope. Potential effects to the recreation economy include changes in recreational boating, fishing opportunities, and other related land-based activities such as camping and sightseeing. The potential effects to boating and angling on the Colorado River are

evaluated in the Recreation Resources Technical Report (ERO 2008a). Potential economic effects associated with different recreation sectors are discussed below.

6.2.4.1. Colorado River Rafting and Kayaking

Potential effects to rafting and kayaking were evaluated for three sections of the Colorado River: Byers Canyon downstream of Hot Sulphur Springs; Big Gore Canyon, which is an advanced white water reach of the river; and at Pumphouse downstream of Big Gore Canyon, which provides more intermediate levels of boating.

Byers Canyon. Daily flow data indicate that there would be no change in the number of days that flow exceeds 400 cfs for any of the alternatives in 22 of the 47-year study period. In the 15 years when there would be a change in flow, there would be an average decrease of 11 days when preferred flows of greater than 400 cfs occur under the No Action alternative and about 12 fewer days for the Proposed Action (Table 22). The greatest decrease in the number of days with preferred flows for kayaking in a single year would be 56 days under all of the alternatives. Up to 1 additional day with preferred flows would occur in some years 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 and Pumphouse.

Assuming the maximum loss of 56 boating days would eliminate all kayaking activity in the year with the lowest flow, this would represent a loss of about 15 user days (based on the existing level of use) with a per unit day value of about $73 or about $1,095. The loss would be similar for all alternatives.

Table 22. 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		
No Action	768	-11.0	-56 to 0[2]
Proposed Action	725	-11.6	-56 to +1
Alts 3 to 5	703	-12.7	-56 to +1

[1] There would be no change in the number of days when preferred flows for kayaking exceed 400 cfs between EC and any of the alternatives in 22 of the 47 years.
[2] There would be no increase in flows during any of the years when flow changes occur.

Big Gore Canyon. There would be no change from existing conditions in preferred rafting flow days in Big Gore Canyon in 13 years of the 47-year study period under all 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 23). Under the Proposed Action, preferred rafting flows would occur about 60 days less than existing conditions over the 47 years. On average, this would be about 2 days fewer per year with preferred rafting flows during the 34 years when flows fall outside of the preferred range. The greatest decrease in preferred flows for rafting 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. The No Action alternative would increase the number of days with preferred flows for rafting up 17 days in a single year and the action alternatives up to 22 days.

Table 23. 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 flows are 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		
No Action	808	-1.2	-23 to +17
Proposed Action	792	-1.7	-31 to +22
Alt 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.

The economic effects analysis assumed that the reduction of flow days between 850 and 1,250 cfs applies to both rafting and kayaking in Big Gore Canyon. Daily boating in August through Big Gore Canyon would average 39 visitors per day based on 1,200 boaters annually. The economic effect from the loss of about 2 boating days on average per year during 34 years of the 47-year study period, under each of the alternatives, would be about 78 visitor days (39 visitors per day x 2 days) with an annual value of about $5,694. A maximum loss of 23 boating days in a single year under the No Action alternative would result in a loss of 897 visitor days with a value of $65,481. Under the Proposed Action and other alternatives, a maximum loss of 31 days would result the loss of all 1,200 boating visitors with an impact of $87,600. If flow levels are insufficient to support the Big Gore Race in late August, there would be additional direct and secondary economic effects associated with impacts to this event. The WGFP under all of the alternatives would rarely divert water in late August except in wet years and, therefore, would have minimal effect on the Gore Race. Beneficial effects from the additional days within the preferred flow range in some years would range from 663 additional visitor days

with a value of $48,399 for the No Action alternative to 858 additional visitor days under the other alternatives with a value of $62,634.

Pumphouse. A change in the number of days of preferred kayaking flows between 1,100 and 2,200 cfs in Pumphouse to State Bridge also was evaluated based on daily data for the period from June to August (Table 24). There would be no change in the number of days in this flow range in 7 years of the 47-year study period under all the alternatives. 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 fewer days per year of preferred kayaking flows during the 40 years where flow changes affect kayaking. The greatest loss in preferred flows for kayaking in a single year would be 56 days under all of the alternatives. An increase of up to 31 days within the preferred flow range for kayaking would occur under the No Action alternative and the Proposed Action. The reduced flows from implementation of reasonably foreseeable actions, including an estimated future decrease in Blue River flows, would have the greatest impact on Colorado River flows. Analysis of daily streamflow data indicates that there would be no change in acceptable flows for kayaking between 400 and 2,200 cfs in 43 out of the 47-year study period; therefore, the actual loss of visitor days would likely be less, although the quality of the experience could be reduced for some users (ERO 2008a).

The net economic effect from an average reduction in 5 days per year with preferred flows for kayaking, which occurs in 40 out of 47 years in the study period, would be a loss of about 1,125 visitor days (225 visitors per day x 5 days) with an annual value of about $82,125. A maximum decrease of 56 days with preferred kayaking flows in a single year under all of the alternatives would result in a loss of 12,600 visitor days with a value of $919,800. Beneficial effects from up to 31 additional days with preferred flows in some years for the No Action and Proposed Action alternatives would provide 6,975 additional visitor days with a value of $509,175.

Table 24. 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 are 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		
No Action	844	-4.3	-56 to +31
Proposed Action	827	-4.5	-56 to +31
Alt 5	834	-4.5	-56 to +29

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

There would be no change from existing conditions in the number of days when the preferred rafting flows in the Pumphouse reach are between 2,000 and 3,000 cfs in 21 years out of the 47-year study period under the alternatives (Table 25). Over the 47-year period, there would be 206 fewer days of preferred rafting 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 fewer days in the preferred rafting flow range. The greatest decrease in rafting days in a single year would be 15 days under the No Action alternative and 14 days for the action alternatives. The greatest increase in the number of days in the preferred flow range for rafting in a year would be 31 days under the No Action and Proposed Action alternatives. Analysis of daily data indicates there would be a net increase in the number of days when rafting flows are between 400 and 3,000 cfs compared to existing conditions under all of the alternatives; therefore, the actual loss of visitor days would likely be less (ERO 2008a). However, the quality of the boating experience may decrease when flows drop below 2,000 cfs.

The net economic effect from the loss of about 9 rafting days on average per year in the 26 years out of 47 years when flow changes occur would be a loss of about 2,025 visitor days with an annual value of about $147,825. A maximum decrease of 15 days within the preferred flow range for rafting in a single year under the No Action alternative would result in a loss of 3,375 visitor days with a value of $246,375. A maximum decrease of 14 days within the preferred flow range for rafting under the action alternatives would result in the loss of 3,150 user days with a value of $229,950. Beneficial effects from up to 31 additional days within the preferred flow range for rafting days for the No Action and the Proposed Action alternatives would provide 6,975 additional visitor days with a value of $509,175. A gain of up to 27 days with preferred rafting flows would provide a recreational value of $443,475 for Alternatives 3, 4, and 5.

Table 25. 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 are 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		
No Action	235	-8.8	-15 to +31
Proposed Action	251	-9.0	-14 to +31
Alts 3 to 5	232	-8.3	-14 to +27

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

Comparison of Alternatives. To provide a common basis for comparing the economic effects to boating on the Colorado River, the change in the number of boating days over the 47-year study period was used to annualize gains or losses in boating recreational values. The average cost per year for reduced boating opportunities in Byers Canyon would be $416 for each of the alternatives (Table 26). A reduction in the number of rafting and kayaking days in Big Gore Canyon would result in an average annual loss in recreation value ranging from $2,423 for the No Action alternative to $3,756 for Alternatives 3, 4, and 5. In the Pumphouse reach, all of the alternatives would result in a decrease in average annual recreation value for kayaking and rafting of about $70,000. As previously stated, this analysis assumes a complete loss of boating days when flows fall outside of preferred ranges; however, the range of acceptable boating flows would be similar to existing conditions; therefore, the actual economic effects would likely be less.

Table 26. Annualized cost or benefit to recreational boating on the Colorado River by alternative.

Alternative	Byers Canyon (Kayaking)	Big Gore Canyon (Rafting and Kayaking)	Pumphouse	
			Kayaking	Rafting
No Action	-$416	-$2,423	-$66,399	-$71,990
Proposed Action	-$416	-$3,392	-$72,340	-$66,399
Alts 3 to 5	-$416	-$3,756	-$69,894	-$73,039

Camping and Sightseeing. It is possible that camping, sightseeing, and other recreation use in the Pumphouse and Radium areas would also change as a result of changes in streamflow. Assuming that nonboating recreation changes in a pattern similar to that of rafting, then an average decrease of 9 days of rafting would result in the loss of about 90 nonboating visitor days with an economic value of about $3,330. This loss would occur in about 21 years of the 47-year study period. A maximum annual loss of nonboating recreation from 15 fewer rafting days under the No Action alternative would be $5,550. The camping value of the loss of 14 days for other alternatives would be $5,180. The estimated increase in nonboating recreation would range from an additional 270 visitor days under Alternatives 3, 4, and 5, to 310 visitor days under the No Action and the Proposed Action alternatives. The recreational value of these additional camping days would range from $9,990 to $11,470.

6.2.4.2. Colorado River Angling

Angling opportunities along the Colorado River are an important component of the local economy. Fishing occurs on BLM lands, State Wildlife Areas, and private lands and resorts. When reasonably foreseeable water-based actions are in place, WGFP diversions would decrease, although Colorado River flows would be lower. Projected changes in streamflow on the Colorado River below Granby Reservoir in the future under all of the alternatives would result in a loss of fish habitat (Miller 2008). An increase in water temperature also would occur under some conditions below Windy Gap Reservoir. The anticipated reduced flows, which are greatest during the high runoff period, are not expected to adversely impact fish populations or fishing opportunities. High stream

flushing flows sufficient for channel and fish habitat maintenance and sediment transport would still occur (ERO and Boyle 2007). No Windy Gap diversions would occur when flows reach minimum streamflow requirements under all of the alternatives. Projected effects to fish habitat are not predicted to translate to a loss in angling opportunities or fishing success. Lower flows in some months could diminish the aesthetic value of the river for some visitors and possibly affect the quality of the recreation experience. No measurable effect to angler user days on the Colorado River or associated economic effects were identified for any of the alternatives.

6.2.4.3. Three Lakes Recreation

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) indicates minor changes to water quality in the Three Lakes. Reduced water clarity and algal growth in Grand Lake and Shadow Mountain Reservoir has been an issue of 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. It is unknown whether the water clarity issues would translate to a loss in visitors and associated economic effects.

Average monthly Granby Reservoir water surface area would be lower under all of the alternatives during the summer months. The decrease in boatable surface area would be less than 3 percent under the No Action alternative, less than 7 percent for the Proposed Action, and less than 4 percent for the other alternatives. This amount of change is unlikely to measurably affect recreation activity in a reservoir of this size. Additional exposed shoreline at lower water levels could reduce the aesthetic value and affect the quality of the visitor experience. 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 at Granby Reservoir, displacement of visitors might occur. Recreational experiences may change to the extent that lower water levels affect the aesthetic quality of the experience. Displaced visitors would likely go to nearby Shadow Mountain Reservoir or Grand Lake. During a sequence of dry years, access to boat ramps would be reduced under all of the alternatives, which may reduce the number of visitors and quality of the recreational experience at Granby Reservoir. Camping, hiking, and shoreline activities could decrease during periods of low water levels, when boat ramp access declines, or from a decrease in aesthetic value. 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 or weather (Orr 2008). There is insufficient information to determine if lower Granby Reservoir water levels would directly affect visitor use.

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 would not likely affect the fish communities in the Three Lakes. Thus, there would be no effect to recreational fishing opportunities at the Three Lakes for any of the alternatives.

6.2.4.4. Carter Lake and Horsetooth Reservoir Recreation

The small projected changes in Carter Lake water surface area (an average monthly decrease of less than 5 acres) under all of the alternatives is unlikely to adversely affect visitor numbers or recreation activities. Larger reductions 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. No measurable economic impact to local economies is likely from the small predicted changes in reservoir storage.

Projected changes in Horsetooth Reservoir 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 (up to 72 acres on average), 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 recreation 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. An unquantified decrease in recreation value is possible during periods when Horsetooth Reservoir water levels are low.

6.2.5. Community Services

There would be no direct need for increased police, fire, medical, educational, or other community resources in Grand County associated with reasonably foreseeable water based actions. Demand for these services is expected to increase in the future as Grand and Summit County population increases. The short-term limited need for these services associated with construction of Jasper East or Rockwell/Mueller Creek Reservoirs under Alternative 3, 4, or 5 would not substantially add to the cumulative need for these services over the long term.

6.3. Land-Based Reasonably Foreseeable Actions

Potential future land-based developments that are reasonably foreseeable within about 5 miles of the alternative reservoir sites were identified to evaluate cumulative socioeconomic effects. These primarily include new residential and commercial developments, but also include future open space management of lands adjacent to Chimney Hollow Reservoir for the Proposed Action. In addition, a general trend in population growth and development in the northern Front Range counties where WGFP Participants are located is expected.

6.3.1. Population, Employment, and Income

Planned future residential, commercial, or other developments within five miles of each of the alternative new reservoir sites includes about 1,440 acres near Chimney Hollow, 1,460 acres near Dry Creek, 2,570 acres near Jasper East, and 4,770 acres near

Rockwell/Mueller. No reasonably foreseeable developments were identified near Ralph Price Reservoir. New residential developments would result in an increased population near the new reservoir sites, along with temporary increases in employment and income during home and business construction. Commercial developments would result in a long-term increase in employment and income. The relatively short-term economic effects associated with construction of any of the alternative reservoirs in addition to the effects associated with new land developments would have minimal cumulative effects to population, employment, and income in the counties where alternatives are located.

The planned future development of open space facilities by Larimer County adjacent to Chimney Hollow Reservoir would provide employment during construction of recreation facilities and long-term employment for Larimer County Parks and Open Lands staff. Construction of Chimney Hollow Reservoir for Alternatives 2, 3, and 4 would add incremental employment needs during construction and possibly for Larimer County Park staff because of the expanded recreation facilities if the reservoir is built.

Like many other East Slope Colorado counties where WGFP Participants are located, Boulder, Broomfield, Larimer, and Weld counties have experienced significant population growth during the last decade. The populations of these counties are expected to continue to grow through 2030 with or without construction of any one of the alternatives. Implementation of any of the WGFP alternatives would allow Participants to meet anticipated water needs that support local economies.

6.3.2. Agricultural and Residential Land Uses

The extent of reasonably foreseeable future land developments that would affect existing agricultural activities is not known. The majority of the lands slated for new development near the Chimney Hollow and Dry Creek reservoir sites are undeveloped and could include properties used for livestock grazing or other agricultural activities. Only the Dry Creek Reservoir site in Alternative 5, which supports a llama ranching operation, would affect agricultural production on the East Slope. The cumulative loss of agricultural income from the llama ranch plus potential loss from development of agricultural lands for new developments would have minimal effect to Larimer County agricultural production and incomes.

Construction of Jasper East Reservoir would result in loss of hay production and grazing lands. Planned future development of the C-Lazy-U Preserve near Jasper East Reservoir could also affect irrigated pastureland and grazing operations. Rockwell/Mueller Creek Reservoir would result in a loss of grazing land. Reasonably foreseeable land developments near Rockwell/Mueller Reservoir include partially developed land, although small areas of livestock grazing could occur seasonally on some lands. The incremental cumulative loss in agricultural land production and farm income in Grand County associated with construction of Rockwell/Mueller Creek Reservoir under Alternatives 4 and 5 or Jasper East Reservoir in Alternative 2, would be a minor component of countywide farm income.

At the regional level, future urban and residential development in Grand, Larimer, and Boulder counties associated with population growth would likely contribute to the

continued reduction in agriculture land uses. The limited effects on agricultural output associated with any of the WGFP action alternatives would add to this cumulative effect, but would not substantially contribute to countywide trends in reduction of agricultural lands.

Reasonable foreseeable land developments within 5 miles of Chimney Hollow, Dry Creek, Jasper East, and Rockwell/Mueller Creek reservoir sites primarily include new residential developments. New homes built on these lands would result in a net cumulative increase in the number of residential properties, even with of the loss of three homes if the Dry Creek Reservoir site is built in Alternative 5 or if four homes are lost with construction of Rockwell/Mueller Reservoir in either Alternative 4 or 5.

6.3.3. Recreation

Planned future recreation development of Larimer County open space adjacent to Chimney Hollow Reservoir would result in a cumulative increase in recreation opportunities in Larimer County under Alternatives 2, 3, and 4. Open space lands would not directly generate revenue because there would be no entrance fee, but local business could benefit from recreation user expenditures.

6.3.4. Community Services

The need for increased levels of community services is possible with reasonably foreseeable land developments near new reservoir sites in addition to general anticipated countywide population growth. Following construction of any new reservoirs, there would be no long-term demand associated with WGFP facilities that would add substantially to the cumulative need for additional community services.

6.3.5. Power Supply

Western plans for rebuilding the transmission line between the Granby Pumping Plant and the Windy Gap Substation would increase power reliability and quality to electrical consumers in the region. The new line could improve reliability for Windy Gap pumping, but is not necessary for continued operation of the existing pumps. Implementation of the WGFP or Western's rebuild project would not result in additional costs to Grand County for transmission line improvements. Rebuilding the transmission line would result in short-term construction related spending in the Grand County area plus increased reliability for the residents of Grand County.

6.3.6. Water Supply and Demand

Future planned urban growth and development is already included in Participant water demand projections. While WGFP water would meet at least a portion of Participants' future water demands, Participants would continue to develop conservation measures and for some Participants they would seek additional water supplies.

6.3.7. WGFP Financing and Water Rates

Financing for the WGFP will not be affected by any past, present, or reasonably foreseeable land development. Future urban and residential development throughout the

Front Range will likely lead to increased operating and maintenance expenditures associated with water delivery and treatment, projected debt service, and capital improvements. Participants would likely account for these added costs through a variety of methods including possible changes to water rates or rate structures.

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