

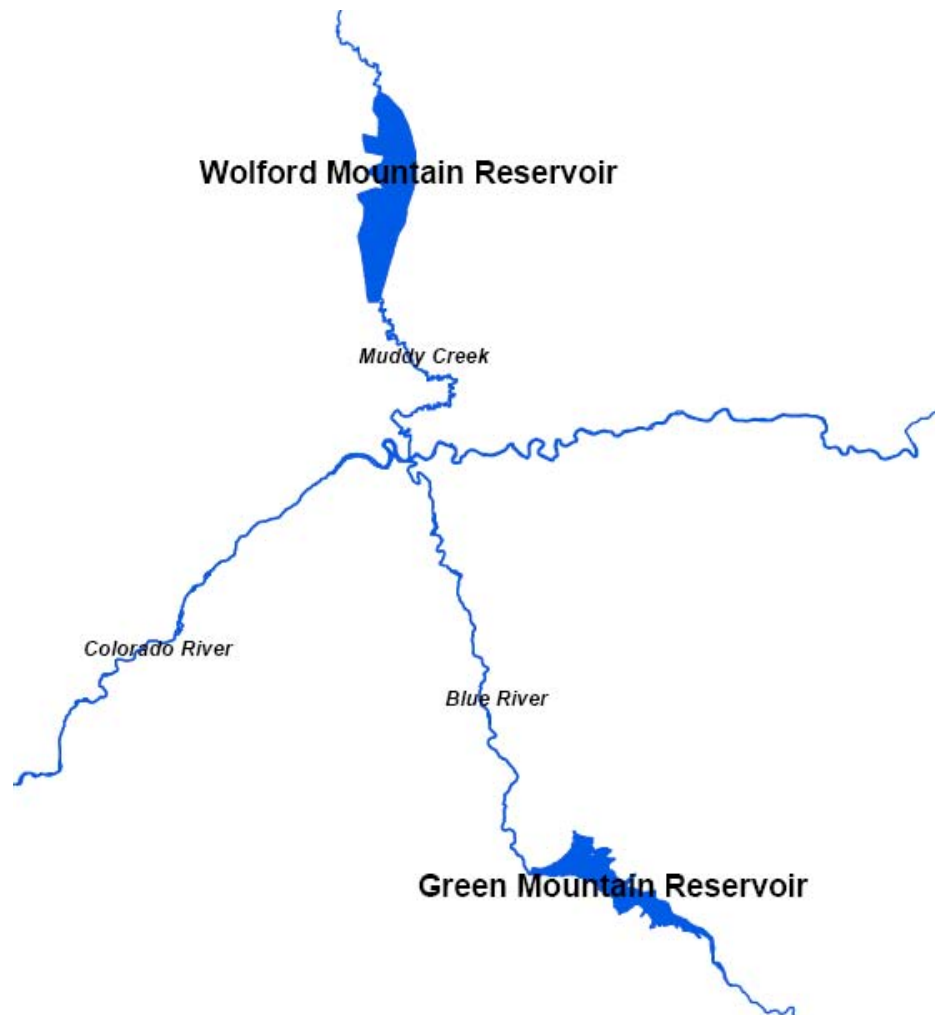
RECLAMATION

Managing Water in the West

EA No. EC-1300-07-04

Exhibit B – Agreement on Wolford Mountain Reservoir and Green Mountain Reservoir Exchanges

Environmental Assessment



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

October 2007

ACRONYMS AND DEFINITIONS

ac-ft	acre-feet
Agreement on Operating Procedures	Agreement on Operating Procedures for Green Mountain Reservoir Concerning Operating Limitation and in Resolution of the Petition Filed August 7, 2003 in Case No. 49-CV-2782
BLM	Bureau of Land Management
C-BT Project	Colorado-Big Thompson Project
cfs	cubic feet per second
contract	proposed contract to execute Exhibit B - Agreement on Wolford Mountain Reservoir / Green Mountain Reservoir Exchanges with the Colorado River Water Conservation District, Northern Colorado Water Conservancy District, and the State of Colorado.
CRWCD	Colorado River Water Conservation District
CWCB	Colorado Water Conservation Board
EA	Environmental Assessment
Exhibit B Agreement	Exhibit B - Agreement on Wolford Mountain Reservoir / Green Mountain Reservoir Exchanges
FSFES	Final Supplement to the Final Environmental Statement Green Mountain Reservoir, Colorado Water Marketing Program
Heeney Slide	landslide with land slippage of about 1 inch per year in the vicinity of the community of Heeney, Colorado, on the shore of Green Mountain Reservoir
NCWCD	Northern Colorado Water Conservancy District
NEPA	National Environmental Policy Act
Operating Policy	Operating Policy for Green Mountain Reservoir; Colorado-Big Thompson Project, Colorado
Reclamation	Bureau of Reclamation
USFS	United States Forest Service
Wolford Mountain	Wolford Mountain Reservoir

Front cover graphics: Close-up of reservoirs and downstream rivers of interest.

TABLE OF CONTENTS

CHAPTER ONE – PURPOSE OF AND NEED FOR ACTION	1
INTRODUCTION	1
PURPOSE AND NEED	1
BACKGROUND	1
<i>Colorado Big-Thompson Project and Green Mountain Reservoir.....</i>	<i>1</i>
<i>Colorado River Water Conservation District and Wolford Mountain Reservoir.....</i>	<i>1</i>
<i>Figure 1.1 – Area Map.....</i>	<i>2</i>
<i>Northern Colorado Water Conservancy District</i>	<i>3</i>
ISSUES AND IMPACT TOPICS	3
<i>Issues and Impact Topics Included for Further Evaluation.....</i>	<i>3</i>
<i>Issues and Impact Topics Considered but Excluded from Further Evaluation.....</i>	<i>3</i>
AREA OF POTENTIAL EFFECT	4
CHAPTER TWO – ALTERNATIVES.....	5
INTRODUCTION	5
NO ACTION ALTERNATIVE	5
PROPOSED ACTION ALTERNATIVE.....	5
<i>Banking Exchange.....</i>	<i>5</i>
<i>Figure 2.1 – Banking Exchange.....</i>	<i>6</i>
<i>Borrowing Exchange.....</i>	<i>7</i>
<i>Figure 2.2 – Borrowing Exchange.....</i>	<i>7</i>
CHAPTER THREE – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES	9
INTRODUCTION AND METHODOLOGY	9
<i>Impact Thresholds.....</i>	<i>9</i>
RESERVOIR OPERATIONS AND HYDROLOGY	10
<i>Affected Environment.....</i>	<i>10</i>
<i>Table 3.1 – Existing Operating Limitations Related to the Heeney Slide</i>	<i>10</i>
<i>Table 3.2 – Wolford Mountain Market CRWCD Water Contract Demands – Colorado River Supply as of May 2007..</i>	<i>12</i>
<i>Environmental Consequences</i>	<i>12</i>
<i>Table 3.3 – Banking Exchange End-of Month.....</i>	<i>13</i>
<i>Green Mountain Storage Levels (ac-ft).....</i>	<i>13</i>
<i>Table 3.4 – Unneeded Banking Exchange.....</i>	<i>13</i>
<i>End-of Month Green Mountain Storage.....</i>	<i>13</i>
<i>Levels (ac-ft).....</i>	<i>13</i>
<i>Table 3.5 – Quick Borrowing Exchange End-of Month Green Mountain Storage Levels (ac-ft)</i>	<i>14</i>
<i>Table 3.6 – Slow Borrowing Exchange End-of Month Green Mountain Storage Levels (ac-ft)</i>	<i>14</i>
<i>Table 3.7 – Banking Exchange End-of-Month Wolford Mountain Storage Levels (ac-ft)</i>	<i>15</i>
<i>Table 3.8 – Unneeded Banking Exchange End-of-Month Wolford Mountain Storage Levels (ac-ft)</i>	<i>15</i>
<i>Table 3.9 – Quick Borrowing Exchange End-of Month Wolford Mountain Storage Levels (ac-ft)</i>	<i>15</i>
<i>Table 3.10 – Slow Borrowing Exchange End-of Month Wolford Mountain Storage Levels (ac-ft)</i>	<i>15</i>
<i>Table 3.11 – Banking Exchange Average Blue River Flows (cfs).....</i>	<i>16</i>
<i>Table 3.12 – Unneeded Banking Exchange Average Blue River Flows (cfs).....</i>	<i>16</i>
<i>Table 3.13 – Quick Borrowing Exchange Average Blue River Flows (cfs).....</i>	<i>16</i>
<i>Table 3.14 – Slow Borrowing Exchange Average Blue River Flows (cfs)</i>	<i>16</i>
<i>Table 3.15 – Banking Exchange Average Muddy Creek Flows (cfs)</i>	<i>17</i>
<i>Table 3.16 – Unneeded Banking Exchange Average Muddy Creek Flows (cfs)</i>	<i>17</i>
<i>Table 3.17 – Quick Borrowing Exchange Average Muddy Creek Flows (cfs).....</i>	<i>17</i>
<i>Table 3.18 – Slow Borrowing Exchange Average Muddy Creek Flows (cfs).....</i>	<i>17</i>
AQUATIC RESOURCES.....	18
<i>Affected Environment.....</i>	<i>18</i>
<i>Environmental Consequences</i>	<i>18</i>
RECREATION	21
<i>Affected Environment.....</i>	<i>21</i>

<i>Environmental Consequences</i>	22
SOCIOECONOMICS	24
<i>Affected Environment</i>	24
<i>Environmental Consequences</i>	24
HYDROELECTRIC POWER PRODUCTION	25
<i>Affected Environment</i>	25
<i>Environmental Consequences</i>	25
CHAPTER FOUR – CONSULTATION AND COORDINATION	26
SCOPING PROCESS	26
TABLE 4.1 – LIST OF RECLAMATION PREPARERS.....	26
REFERENCES	27
APPENDIX A – HYDROLOGIC ANALYSIS SUMMARY	29
APPENDIX B – EXHIBIT B AGREEMENT	30

CHAPTER ONE – PURPOSE OF AND NEED FOR ACTION

INTRODUCTION

The Bureau of Reclamation (Reclamation) is proposing to enter into a contract with the Colorado River Water Conservation District (CRWCD) and Northern Colorado Water Conservancy District (NCWCD). The proposed contract would execute Exhibit B - Agreement on Wolford Mountain Reservoir / Green Mountain Reservoir Exchanges (Exhibit B Agreement), which was signed by all parties in late 2005. The Exhibit B Agreement is part of the Agreement on Operating Procedures for Green Mountain Reservoir Concerning Operating Limitation and in Resolution of the Petition Filed August 7, 2003 in Case No. 49-CV-2782 (Agreement on Operating Procedures). The term of the proposed contract would be for up to 40 years, but upon termination of the Agreement on Operating Procedures, the Exhibit B Agreement would also terminate.

This Environmental Assessment (EA) was prepared by Reclamation in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508), and Reclamation's NEPA Handbook (USDI 2000). It is not a decision document, but rather it is a disclosure of the environmental consequences of the No Action and Proposed Action Alternatives.

PURPOSE AND NEED

The Exhibit B Agreement was created to avoid shortages and/or to mitigate any existing shortage caused by an operating limitation at Green Mountain Reservoir (Green Mountain) by using available storage space and stored water at Wolford Mountain Reservoir (Wolford Mountain). This avoidance and/or mitigation would increase the reliability of water delivery

to the beneficiaries in the service areas of both CRWCD and NCWCD. See Figure 1.1 for the location of Green Mountain, Wolford Mountain, and the service areas of CRWCD and NCWCD. An operating limitation could result in a decreased rate of water release, required minimum or maximum elevation of the reservoir, a mandated reservoir evacuation, a limitation on the amount of inflow that could be stored, or any other constraint put in place by Reclamation that reduces the ability to make releases from Green Mountain.

BACKGROUND

Colorado Big-Thompson Project and Green Mountain Reservoir

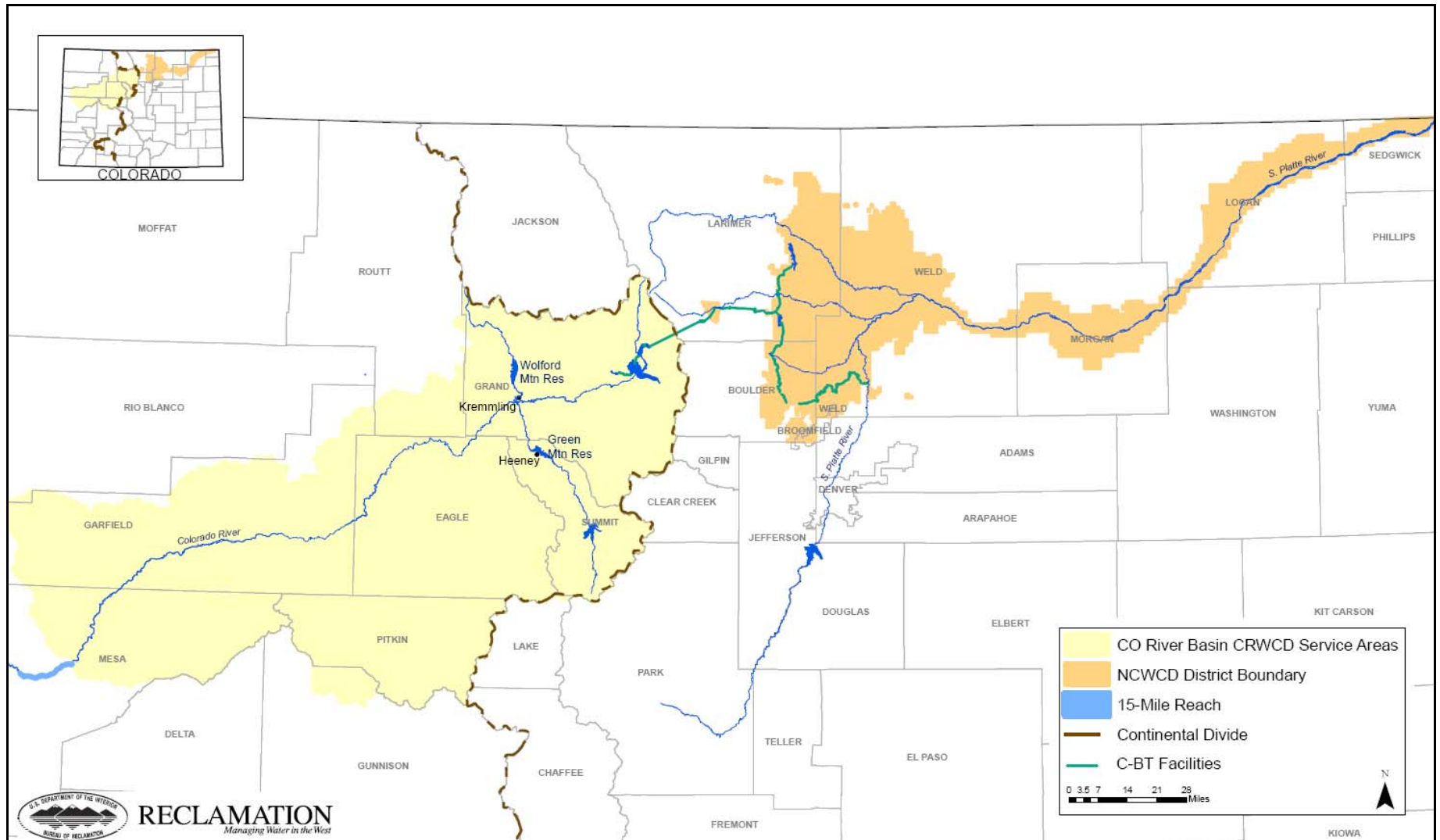
Reclamation operates the Colorado-Big Thompson (C-BT) Project, which is a multipurpose transmountain diversion that collects runoff water originating at the headwaters of the Colorado River Basin on the western slope of the Rocky Mountains to deliver water to the eastern slope. The C-BT Project was designed to collect up to an average of 310,000 ac-ft of water annually, primarily from snowmelt from the upper reaches of the Colorado River Basin west of the Continental Divide. The average annual diversion to date has been approximately 220,000 ac-ft per year.

Green Mountain Reservoir, located 13 miles southeast of Kremmling, Colorado, on the Blue River, is part of the C-BT west slope storage system. It provides water for replacement storage for out-of-priority depletion by the C-BT Project and for use by beneficiaries on the west slope.

Colorado River Water Conservation District and Wolford Mountain Reservoir

CRWCD is a political subdivision of the State of Colorado. It was established by the State

Figure 1.1 – Area Map



Legislature in 1937 under Colorado's Water Conservancy Act to protect, conserve and put to beneficial use the water resources of the Colorado River and its principal tributaries including the Yampa, White, and Gunnison Rivers. A water-marketing plan has been developed by CRWCD through its Colorado River Water Projects Enterprise that allows third parties to contract for use of water directly, or by exchange or augmentation.

CRWCD owns and operates Wolford Mountain, located 5 miles above the confluence with the Colorado River northwest of the town of Kremmling. Funds for the construction of Wolford Mountain were provided in part as basin of origin compensation for the construction and operation by the NCWCD of the Windy Gap Project.

Northern Colorado Water Conservancy District

NCWCD is a public agency that was also created in 1937 under Colorado's Water Conservancy Act. Its original purpose was to contract with the United States to repay Reclamation's construction of the C-BT Project. An estimated 750,000 people live in and nearly 1.6 million acres are contained by the boundaries of NCWCD. NCWCD determines the method of distribution of water to end users and makes water available for delivery from the C-BT Project. The C-BT Project relies upon releases from the 52,000 ac-ft Replacement Pool of Green Mountain to provide replacement water for C-BT diversions to the eastern slope which would otherwise be curtailed by a legal call in the Colorado River basin.

ISSUES AND IMPACT TOPICS

During the consideration of the proposed contract, Reclamation conducted internal and agency scoping, as discussed in Chapter Four – Consultation and Coordination, to determine the issues relevant to the proposed contract. Below is a summary of the issues Reclamation

identified to be included for further evaluation in Chapter Three – Affected Environment and Environmental Consequences, and those considered but excluded from further evaluation along with a brief explanation.

Issues and Impact Topics Included for Further Evaluation

Reservoir Operations and Hydrology

- Impacts to Green Mountain and Wolford Mountain hydrology and operations.
- Impacts to the Blue River and Muddy Creek downstream of the reservoirs.

Aquatic Resources

- Impacts to sport fish, their habitat, and their food sources in Green Mountain, Wolford Mountain, the Blue River, and Muddy Creek.

Recreation

- Impacts to fishery and other forms of recreation at Green Mountain and Wolford Mountain, the Blue River, and Muddy Creek.

Socioeconomics

- Effects upon tourism, local businesses, and employment.

Hydroelectric Production

- Impacts to Green Mountain Powerplant.

Issues and Impact Topics Considered but Excluded from Further Evaluation

Threatened and Endangered Species

Since with either alternative there would be no construction activities, the water stored would not exceed the existing high and low pool levels originally established for and seen at the reservoirs, and the water released would still be within the range of normal flows in the downstream rivers, no impacts are anticipated to any threatened or endangered species. Specifically with respect to the four endangered fish of the Colorado River Basin - pikeminnow

(*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypa*), and bonytailed chub (*Gila elegans*) - no further consideration is needed because there are no changes to the flows of the critical habitat of the fish expected with either alternative.

Floodplains, Wetlands, Water Quality, River Physical Properties, Vegetation, Farmland and Soil

Again, since with either alternative there would be no construction activities, the water stored would not exceed the existing high and low pool levels originally established for and seen at the reservoirs, and the water released would still be within the range of historic flows in the downstream rivers, no impacts are anticipated to these resources.

Cultural Resources

A Programmatic Agreement (PA) was entered into by Reclamation and the State Historic Preservation Office (SHPO) regarding reservoir operations and storage issues on January 23, 2007. The PA allows for implementation of contracts related to changes in operational strategies without further consultation when the expected changes will not exceed the existing high and low pool levels originally established for a reservoir. Therefore, because the changes are not expected to cause elevations to exceed high and low pool levels for either alternative, no further SHPO consultation is necessary.

Indian Trust Resources

Indian trust assets are legal interests in property held in trust by the United States for Indian tribes or individuals. The United States has a responsibility to protect and maintain rights reserved by or granted to Indian tribes or Indian individuals by treaties, statutes, and Executive

Orders, which are sometimes further interpreted through court decisions and regulations. This trust responsibility requires Reclamation to take all actions reasonable and necessary to protect trust assets. No Indian-owned lands, federally-recognized Indian reservation, or ceded lands have been identified within the study area where traditional use rights are retained by a federally-recognized Indian tribe; therefore, no Indian trust assets would be affected by implementation of either alternative.

Environmental Justice

As required by Executive Order 12898, *General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” The issuance of the proposed contract would not adversely effect these populations since residents within and surrounding the area of potential effect are not disproportionately minority or low-income.

AREA OF POTENTIAL EFFECT

The area of potential effect upon which the analysis has been completed primarily focuses on Green Mountain and Wolford Mountain Reservoirs, Blue River and Muddy Creek below those reservoirs; and for the case of socioeconomic resources on the CRWCD Service Area in the Colorado River Basin (see Figure 1.1).

CHAPTER TWO – ALTERNATIVES

INTRODUCTION

This Chapter describes the No Action and Proposed Action Alternatives. The No Action Alternative represents the conditions that would occur if the Exhibit B Agreement were not implemented. In order to represent the greatest feasible difference between the alternatives it should be noted that all the methods except the Exhibit B Agreement outlined in the Agreement on Operating Procedures used to deal with an operating limitation could be utilized with either alternative (see Resource Operations and Hydrology Affected Environment section of Chapter Three).

Details of the Proposed Action Alternative are in large part dictated by Exhibit B; however, the discretionary components are also explained. An analysis of the historic Green Mountain hydrology provided guidance for many details and assumptions in the Proposed Action Alternative. Refer to Appendix A for more detail on the analysis.

NO ACTION ALTERNATIVE

Under this alternative Reclamation would enter into up to a 40 year contract with CRWCD and NCWCD as required by the court settlement. The contract would allow Reclamation to implement the Exhibit B Agreement. However, as part of its discretion, Reclamation would choose not to utilize any components of the Exhibit B Agreement as described in the Proposed Action Alternative. In order to highlight the greatest difference between the alternatives, it will be assumed for the purposes of this analysis that operating limitations would be implemented in lieu of the use of the Exhibit B Agreement exchanges as described in the Proposed Alternative.

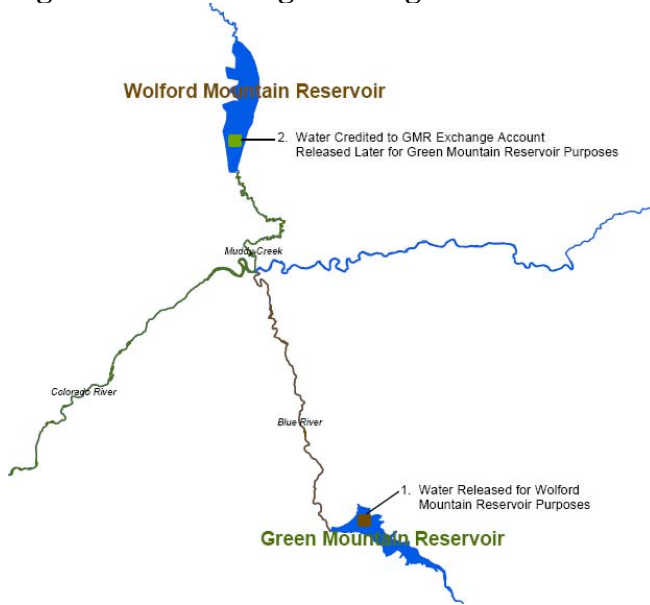
PROPOSED ACTION ALTERNATIVE

Under the Proposed Action Alternative, Reclamation would enter into the same contract as described in the No Action Alternative. However, with this alternative, as part of its discretion, Reclamation could choose to use both of the exchanges involved in the Exhibit B Agreement. The two different types of exchanges are the Banking Exchange and the Borrowing Exchange. The following is a basic description of the exchanges. Refer to the entire Exhibit B Agreement, which is included in Appendix B, for complete details.

Banking Exchange

The Banking Exchange would allow Reclamation, in anticipation of an operating limitation, to release water from Green Mountain that would be credited as a Wolford Mountain release. This release would be in exchange for crediting (banking) an equal amount of water in Wolford Mountain for later release for Green Mountain purposes. In order to determine if an exchange is desired, on or before July 31st of each year CRWCD would estimate the projected demand for releases from Wolford Mountain, and the amount of water accounted to storage at Green Mountain that could be exchanged into Wolford Mountain during the allowed banking period from August 1 through October 31. The amount of Green Mountain water released for Wolford Mountain purposes would be credited as Green Mountain water in a designated account in Wolford Mountain called the GMR Exchange Account, located within the CRWCD's capacity at Wolford Mountain. Figure 2.1 shows a basic visual depiction of the banking exchange concept.

Figure 2.1 – Banking Exchange



Due to the nature of the banking exchange procedure and the expected time periods in which shortages might occur due to the current operating limitation, the shortage must be anticipated months in advance. While the conditions that could cause potential shortages are expected to occur no more than two times over the 40 year life of the contract, it is possible that forecasts predicting the conditions that might give rise to a shortage could also occur an additional two times over the 40 year life of the contract.

The analysis of historic Green Mountain hydrology indicated that potential shortages are concentrated in two time periods. During the latter part of October the potential shortage could be as large as 5,000 ac-ft, while the potential shortage April just prior to the initiation of runoff is not expected to exceed 1,000 ac-ft. However, the Exhibit B Agreement limits the amount of water that can be banked to 5000 ac-ft in any one year. Therefore, for the purposes of this analysis it will be assumed that Reclamation would bank up to 5,000 ac-ft four years out of the total 40 year contract. The latter part of October and the month of April will be used as examples in the analysis; however, these months represent general time periods (fall and early spring) and exact dates may vary.

Release of water from the GMR Exchange Account would be at the direction of Reclamation carried out by CRWCD. Any exchange into and subsequent release of water from the GMR Exchange Account would be conducted in a manner that recognizes the physical limitations of Wolford Mountain's dam (Ritschard Dam). Additionally, the releases would be subject to CRWCD's existing contractual commitments and would not lower flows below Colorado Water Conservation Board's (CWCB) Instream Flows. Furthermore, Reclamation's request would not cause more than a 60 cfs (10% of bank full; Ewert 2007, CRWCD 2007) change in the flows of Muddy Creek in a 12 hour period, including other releases being made at that time in order to minimize impacts to the aquatic resources in and recreational users of that stream.

It will be assumed that the release of up to 5,000 ac-ft of water from Green Mountain for Wolford Mountain purposes would occur in commensurate proportion to current CRWCD water marketing demands (CRWCD 2007). As mitigation for impacts to aquatic resources and recreationalist safety this alternative would not cause more than a 260 cfs (10% of bank full) increase in flows of the Blue River in a 12 hour period.

Further, Reclamation would not request a banking exchange greater than 2,500 ac-ft for the portion of the operating limitation anticipated to occur in October unless the Division 5 Engineer for the Division of Water Resources agreed to allow Reclamation to utilize owed-to-the-river accounting for that October operating limitation. This accounting would allow the up to 5,000 ac-ft of water to be released from Wolford Mountain for Green Mountain purposes evenly over the entire month of October rather than at a higher rate during the last two weeks of October. If permission is not granted the impact of a 2,500 ac-ft release during the last two weeks of October would not exceed that of a 5,000 ac-ft released over the entire month. Regardless, the release of the

1,000 ac-ft of water during April would be spread over the entire month.

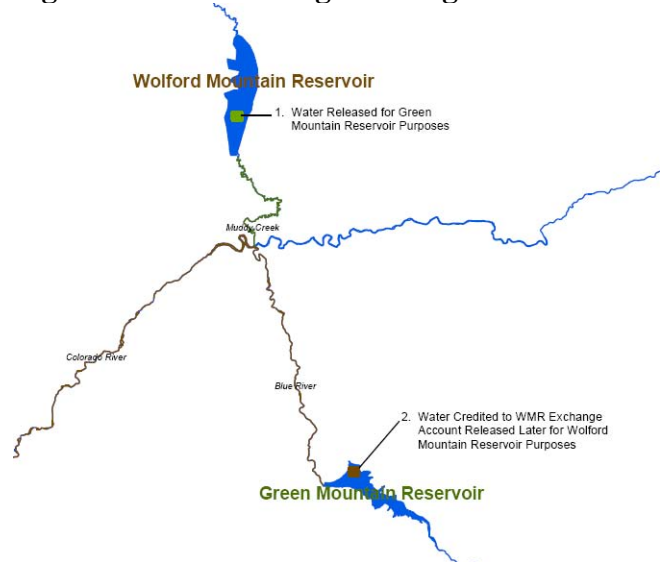
If it is determined that all or a portion of the banked water is not necessary to alleviate a shortage in any period banking was conducted, Reclamation would direct a release of the banked water as soon as practicable and prior to the anticipated fill of Wolford Mountain (typically the latter part of May) in order to reduce the risk of spilling that banked water. This scenario will be designated “unneeded banking exchange” throughout the document and for the purposes of this analysis it will be assumed that 5,000 ac-ft of the banked water would be released evenly from October through March. Reclamation’s request would not cause a drop in the Blue River below CWCB’s Instream Flows in order to minimize impacts to the aquatic resources in and recreational users of that stream.

Borrowing Exchange

The Borrowing Exchange would allow Reclamation to alleviate potential shortages due to an operating limitation when there is not sufficient water available in the GMR Exchange Account in Wolford Mountain. Such a scenario might occur when the potential shortages were not anticipated in time to initiate the banking exchange. The Borrowing Exchange, visually depicted in Figure 2.2, involves borrowing water in CRWCD’s account in Wolford Mountain to be released for Green Mountain purposes. This release would be in exchange for a later release of water from an account in Green Mountain for Wolford Mountain purposes. Wolford Mountain water released to avoid or mitigate Green Mountain operating limitation shortages would be exchanged on an instantaneous basis by crediting an equal amount in an account in Green Mountain called the WMR Exchange Account.

The borrowing exchange is limited to occasions when the March 1 content of Wolford Mountain exceeds 40,000 ac-ft and the March 1 snowpack above Wolford Mountain exceeds 120% of

Figure 2.2 – Borrowing Exchange



average. In the 11 years for which data is available (1997-2007) this condition has only occurred twice. Further, the exchange could only occur during the period of March 1 to the Green Mountain start-to-fill-date of the same calendar year, which is determined by the Secretary of the Interior and falls between April 1 and May 15.

An analysis was completed of the historic hydrology in conjunction with consideration of the previously mentioned constraints. The conclusion of that effort determined that for the purposes of this analysis and as part of Reclamation’s discretion, Reclamation could request up to 1000 ac-ft to be borrowed. The month of April will be used as an example in the analysis; however, this month represents a general time period (early spring) and exact dates may vary.

Unlike the banking exchange, the borrowing exchange does not require a forecast of low reservoir water surface elevations. In situations where the borrowing exchange can be utilized, the need for water to alleviate any shortage is immediately known. The analysis of historic hydrology indicated that shortages during the April time period are expected to occur in less than two years over the life of the 40-year contract. Therefore, this analysis will assume that over the 40 year life of the contract the

banking exchange could be utilized up to two of those years.

It will also be assumed that the up to 1,000 ac-ft of water released from Wolford Mountain for Green Mountain purposes would occur over the entire month of April. CRWCD would intend to release the water in the WMR Exchange Account from Green Mountain for Wolford Mountain purposes prior to November 1 of the same calendar year in which the Borrowing Exchange was conducted. There are two likely scenarios that will be analyzed. The first, which will be designated “quick borrowing exchange,” involves CRWCD requesting release of the

entire 1,000 ac-ft spread evenly over the month of May to go toward filling Wolford Mountain when it is out-of-priority. The second, designated “slow borrowing exchange,” involves CRWCD requesting release spread over the months of July through September at a rate proportional to current demands (CRWCD 2007).

Regardless, the releases would not cause the flows of the Blue River or Muddy Creek to drop below CWCB’s Instream Flows and would not cause more than a 10% of bank full change in the flows in a 12 hour period.

CHAPTER THREE – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION AND METHODOLOGY

This chapter describes the affected environment and discloses the environmental consequences associated with implementing the No Action and Proposed Action Alternatives as described in Chapter Two. Resources evaluated in this chapter include: reservoir operations and hydrology, aquatic resources, recreation, socioeconomics, and hydroelectric production. As described in the Issues and Impact Topics section of Chapter One, there are no impacts expected to threatened and endangered species, floodplains, wetlands, water quality, river physical properties, vegetation, soil, farmland, cultural resources, Indian trust assets, or environmental justice as a result of the issuance of the proposed contract. Therefore, impacts to these topics have been considered but eliminated from further evaluation.

The No Action Alternative represents a continuation of conditions that would occur without the implementation of the Exhibit B Agreement. It provides a baseline condition, which was used to evaluate the level of impact caused by the Proposed Action Alternative.

Impact Thresholds

Direct, indirect, and cumulative effects were analyzed for each impact topic and are described in terms of type, duration, and intensity with general definitions of each provided below.

Type - describes the classification of the impact as beneficial or adverse, and direct, indirect or cumulative.

Beneficial: positive change in the condition or appearance of the resource, or a change that moves the resource toward the desired condition.

Adverse: negative change that detracts from the resource's appearance or condition, or a change that moves the resource away from the desired condition.

Direct: effect caused by alternative and occurs in the same time and place.

Indirect: effect caused by alternative but is later in time or farther removed in distance, but is still reasonably foreseeable.

Cumulative: incremental effect caused by alternative when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts can result from individually minor, but collectively significant actions taking place over time.

Duration - describes the length of time an effect would occur as short- or long-term.

Short-term: lasting through and not more than one year after the year the exchange occurred.

Long-term: lasting beyond one year after the year in which the banking or borrowing exchange occurred.

Intensity - describes the degree, level, or strength of an impact as no impact, negligible, minor, moderate, or major.

No impact: no discernable effect.

Negligible: effect is at the lowest level of detection and causes very little or no disturbance.

Minor: effect that is slight, but detectable, with some perceptible effects of disturbance.

Moderate: effect is readily apparent and has measurable effects of disturbance.

Major: effect is readily apparent and has significant effects of disturbance.

RESERVOIR OPERATIONS AND HYDROLOGY

Affected Environment

Green Mountain

Green Mountain is part of the C-BT Project, is operated by Reclamation, and has a physical storage capacity of 153,639 ac-ft of water. Of that capacity, up to 52,000 ac-ft, designated as the replacement pool, may be released for western Colorado use to provide replacement water for C-BT Project diversions to the eastern slope which would otherwise be curtailed by a legal call on the river. The remaining capacity of 100,000 ac-ft, known as the power pool, is released under different guidelines and is made available to west slope users. Up to 5,000 ac-ft is made available to replace out-of-priority diversions of the Federal Silt (Colorado) Project. When irrigation and domestic needs of water rights perfected by use prior to October 16, 1977 are not met by release of the replacement pool, up to 66,000 ac-ft of the 100,000 ac-ft Power Pool is released. This amount is commonly known as the Historic Users Pool (HUP). Additionally, a 20,000 ac-ft marketable yield has been made available for contracting from the power pool (USBR 1937, USBR 1983).

Currently 9,636 ac-ft of the marketable yield is under contract. Many of the 82 contractors make diversions and/or depletions above Green Mountain. The corresponding releases are exchanged and released from Green Mountain to replace upstream or downstream depletions.

The general target date for Green Mountain fill is July 4. In order to maximize power generation for C-BT Project repayment, the goal is to accomplish the fill without spilling to the greatest extent possible.

A section of the eastern shore of the Green Mountain includes an ancient, slow moving landslide with land slippage of about 1 inch per year. Portions of the community of Heeney (see Figure 1.1) have been built within the slide

areas. In the 1960s there was significant land movement of the Heeney Slide. This was around the same time of a rapid draw down of the reservoir for maintenance. In the mid-1980s Reclamation began collecting data to determine if there was a link between the Heeney Slide and reservoir operations. While investigating this possibility, Reclamation imposed operating limitations on the operation of the reservoir. The current limitations are shown in Table 3.1 (note they are not the same as those that precipitated the law suit described below). There is no minimum water surface elevation, except for the Dead Pool at elevation 7,800ft (6,860 ac-ft).

Table 3.1 – Existing Operating Limitations Related to the Heeney Slide

Reservoir Level		Rate of Drawdown	
Elevation Ft	Ac-Ft	Ft/Day	Cfs
7,880-7,870	49,508-40,845	≤1.5	≤690-620
7,870-7,865	40,945-36,957	≤1	≤405-380
<7,865	<36,957	≤0.5	≤187

In 2002, Colorado was faced with the worst drought on record. In anticipation of not being able to deliver water in full to all beneficiaries, Reclamation advised beneficiaries on how they would allocate the water that could be delivered. Through a variety of methods Reclamation was able to make full deliveries for the Silt Project and the HUP beneficiaries. Deliveries were made to the Green Mountain contractors to meet their critical needs. However, in 2003 the CRWCD and several other west slope beneficiaries filed a suit to contest how Reclamation allocated the potential shortage of water within Green Mountain. As part of the settlement in the case, the Agreement on Operating Procedures, which includes Exhibit B, was negotiated.

Even without the Exhibit B exchanges Reclamation can use various measures to avoid or minimize the impacts of a potential shortage caused by an operating limitation, such as:

- Using available alternative water supplies in reservoirs other than Green Mountain by exchange.

- Managing substitution water releases from Williams Fork, Wolford Mountain, or other reservoirs.
- Making available water stored in Green Mountain, or elsewhere, that is reasonably anticipated not to be needed during that fill and delivery year by the party or parties that would otherwise be the beneficiaries of such water.
- Working with beneficiaries to implement temporary water conservation or management measures that would decrease demand for water from Green Mountain, including the reduction of water calls or demands.
- Using owed-to-the-river accounting, subject to State Engineer approval, to maintain constant release rates by keeping track of over-releases and applying that flow to times when there are under-releases.
- Adopting other measures as negotiated with those concerned.

The combination of measures employed in any given year would be a function of many different variables, including availability of water from other sources, amount of substitution water available, and willingness to participate in conservation or management measures. The ability of the measures to prevent impacts from an operating limitation without the use of the Exhibit B exchanges to deal with the operating limitation is similarly dependent upon these variables. Therefore, the ability of these methods to prevent impacts from an operating limitation in the future and its impact to reservoir operations cannot be quantitatively defined without making a number of highly speculative assumptions.

To the extent that a shortage does occur, the relative shortage allocation for the power pool and the replacement pool is defined in Exhibit A of the Agreement on Operating Procedures. Under the current operating limitation, the shortage allocation is a function of the relative demands on that day. There is currently no definition as to how the shortage is to be allocated amongst the power pool water users, namely the Town of Silt, HUP beneficiaries, and water service contractors. Water service

contracts already include shortage provisions which dictate how shortages will be allocated.

Reclamation continues to collect data and assess if there is any correlation between reservoir operations and the Heeney Slide. In 2002, due to concerns about being able to provide water, Reclamation declared a moratorium on contracting additional water from Green Mountain. Modeling and analysis are underway to determine whether or not additional water will be available for contract in the future.

Blue River

Below Green Mountain to the Colorado River the Blue River is described as a pool-and-drop stream that primarily flows through a steep-sided stream channel. This is particularly the case immediately below the reservoir where there is a small canyon. Changes in stream flow are not as readily apparent with this type of topography.

Flows in the Blue River below Green Mountain are affected by reservoir operations and power generation. Bank full flow for this stream is 2,600 cfs; a flow greater than 2,000 cfs is considered a flushing flow. Before the Blue River was dammed it would regularly peak at a flow rate of over 3,000 cfs, and on occasion would reach over 4,000 cfs (Ewert 2007).

The CWCB Instream Flows for the Blue River below Green Mountain were appropriated on October 2, 1987 and are junior to Green Mountain's fill and junior refill rights. The Instream Flows are 60 cfs from May 1 to July 15 and 85 cfs from July 16 to April 30.

Wolford Mountain

Wolford Mountain was built in part as basin of origin compensation for the construction and operations by the municipal subdistrict of Northern Colorado Water Conservancy District of the Windy Gap Firing Project. CRWCD owns and operates the reservoir, which is located on Muddy Creek 5 miles above the confluence with the Colorado River above the town of Kremmling. The capacity of the

reservoir is 66,000 ac-ft, 24,000 ac-ft of which is leased to Denver Water for substitution or exchange in extraordinary circumstances. A 4,000 ac-ft conservation pool is designated to protect the fishery within the reservoir. In the

short-term only about 1,000 ac-ft is still available to contract from Wolford Mountain (CRWCD 2007). Table 3.2 shows the current marketing demands for the Wolford Mountain market.

Table 3.2 – Wolford Mountain Market CRWCD Water Contract Demands – Colorado River Supply as of May 2007

	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Total
Ac-Ft	182	227	281	373	403	318	196	128	117	85	80	123	2,513
Cfs	3.06	3.69	4.72	6.07	6.55	5.34	3.19	2.16	1.90	1.38	1.40	2.00	

(CRWCD 2007)

Muddy Creek

Muddy Creek is a smaller stream than the Blue River. Bank full flow for this stream for the section just below the dam is approximately 600 cfs (Ewert 2007, CRWCD 2007), increasing to approximately 1,000 to 1,100 cfs at Kremmling (CRWCD 2007). It is a meandering stream with a wide floodplain.

Wolford Mountain has 1995 water rights with 1998 refill rights, which are junior to most Colorado River mainstem and local water rights holders downstream of the reservoir. Therefore, the amount that can be stored in the reservoir and the Muddy Creek flows are highly controlled by bypasses required to satisfy senior calls on the river rather than by contract releases (CRWCD 2007).

CWCB Instream Flows for Muddy Creek below Wolford Mountain were appropriated on July 13, 1998, and are 105 cfs from May 15 to June 30; 70 cfs from July 1 to July 14; 20 cfs from July 15 to April 30; and 70 cfs from May 1 to May 14 absolute. Despite having senior rights, CRWCD makes every effort to maintain Instream Flows and does not exercise exchanges that would injure Instream Flows.

Environmental Consequences

No Action Alternative

This alternative would result in reservoir operations and hydrology, and downstream hydrology continuing to fluctuate as a result of any existing operational releases, yearly

precipitation variations, water rights, established water contracts, releases for fish recovery, and operating limitations. Therefore, there would be no impact to reservoir operations or hydrology as a result of this alternative.

Proposed Alternative

The potential changes to the storage level of Green Mountain and Wolford Mountain Reservoirs, and the changes in the flows of the Blue River and Muddy Creek below the reservoirs that are possible with the implementation of this alternative are shown through examples. Synthesized hydrology had to be developed in order to create the hydrologic conditions necessary to require full implementation of the alternative, thereby allowing the maximum potential impacts to be demonstrated. In general, this synthesized hydrology is representative of extremely dry years. The alternative is not likely to be implemented in average or wet years.

Note that the potential shortage in the examples for October is 4,000 ac-ft. The banking of 5,000 ac-ft of water under the Proposed Alternative only alleviates about 2,000 ac-ft of this potential 4,000 ac-ft shortage. The reason for this is that the act of banking water in Wolford Reservoir lowers Green Mountain's water level more quickly, causing the operating limitation to be invoked earlier than it would otherwise.

Also note that the 4,000 ac-ft release shortage has been incorporated into the No Action Alternative figures for the banking exchange. This shortage results in higher storage levels for

Green Mountain throughout the winter and lower average Blue River flows during the shortage period than if there was no operating limitation under the same conditions. Likewise, the approximate 1,000 ac-ft shortage in April has been incorporated into the No Action Alternative calculations for either exchange. In the examples used here this shortage results in higher storage levels for Green Mountain until the next year's start-of-fill.

The following tables summarize the months that are expected to be affected; months not shown are not likely to be affected by the Proposed Action Alternative. The estimated releases made from Green Mountain for Wolford Mountain purposes were derived by extrapolating current CRWCD water marketing demands to equal the maximum potential of water to be released for the exchange being considered (CRWCD 2007). As previously mentioned and shown in the tables, flows in the Blue River and Muddy Creek would not be reduced below CWCB's Instream Flows with the implementation of this alternative.

Green Mountain

Tables 3.3 and 3.4 show the potential change in the storage levels of Green Mountain that could be possible for up to two years in the 40 year contract for each of the banking and unneeded banking exchanges. The releases in August through September from Green Mountain for Wolford Mountain purposes are expected to

reduce the storage level of Green Mountain by up to approximately 5,000 ac-ft by the end of September as compared to the No Action Alternative.

In the banking exchange the level of deficit is then reduced from October through the start-of-fill to about 2,000 ac-ft. The 2,000 ac-ft is the amount of the 4,000 ac-ft October shortage the banking exchange could meet.

In contrast, in the unneeded banking exchange Green Mountain storage level would gradually diminish from approximately 5,000 ac-ft until it equalizes with the No Action Alternative by the end of April.

Meeting a shortage of up to 1,000 ac-ft in April would only be possible if the October shortage was not large enough to utilize all of the banked water. The releases could pattern either the banking or unneeded banking exchange depending upon if there was an October shortage or not, respectively. It will be assumed for the purposes of this analysis that the releases to meet an April shortage would pattern those seen in the unneeded banking exchange in order to illustrate a wider range of impacts. The only difference is that there would be up to -1,000 ac-ft water in storage by the end of March, which would continue throughout the summer and into the next year's start-of-fill if Green Mountain fails to fill in the current year.

Table 3.3 – Banking Exchange End-of Month Green Mountain Storage Levels (ac-ft)

	No Act	Prop Act	Diff	% Diff
Aug	77,311	74,522	-2,790	-3.6
Sept	63,337	58,358	-4,980	-7.9
Oct	35,507	33,530	-1,977	-5.6
Nov	28,806	26,881	-1,925	-6.7
Dec	25,255	23,331	-1,924	-7.6
Jan	21,769	19,845	-1,924	-8.8
Feb	20,517	18,592	-1,924	-9.4
Mar	17,973	16,050	-1,923	-10.7
Apr	16,434	14,550	-1,884	-11.5

Table 3.4 – Unneeded Banking Exchange End-of Month Green Mountain Storage Levels (ac-ft)

	No Act	Prop Act	Diff	% Diff
Aug	82,617	79,827	-2,790	-3.4
Sept	69,005	64,024	-4,981	-7.2
Oct	41,590	37,064	-4,526	-10.9
Nov	39,448	35,750	-3,699	-9.4
Dec	36,461	33,615	-2,847	-7.8
Jan	34,205	32,210	-1,995	-5.8
Feb	32,266	31,041	-1,226	-3.8
Mar	28,814	28,440	-374	-1.3

Tables 3.5 and 3.6 show the potential change in storage levels at Green Mountain that could be possible for up to two years in the 40 year contract for either the quick or slow borrowing exchanges. The Green Mountain April storage level is the same for either alternative since the 1,000 ac-ft would be retained in Green Mountain during a shortage in the No Action and Wolford Mountain would make the up to 1,000 ac-ft of releases to avoid or mitigate Green Mountain operating limitation shortages in the Proposed Alternative.

In the quick borrowing exchange the reservoir would initially be reduced by 1,000 ac-ft during

the month of May as releases are made to payback Wolford Mountain for its releases to avoid or mitigate a Green Mountain Reservoir operating limitation during April. This 1,000 ac-ft deficit would continue throughout the summer and into the next year's start-of-fill if Green Mountain fails to fill in the current year. In the slow borrowing exchange the reservoir would be reduced by up to 289 ac-ft starting in July, continuing until it is up to 1,000 ac-ft lower than the No Action Alternative by the end of October. This level of deficit as compared to the No Action Alternative is expected until the next year's start-of-fill.

Table 3.5 – Quick Borrowing Exchange End-of Month Green Mountain Storage Levels (ac-ft)

	No Act	Prop Act	Diff	% Diff
May	65,808	64,808	-1,000	-1.5
Jun	115,727	114,727	-1,000	-0.9
Jul	139,678	138,678	-1,000	-0.7
Aug	122,626	121,626	-1,000	-0.8
Sept	104,232	103,232	-1,000	-1.0
Oct	62,910	61,910	-1,000	-1.6
Nov	61,264	60,264	-1,000	-1.6
Dec	58,802	57,802	-1,000	-1.7
Jan	55,898	54,898	-1,000	-1.8
Feb	53,212	52,212	-1,000	-1.9
Mar	55,515	54,515	-1,000	-1.8
Apr	62,768	61,768	-1,000	-1.6

Table 3.6 – Slow Borrowing Exchange End-of Month Green Mountain Storage Levels (ac-ft)

	No Act	Prop Act	Diff	% Diff
Jul	139,678	139,389	-289	-0.2
Aug	122,626	122,025	-602	-0.5
Sept	104,232	103,384	-848	-0.8
Oct	62,910	61,910	-1,000	-1.6
Nov	61,264	60,264	-1,000	-1.6
Dec	58,802	57,802	-1,000	-1.7
Jan	55,898	54,898	-1,000	-1.8
Feb	53,212	52,212	-1,000	-1.9
Mar	55,515	54,515	-1,000	-1.8
Apr	62,768	61,768	-1,000	-1.6

Wolford Mountain

Tables 3.7 and 3.8 show the potential change in the storage levels of Wolford Mountain that could be possible for up to two years in the 40 year contract for each the banking and unneeded banking exchanges. Essentially the results are opposite of what is likely to occur at Green Mountain. The only notable difference is that in

the needed banking exchange Wolford Mountain would be back to its No Action Alternative storage level by the end of October since the release of the 5,000 ac-ft of banked water to avoid or mitigate Green Mountain operating limitation shortages would be made in October.

Table 3.7 – Banking Exchange End-of-Month Wolford Mountain Storage Levels (ac-ft)

	No Act	Prop Act	Diff	% Diff
Aug	41,642	44,436	2,795	6.7
Sept	33,042	38,042	5,000	15.1

Table 3.8 – Unneeded Banking Exchange End-of-Month Wolford Mountain Storage Levels (ac-ft)

	No Act	Prop Act	Diff	% Diff
Aug	52,206	55,001	2,795	5.4
Sept	47,291	52,291	5,000	10.6
Oct	46,070	50,630	4,560	9.9
Nov	45,412	49,148	3,736	8.2
Dec	44,715	47,599	2,885	6.5
Jan	44,019	46,052	2,033	4.6
Feb	43,479	44,742	1,264	2.9
Mar	43,239	43,651	412	1.0

Tables 3.9 and 3.10 show the potential change in storage levels at Wolford Mountain that could be possible for up to two years in the 40 year contract for either the quick or slow borrowing exchanges. Starting in April Wolford Mountain is reduced by 1,000 ac-ft as compared to the No Action Alternative in order to avoid or mitigate Green Mountain operating limitation shortages.

This deficit is completely repaid by the end of May through Green Mountain releases made for Wolford Mountain purposes during a quick borrowing exchange. In the slow borrowing exchange this deficit continues from April through June and then gets repaid starting in July when releases are made from Green Mountain for Wolford Mountain purposes.

Table 3.9 – Quick Borrowing Exchange End-of Month Wolford Mountain Storage Levels (ac-ft)

	No Act	Prop Act	Diff	% Diff
Apr	40,696	39,696	-1,000	-2.5

Table 3.10 – Slow Borrowing Exchange End-of Month Wolford Mountain Storage Levels (ac-ft)

	No Act	Prop Act	Diff	% Diff
Apr	39,696	38,696	-1,000	-2.5
May	56,352	55,352	-1,000	-1.8
Jun	65,234	64,234	-1,000	-1.5
Jul	63,529	62,818	-711	-1.1
Aug	62,452	62,053	-398	-0.6
Sept	61,571	61,419	-152	-0.3

Blue River

Tables 3.11 and 3.12 show the potential flows of the Blue River downstream of the reservoir that could be possible for up to two years in the 40 year contract for each of the banking exchanges. Flows are expected to range from 45 cfs to 37 cfs increase over the No Action Alternative between August and the end of September when releases are being made from Green Mountain for Wolford Mountain purposes.

In the banking exchange the flows could be reduced by as much as 94 cfs during the latter half of October when the shortages are expected to occur and Wolford Mountain is (or has been in the case of owed-to-river accounting) making releases to avoid or mitigate Green Mountain operating limitation shortages.

For an unneeded banking exchange the flows are expected to decrease up to 14 cfs from mid-October through mid-April as the water that was not needed to avoid or mitigate Green Mountain operating limitation shortages is released from Wolford Mountain.

Meeting a shortage in April would pattern the unneeded banking exchange results except there would be a somewhat more flow (still less than No Action Alternative) through the winter and up to -17 cfs flow in April.

Table 3.11 – Banking Exchange Average Blue River Flows (cfs)

	No Act	Prop Act	Diff	% Diff
Aug	436	482	45	10.9
Sept	472	509	37	8.4
Oct 16-31	564	470	-94	-15.9

Table 3.12 – Unneeded Banking Exchange Average Blue River Flows (cfs)

	No Act	Prop Act	Diff	% Diff
Aug	360	406	45	13.1
Sept	432	469	37	8.7
Oct 16-31	572	559	-14	-2.5
Nov	165	151	-14	-8.9
Dec	177	163	-14	-8.2
Jan	166	152	-14	-8.5
Feb	164	150	-14	-8.6
Mar	192	178	-14	-7.5
Apr 1-15	278	264	-14	-5.1

Tables 3.13 and 3.14 show the potential flows of the Blue River downstream of the reservoir that could be possible for up to two years in the 40 year contract for either of the borrowing exchanges. During the quick borrowing exchange the release of Green Mountain water

for Wolford Mountain purposes is expected to cause an increase of up to 16 cfs in May. On the otherhand in the slow borrowing exchange the releases in July through October are expected to cause no more than a 5 cfs increase.

Table 3.13 – Quick Borrowing Exchange Average Blue River Flows (cfs)

	No Act	Prop Act	Diff	% Diff
May	72	88	16	25.5

Table 3.14 – Slow Borrowing Exchange Average Blue River Flows (cfs)

	No Act	Prop Act	Diff	% Diff
July	82	87	5	7.3
August	589	594	5	0.9
September	585	589	4	1.1
October	866	868	2	0.3

Muddy Creek
Tables 3.15 and 3.16 show the potential flows of Muddy Creek downstream of Wolford Mountain that could be possible for up to two years in the 40 year contract for each of the banking exchanges. Essentially the results are opposite of what is expected to occur in the

Blue River. The only notable difference is that in the needed banking exchange Muddy Creek flows would be up to 81 cfs higher for the entire month of October as owed-to-river accounting is employed at Wolford Mountain to avoid or mitigate Green Mountain operating limitation shortages.

Table 3.15 – Banking Exchange Average Muddy Creek Flows (cfs)

	No Act	Prop Act	Diff	% Diff
Aug	151	105	-45	-37.2
Sept	163	126	-37	-23.0
Oct 1-15	112	193	81	77.3
Oct 16-31	76	157	81	109.5

Table 3.16 – Unneeded Banking Exchange Average Muddy Creek Flows (cfs)

	No Act	Prop Act	Diff	% Diff
Aug	150	104	-45	-39.7
Sept	80	43	-37	-69.0
Oct 16-31	21	35	14	65.3
Nov	23	37	14	60.4
Dec	22	36	14	62.5
Jan	21	35	14	64.8
Feb	22	36	14	63.3
Mar	26	40	14	56.1
Apr 1-15	71	85	14	23.8

Table 3.17 and 3.18 show the potential flows of Muddy Creek downstream of the reservoir that could be possible for up to two years in the 40 year contract for either of the borrowing exchanges. The results are also nearly opposite

of those seen in the Blue River. The only notable difference is that in April an increase of up to 17 cfs is expected due to the release from Wolford Mountain to avoid or mitigate Green Mountain operating limitation shortages.

Table 3.17 – Quick Borrowing Exchange Average Muddy Creek Flows (cfs)

	No Act	Prop Act	Diff	% Diff
Apr 1-15	65	82	17	28.4
Apr 16-30	68	85	17	25.7
May	104	88	-16	-29.6

Table 3.18 – Slow Borrowing Exchange Average Muddy Creek Flows (cfs)

	No Act	Prop Act	Diff	% Diff
Apr-15	65	82	17	28.4
Apr16-30	68	85	17	25.7
Jul	50	45	-5	-12.4
Aug	25	20	-5	-20.3
Sept	24	20	-4	-17.2
Oct	22	20	-2	-11.0

Cumulative Impacts

The amount of additional contracts that will be issued under the Green Mountain Reservoir Water Marketing Program in the future is unknown. However, the amount of water, and therefore the impacts are not reasonably anticipated to be greater than the approximately 20,000 ac-ft analyzed in the 1988 Final

Supplement to the Final Environmental Statement Green Mountain Reservoir, Colorado Water Marketing Program (FSFES). FSFES. Further, since Muddy Creek flows are expected to continue to be driven by river management at the current level (CRWCD 2007), no cumulative impacts are expected to result.

AQUATIC RESOURCES

Affected Environment

The most common fish that inhabit Green Mountain are: rainbow trout (*Oncorhynchus mykiss*), kokanee salmon (*Oncorhynchus nerka*), mackinaw trout (*Salvelinus namaycush*), rainbow/cutthroat trout hybrids, and Snake River cutthroat trout (*Oncorhynchus clarki behnkei*). Mackinaw trout have a self-sustaining population; the other species are actively stocked by the Colorado Division of Wildlife (CDOW; Ewert 2007).

Wolford Mountain is dominated by far by white sucker (*Catostomus commersonii*). Another fairly prolific species in the reservoir is the round-tailed chub (*Gila robusta seminula*), which has been designated as a species of management concern by the state of Colorado. The chub occurs in Wolford Mountain naturally likely due to its presence in Muddy Creek when the reservoir was built, and it is a self-sustaining population. Game species present in the reservoir include rainbow trout, brown trout (*Salmo trutta*), kokanee salmon, Snake River cutthroat trout, and splake trout (*Salvelinus namaycush* x *S. fontinalis*). Recently it has been discovered that the kokanee salmon population may be a self-sustaining population. The other game species are all stocked in the reservoir (Ewert 2007).

Brown trout are about ten times more prevalent than rainbow trout in the Blue River downstream of Green Mountain. CDOW is currently trying to favor rainbow trout through management efforts such as primarily stocking rainbow trout here. Muddy Creek also contains primarily brown trout, with rainbow trout being occasionally stocked. It is assumed that round-tailed chub are still in Muddy Creek, although current information for verification is lacking (Ewert 2007).

Of those fish listed above the following are fall spawning fish: kokanee salmon, mackinaw

trout, brown trout and splake trout. The others are spring spawning fish.

Macroinvertebrates represent a significant food source for trout species, and their presence is important to maintaining a productive fishery. Of the basic physical requirements necessary to sustain macroinvertebrate populations, river depth and flow velocity are the most critical (Nelson and Roline 1996). Significant fluctuations in flow velocity and depth can have negative effects on macroinvertebrates; however, since this variation is typical for high mountain environments, where summer storm events are common, these species are adapted to fluctuations of this nature (Roline 2001).

Of the reservoirs and downstream reaches being considered, macroinvertebrate population information is available only for the Blue River downstream of Green Mountain. Data has been collected since 1993. Up until about 6 years ago the population numbers and diversity were considered excellent. In the past 6 years, however, numbers and diversity have been dramatically lower (Mitchell 2007). Although the exact cause of this decrease is unknown, there may be a link with the proliferation of *Didymo* (*Didymosphenia geminate*), a native alga that forms continuous mats over rocks, that has been noted in the area. *Didymo* is known to increase as flushing flows decrease (Mitchell 2007).

Environmental Consequences

No Action Alternative

This alternative would result in reservoir operations and hydrology, and downstream hydrology continuing to fluctuate as a result of any existing operational releases, yearly precipitation variations, water rights, established water contracts, releases for fish recovery, and operating limitations. Therefore, this alternative is expected to have no impacts to aquatic resources in these areas.

Proposed Action Alternative

The following analysis has been based on the expected changes in reservoir storage levels and downstream flow rates as discussed in the Reservoir Operations and Hydrology section of this chapter. All the resultant impacts are expected to be short-term unless otherwise noted.

Green Mountain

See Tables 3.3-3.6 for the magnitude and duration of the expected decrease in the storage levels of Green Mountain that the exchanges are expected to cause. The reservoir is expected to drop up to the following of its full capacity: banking exchange 10% (April), unneeded banking exchange 19% (March), and borrowing exchanges 34% (February).

The CDOW does not expect losses of fish are likely to be experienced unless the reservoir storage level drops under 10% of full capacity (Ewert 2007). However, the decrease would cause less bottom area to be underwater at the reservoir, which could damage incubating eggs, and reduce spawning habitat, rearing areas for juvenile fish, and feeding areas for adult fish as compared to the No Action Alternative. Therefore, this alternative has the potential to cause an adverse impact to the aquatic resources in Green Mountain ranging from up to minor for the banking exchanges and up to negligible for the borrowing exchanges.

Wolford Mountain

See Tables 3.7-3.8 for the magnitude and duration of the expected increase in storage levels of Wolford Mountain that either banking exchange is expected to cause.

It is possible that an increased water level in summer could reduce stress to fish, because as summer progresses the colder deep water normally becomes starved of oxygen, making it nearly uninhabitable for fish. The fish are forced to live in the surface water. More water in the reservoir would help keep the surface water from becoming as warm for the fish.

Furthermore, the additional water in the fall through winter expected with the unneeded banking exchange could keep eggs submerged during winter drawdown. This continuous submersion would increase the reproduction success of fall spawning fish, particularly the kokanee salmon (Ewert 2007). Therefore, either banking exchange has the potential to cause up to a minor beneficial impact to the aquatic resources in Wolford Mountain.

See Tables 3.9-3.10 for the magnitude and duration of the expected decrease in storage levels of Wolford Mountain expected during the implementation of the borrowing exchanges. The reservoir is expected to drop up to the following of its full capacity: quick borrowing exchange 60% (April) and slow borrowing exchange 59% (April). Therefore, for the reasons discussed in the Green Mountain analysis, it is expected that the borrowing exchanges have the potential to cause up to a negligible adverse impact to the aquatic resources in Wolford Mountain.

Blue River

See Tables 3.11-3.14 for the expected magnitude and duration of changes to the flows of the Blue River as a result of the banking and borrowing exchanges. As explained in the alternatives description, it is important to note that the daily fluctuations would not exceed the threshold of 260 cfs (10% of bank full) in a 12 hour period recommended by the CDOW to keep impacts to aquatic resources low. The prevention of sudden changes in flows is especially important for decreases, which can strand young fish who cannot react as quickly to move into deeper water (Ewert 2007).

It is possible that the increased flows during the late summer to fall period for both banking exchanges and the slow borrowing exchange could cause fall spawning fish to put more of their energy into fighting higher currents instead of preparing physiologically for spawning. Also, this elevation of flows in the fall above those later in the winter is likely to cause fall spawning in redds (gravel beds) that would later

not be inundated. Finally, it is possible that some eggs already laid could be washed downstream (Ewert 2007).

The reduction of flows in the fall seen in both banking exchanges has the potential to limit the availability of fall spawning habitat. Spring spawning habitat is expected to be limited in the unneeded banking exchange and when dealing with an April shortage. Further, the reduction of flows throughout the winter seen with the unneeded banking exchange and when dealing with an April shortage could limit the habitat available for fish to survive the winter (Ewert 2007).

The increase in flows in spring with the quick borrowing exchange could also cause spring spawning fish to expend more energy fighting higher currents and may flush them out of their preferred habitats (Ewert 2007).

Therefore, it is expected that the implementation of this alternative would cause an adverse impact to the aquatic resources of the Blue River ranging from up to minor for both banking exchange and the quick borrowing exchange to up to negligible for the slow borrowing exchange.

Muddy Creek

See Table 3.15-3.16 for the expected magnitude and duration of changes to the flows of Muddy Creek as a result of the banking exchange. The decrease in the flows of Muddy Creek in late summer to early fall could cause habitat loss and/or damage incubating eggs of early fall spawning fish (Ewert 2007).

The banking exchange is expected to cause an increase in Muddy Creek flows during the month of October, and in October and April for an April shortage. As explained in the Blue River discussion, this could also cause an impact to spawning fish. However, in order to mitigate the October shortage impacts, this alternative requires that with regard to the October operating limitation the banking exchange would only occur up to the amount

equal to a release of 5,000 ac-ft spread evenly throughout the month rather than just in the last half of the month. Furthermore, because the alternative also requires Reclamation not to cause more than a 60 cfs (10% of bank full) change in the flows of Muddy Creek in a 12 hour period, including other releases being made at that time, fish should otherwise be able to adjust (Ewert 2007).

The unneeded banking exchange and releases made to deal with an April shortage are expected to cause an increase in Muddy Creek flows from mid-October into spring. The increase of water may help to provide deeper holes for fish to survive the winter (Ewert 2007).

Therefore, the banking exchange has the potential to cause up to a short-term moderate adverse impact to the aquatic resources of Muddy Creek when dealing with an October shortage. However, even if the two out of 40 years that the banking exchange is allowed were to occur consecutively it is anticipated that the aquatic resources would quickly rebound in the following years (Ewert 2007). Thus, it is expected that the banking exchange would result in up to a long-term negligible adverse impact on the aquatic resources of Muddy Creek.

During the unneeded banking exchange and when dealing with an April shortage the adverse impact in late summer to early fall is expected to be somewhat greater than the benefit expected later in the winter. Therefore, the implementation of the unneeded banking exchange and when dealing with an April shortage has the potential to cause up to a minor adverse impact to the aquatic resources in Muddy Creek.

See Tables 3.17-3.18 for the expected magnitude and duration of changes to the flows of Muddy Creek as a result of the borrowing exchanges. As discussed in the Blue River analysis the increase in Muddy Creek flows in April could cause spring spawning fish to expend more energy fighting higher currents

and may flush them out of their preferred habitats. The decrease of flows in spring during a quick borrowing exchange could limit habitat. The decrease of flows later in the summer into early fall could limit spawning habitat for fall spawning fish in the slow borrowing exchange (Ewert 2007). Therefore, both borrowing exchanges have the potential to cause up to a minor adverse impact to aquatic resources of Muddy Creek.

Macroinvertebrates

Macroinvertebrates are primarily confined to the areas of the stream that remain submerged during the lowest flows. None of the exchanges of this alternative would violate the Instream Flows. Therefore, there are no impacts expected specific to macroinvertebrates due to any decreases in the flows of the Blue River or Muddy Creek from the implementation of this alternative (Mitchell 2007).

See Tables 3.3-3.10 for the magnitude and duration of the expected decrease in storage levels of the reservoirs from the implementation of this alternative. The lowest level of Green Mountain in the past was the dead pool at 6,860 ac-ft in 1963. In more recent times the lowest level was 36,144 ac-ft in March 2003. Wolford Mountain's lowest level was 16,849 ac-ft in February 2003.

The banking exchange would not cause Green Mountain to drop below 36,144 ac-ft; it would either already be below that level or even with the implementation of the alternative would not drop below that level. However, the banking exchange is expected to cause the reservoir to drop further below that level from November through April. The unneeded banking exchange would drop Green Mountain below that level from November through March. The borrowing exchanges at Green Mountain and none of the exchanges at Wolford Mountain would cause the reservoirs to be reduced even near their most recent lowest level.

Therefore, the banking exchanges have the potential to cause up to a minor adverse impact

to the macroinvertebrates of Green Mountain. No impacts are expected to macroinvertebrates during either borrowing exchange at Green Mountain or during any of the exchanges at Wolford Mountain.

In general, increases in reservoir levels or flows are expected to be the same as those discussed previously for aquatic resources such as fish.

Cumulative Impacts

The amount of additional contracts that will be issued under the Green Mountain Reservoir Water Marketing Program in the future is unknown. However, the amount of water, and therefore the impacts are not reasonably anticipated to be greater than the 20,000 ac-ft analyzed in the FSFES. Further since Muddy Creek flows are expected to continue to be driven by river management at the current level (CRWCD 2007), no cumulative impacts are expected to result.

RECREATION

Affected Environment

When full, the water surface of Green Mountain Reservoir is approximately 2,125 acres with about 19 miles of shoreline. The reservoir is owned by Reclamation, but recreational opportunities are managed by the U.S. Forest Service (USFS) with conveniences such as 6 campgrounds with 208 campsites, picnic areas, 2 boat ramps, 2 concessions, and a swimming beach. The land surrounding the reservoir is a mixture of USFS and private land. The community of Heeney sits on the west side of the reservoir, also providing some services to visitors.

Fishing is the primary recreational activity at the reservoir, followed by power boating and camping. Ice and snow conditions prohibit most recreation in winter, however fishing and kayaking are popular summertime activities (Waugh 2007).

When the reservoir level decreases, the management challenges for the USFS increase. The established campsites and restrooms are further away from the waterline, which is where people prefer to camp. In order to accommodate visitors, the USFS allows camping on the exposed beach by lending visitors firepans and portable toilets. Sometimes there are problems with off-road vehicles driving through the camp areas on the beach. However, the numbers of visitors is unaffected by the level of the reservoir (Waugh 2007).

The high-season for visitation is between Memorial Day and Labor Day, with the heaviest use occurring after July 4th. All the facilities close down October 1st except for one to two campsites that are left open through November for big game hunter and kokanee salmon fishermen/women. Many visitors take advantage of the annual season pass offered by the USFS. Most visitors are either from the local area or from the Front Range of Colorado (Waugh 2007).

The Blue River downstream of the reservoir is about 13 miles in length, less than half of which are on public lands managed by the USFS, Bureau of Land Management (BLM), and Summit County. CDOW has designated this section of the Blue River as a gold metal fishery.

Wolford Mountain Reservoir, with approximately 1,550 surface acres, provides many recreational opportunities. The reservoir has a marina, day use, and campground area with amenities such as a boat ramp, boat rentals, picnic areas, 48 RV camping sites, and a group camping site. Most of the visitors to the reservoir participate in a water-related activity such as boating, fishing, and wildlife viewing; however, hiking, mountain biking and other activities are enjoyed since large portions of land adjacent to the reservoir are BLM public lands (CRWCD 2007).

The high season for visitation is the same as that to Green Mountain. Visitation is mostly from residents of the local area and the metropolitan Denver Area. The reservoir has become a significant draw for the west Grand County area, both for summer flat water and stream recreation, as well as for winter ice fishing. The Kremmling Area Chamber of Commerce sponsors numerous events at the reservoir, which draw primarily from the metropolitan Denver area (CRWCD 2007).

Muddy Creek downstream of the reservoir is about 10 miles in length and also is surrounded mostly by BLM lands. Management of the fishery is challenging due to the high turbidity. However, there is a self-sustaining brown trout population (Ewert 2007).

Environmental Consequences

No Action Alternative

This alternative would result in reservoir operations and hydrology, and downstream hydrology continuing to fluctuate as a result of any existing operational releases, yearly precipitation variations, water rights, established water contracts, releases for fish recovery, and operating limitations. Therefore, this alternative is expected to have no impacts on the recreation in these areas.

Proposed Action Alternative

This alternative does not involve any construction activities, the water stored would not exceed the existing high and low pool levels originally established for and seen at the reservoirs, and the water released would still be within the range of normal flows in the downstream rivers. Therefore, there are no impacts to non-water related recreation expected with the implementation of this alternative.

Refer to the Aquatic Resources section of this chapter for a discussion of the expected impacts to sport fish as a result of the implementation of the Proposed Alternative. Using a conservative estimate, by extension it is estimated that similar

levels of impact would result to fishery recreation in those water bodies.

Impacts to non-fishery water-related recreation at the reservoirs can be directly correlated with whether there is an expected increase (beneficial impact) or decrease (adverse impact) in the storage level. Therefore, either banking exchange is expected to cause up to a minor adverse impact to the recreational experience at Green Mountain from August into spring. Recreation at Wolford Mountain is expected to experience up to a minor beneficial impact from August through September to meet an October shortage or August through March to meet an April shortage during a banking exchange. The same level of impact from August through March is expected during an unneeded banking exchange. The quick and slow borrowing exchanges are expected to cause up to a negligible adverse impacts during the following time frames at Green Mountain: May until April for quick and July through April for slow. At Wolford Mountain the following time frames would be expected: April for quick and April through September for slow. Only direct short-term impacts are expected to result at the reservoirs.

Impacts to non-fishery water-related recreation for the streams is also in part directly correlated to whether there is an expected increase or decrease in the flow rate. Only direct short-term impacts are expected to result at the streams unless otherwise noted. The impact to human safety as a result of increased flows was not an issue. This alternative would not cause more than a 260 cfs (10% of bank full) increase in flows of the Blue River in a 12 hour period. Further, Reclamation would not request water be released from Wolford Mountain that would cause more than a 60 cfs (10% of bank full) increase in Muddy Creek flows in a 12 hour period. These rates of increase would give stream users ample time to move out of narrow and/or deep water areas to safer areas during high flows if needed (Ewert 2007).

Therefore, the increase in flows expected with either of the banking exchanges could cause up to a minor beneficial impact from August through September to the Blue River recreational experience. Up to a minor adverse impact would then be expected during October for an October shortage and October through April for an April shortage for the banking exchange. The same level of impact is expected from October through April for an unneeded banking exchange. The quick and slow borrowing exchanges could cause a beneficial impact of up to minor in May for the quick borrowing exchange and up to negligible from July through October for a slow borrowing exchange.

It is expected that either of the banking exchanges could cause up to a moderate adverse short-term impact from August through September to the Muddy Creek recreational experience. However, the duration is not expected to last more than two months and the frequency is not expected to occur more than two years for each exchange in the 40 year contract. Therefore, it is expected that either banking exchange would result in up to a negligible long-term adverse impact to the recreational experience at Muddy Creek. Up to a moderate beneficial impact is expected from October until spring during the unneeded banking exchange and when dealing with an April shortage.

During either borrowing exchange a minor beneficial impact in April is expected to occur to the Muddy Creek recreational experience. Then the quick borrowing exchange is expected to cause up to a minor adverse impact during May, and the slow borrowing exchange is expected to cause up to a minor adverse impact from July through October.

The amount of additional contracts that will be issued under the Green Mountain Reservoir Water Marketing Program in the future is unknown. However, the amount of water, and therefore the impacts are not reasonably anticipated to be greater than the 20,000 ac-ft

analyzed in the FSFES. Further since Muddy Creek flows are expected to continue to be driven by river management at the current level (CRWCD 2007), no cumulative impacts are expected to result.

SOCIOECONOMICS

Affected Environment

Green Mountain and the upper portions of the Blue River below Green Mountain are within Summit County, while Wolford Mountain, Muddy Creek, and the lower portions of the Blue River below Green Mountain are within Grand County. The populations of Summit and Grand Counties have increased by about 93% and 66%, respectively, since 1990. Although the number of jobs directly related to the reservoirs and streams is not available, both counties showed accommodation and food services as the largest of the major economic sectors at roughly 33% for Summit County and 40% for Grand County in 2005 (STATS 2007). Similarly, total retail jobs (sporting goods, hobbies, books and music lumped into one description) and jobs related to arts, entertainment, and recreation (lumped into one description) accounted for 28% and 3% for Summit County, respectively, and 7% and 4% for Grand County, respectively (USCB 2007). Although not quantifiable, it is assumed that the recreational opportunities associated with the reservoirs and downstream reaches of river benefits the local economy and communities where recreation visitors purchase goods and services.

CRWCD contract water deliveries from Wolford Mountain provide over 2,700 ac-ft of augmentation water to over 80 west slope contractors (CRWCD 2007). There is only about 1,000 ac-ft available to contract from Wolford Mountain (Merritt 2006c).

Environmental Consequences

No Action Alternative

This alternative would result in reservoir operations and hydrology, and downstream hydrology continuing to fluctuate as a result of any existing operational releases, yearly precipitation variations, water rights, established water contracts, releases for fish recovery, and operating limitations. Therefore, this alternative is expected to have no impacts on the socioeconomic resources in these areas.

Proposed Action Alternative

As discussed in the Recreation section of this chapter, impacts to fishery and non-fishery water-related recreation are expected to occur with the implement of this alternative. Although not quantifiable it is expected that similar levels of impact would result to recreation-related socioeconomic resources.

The availability of suitable augmentation water to supply demands in the growing Colorado River Basin area could also potentially play a role in local economies. If this contract was not issued and there was an operating limitation it is likely that Reclamation would not be able to provide water to existing contractors or possibly HUP beneficiaries. Such an operating limitation would probably be occurring at a time when other sources of water would be non-existent or minimal. Therefore, although this alternative may not be able to satisfy all the shortages an operating limitation would cause, it is expected that up to a moderate beneficial short-term impact would be experienced to the socioeconomics of the Colorado River Basin with the implementation of this alternative. Furthermore, it is possible that if the up to two years in the 40 year contract of operating limitations were to occur consecutively that impacts to socioeconomic resources could be long-term, such that this alternative could have up to a moderate beneficial long-term impact to the socioeconomics of the Colorado River Basin.

The amount of additional contracts that will be issued under the Green Mountain Reservoir Water Marketing Program in the future is unknown. However, the amount of water, and therefore the impacts are not reasonably anticipated to be greater than the 20,000 ac-ft analyzed in the FSFES. Further since Muddy Creek flows are expected to continue to be driven by river management at the current level (CRWCD 2007), no cumulative impacts are expected to result.

HYDROELECTRIC POWER PRODUCTION

Affected Environment

Green Mountain Powerplant was first put into operation in 1943. The power right was awarded a priority of August 1, 1935 for a direct flow right of 1,726 cfs.

There are two generators each with a capacity to produce 13,000 kilowatts of power. Power is produced, up to the power plant capacity, upon release of water for other purposes. Reclamation manages power production and Western Area Power Administration markets the power produced.

Environmental Consequences

No Action Alternative

This alternative would result in reservoir operations and hydrology, and downstream hydrology continuing to fluctuate as a result of

any existing operational releases, yearly precipitation variations, water rights, established water contracts, releases for fish recovery, and operating limitations. Therefore, this alternative is expected to have no impacts on the hydroelectric power production of Green Mountain Powerplant.

Proposed Action Alternative

Impacts to hydroelectric production at Green Mountain Powerplant can usually be directly correlated with whether there is an expected increase (beneficial impact) or decrease (adverse impact) in the release of water from the reservoir. The increase, however, is only beneficial when the additional water is made available for generation at a time when plant capacity is not exceeded, such as during peak spring runoff, and power marketing rates are significantly higher.

Therefore, the increased power generation expected with this alternative would cause a beneficial impact ranging from minor for the months of August and September for both banking exchanges to negligible July through October for the slow borrowing exchange. The reduction in power generation with an unneeded banking exchange and when dealing with an April shortage is expected to cause a negligible adverse impact from October into spring. No impact is expected to power generation during a quick borrowing exchange as an increase in flows is anticipated to occur in May.

No cumulative adverse impacts to hydroelectric power production are expected.

CHAPTER FOUR – CONSULTATION AND COORDINATION

SCOPING PROCESS

Reclamation started internal scoping in February 2007. In a series of meetings and emails between Reclamation staff, and between Reclamation, CRWCD, and NCWCD staff, issues such as the establishment and definition of Reclamation’s discretion, possible resource effects, and environmental commitments were discussed and resolved.

Discussions with CDOW staff were conducted on March 28, April 9, April 12, and July 9, 2007; and private contractor for Blue Valley

Ranch, on March 29, 2007. These discussions centered on concerns and concurrence on impact analysis related to aquatic resources.

The USFS was contacted on April 3, 2007 to discuss issues and agreement on impact analysis relative to recreation at Green Mountain.

The Division 5 Engineer for the Division of Water Resources was contacted in July 2007 to discuss the possibility of using owed-to-river accounting for the October operating limitation to mitigate impacts to aquatic resources.

TABLE 4.1 – LIST OF RECLAMATION PREPARERS

Name	Title	Contribution
Burton, Robert	Archeologist	Cultural resources compliance.
Gomoll, Terry	Repayment Specialist	Water contracting information and document review.
Ronca, Carlie	Natural Resource Specialist	Project management for NEPA compliance and document production.
Thomasson, Ron	Hydraulic Engineer	Water scheduling consideration, hydrologic analysis, and document review.
Tully, Will	Environmental Specialist	Environmental compliance guidance and document review.
Wilson, Malcolm	Hydraulic Engineer	Water scheduling consideration and document review.

REFERENCES

- Colorado River Water Conservation District (CRWCD). 2007. Personal communication (series of emails and telephone calls) between David Merritt, Chief Engineer, Taylor Hawes, Associate Council, and Don Meyer, Hydrologist with CRWCD, and Carlie Ronca, Natural Resource Specialist with Bureau of Reclamation. January 23 – August 28.
- Ewert, Jon. 2007. Personal communication (telephone) between Jon Ewert, Area 9 Aquatic Biologist, Colorado Division of Wildlife, and Carlie Ronca, Natural Resource Specialist, U.S. Bureau of Reclamation. March 28, April 9 and 12, and July 9.
- Jaouen, Steven. 2006. Personal communication (telephone) between Steven Jaouen, Natural Range Management Specialist, Resources Conservation Service, and Carlie Ronca, Natural Resource Specialist, U.S. Bureau of Reclamation. November 6.
- Mitchell, Michael. 2007. Personal communication (telephone) between Michael Mitchell, Senior Aquatic Biologist, Queen of the River Consultants, Inc., and Carlie Ronca, Natural Resource Specialist, U.S. Bureau of Reclamation. March 29.
- Nelson, M.S., R.A. Roline. 1996. Distribution of Aquatic Macroinvertebrates in Relation to Stream Flow Characteristics in the Arkansas River. No. 8220-96-19. Denver: USDI Bureau of Reclamation Technical Service Center.
- Roline, R.A. 2001. Personal communication (telephone) between Richard Roline, Research Biologist, Technical Service Center U.S. Bureau of Reclamation and Tara Moberg, Natural Resource Specialist, U.S. Bureau of Reclamation.
- STATS (STATS Indiana). 2007. USA Counties IN Profile. <http://www.stats.indiana.edu/>. Accessed March 15.
- USBR (U.S. Bureau of Reclamation). 1937. Synopsis of Report on Colorado-Big Thompson Project, Plan of Development and Cost Estimate. U.S. Senate Document No. 80, U.S. Government Printing Office, Washington D.C.
- USBR (U.S. Bureau of Reclamation). 1983. Operating Policy for Green Mountain Reservoir; Colorado-Big Thompson Project, Colorado. Federal Register, Vol. 48, No. 247, December 22, 1983.
- USBR (U.S. Bureau of Reclamation). 1988. Green Mountain Reservoir, Colorado Water Marketing Program, Final Supplement to the Final Environmental Statement, Colorado-Big Thompson, Windy Gap Projects, Colorado.
- USBR (U.S. Bureau of Reclamation). 1998. Programmatic Agreement Among The Bureau of Reclamation, The Advisory Council on Historic Preservation, and the Colorado State Historic Preservation Officer Regarding The Ruedi Round II Water Marketing Program of the Fryingpan-Arkansas Project, and The Green Mountain Reservoir Water Marketing Program of the Colorado-Big Thompson Project. Cooperative Agreement #98-FC-60-11230.

- USDI (U.S. Department of the Interior). 2000. Public Review Draft National Environmental Policy Act Handbook.
- USFWS (U.S. Fish and Wildlife Service). 2006. Mountain-Prairie Region Endangered Species. <http://mountain-prairie.fws.gov/endspp/CountyLists/COLORADO.htm>. Accessed October 26.
- USCB (United States Census Bureau). 2007. 2002 Economic Census Summary Statistics by 2002 NAICS. <http://www.census.gov/econ/census02>. Accessed March 15.
- USGS (United States Geological Survey). 2007. USGS Monthly Statistics for the Nation. <http://nwis.waterdata.usgs.gov/nwis/>. Accessed May 9.
- Waugh, Ken. 2007. Personal communication (telephone) between Ken Waugh, Dillon Ranger District of White River National Forest and Carlie Ronca, Natural Resource Specialist, U.S. Bureau of Reclamation. April 3.

APPENDIX A – HYDROLOGIC ANALYSIS SUMMARY

An analysis of the historic Green Mountain Reservoir hydrology indicates that shortages in release rate due to the current drawdown rate operational limitations, which cannot be addressed with typical “owed-to-river” accounting, could be expected to occur in up to 5-percent of the years. The shortages are generally concentrated in two time periods; 1) the latter part of October, and 2) in April, just prior to the initiation of runoff. It is estimated that the potential shortage during the latter part of the October time period could be as large as 5,000 acre-feet. Estimated potential shortages during the April time period are not expected to exceed 1,000 acre-feet. The assumptions used to generate the potential shortage volumes and frequency estimates are extremely conservative and include full utilization of the HUP, Silt, and contract allocations every year.

The shortages that could occur in the late October time period result from a combination of abnormally low reservoir water surface elevations and relatively high C-BT replacement requirements and HUP demands during the latter part of October. The conditions that would give rise to reservoir water surface elevations sufficiently low enough for shortages to occur (below 7870.0 ft, triggering the 1.0 ft/day drawdown rate limitation) include almost full utilization of the HUP and Silt allocations and well-above average C-BT replacement releases between start-of-fill and the latter part of October. Once the reservoir’s water surface elevation falls below elevation 7870.0 feet, releases of stored water would be limited to approximately 390 cfs. Therefore, allowing for typical “owed-to-river” accounting, shortages could occur if the demand for stored water (Silt, HUP, C-BT replacement) significantly exceeds an average of 390 cfs for an extended period in late October.

The shortages that could occur in the April time period result from a combination of abnormally low reservoir water surface elevations and abnormally high C-BT replacement requirements just prior to the reservoir’s start of fill. The conditions that would give rise to reservoir water surface elevations sufficiently low enough for shortages to occur (below 7865.0 ft, triggering the 0.5 ft/day drawdown rate limitation) include nearly full utilization of the HUP and Silt allocations and well-above average C-BT replacement releases between start-of-fill and the end of March of the following year. Once the reservoir’s water surface elevation falls below elevation 7865.0 feet, releases of stored water would be limited to approximately 185 cfs. Therefore, allowing for typical “owed-to-river” accounting, shortages could occur if the demand for stored water (primarily C-BT replacement) significantly exceeds an average of 185 cfs for an extended period in April.

During the March – May 15 time period, release of stored water for C-BT Project replacement is by far the greatest demand for the reservoir’s stored water. Since 1955, C-BT Project replacement releases between March 1 and May 15 have ranged from 0 cfs to 375 cfs with an average of about 25 cfs. In fact, the C-BT Project replacement release requirement has been less than 165 cfs approximately 99-percent of the time. Since the release rate restriction is 165 cfs when the reservoir elevation is above 7860.0 feet, there is no need for the borrowing exchange as long as the reservoir remains above this level. Since the reservoir first filled in 1944, the reservoir has only been below elevation 7860.0 in one year (1963) and that was for maintenance purposes.

APPENDIX B – EXHIBIT B AGREEMENT

EXHIBIT B TO AGREEMENT ON OPERATING PROCEDURES

AGREEMENT ON WOLFORD MOUNTAIN RESERVOIR/GREEN MOUNTAIN RESERVOIR EXCHANGES

The River District, Northern, Reclamation, and the State of Colorado agree to an exchange protocol between Wolford Mountain Reservoir and Green Mountain Reservoir ("Exhibit B Agreement") as follows:

B.1. PURPOSE

B.1.a. The purpose of this Exhibit B Agreement is to provide additional flexibility to avoid shortages and/or to mitigate any existing shortage caused by an Operating Limitation at Green Mountain Reservoir.

B.1.b. This Exhibit B Agreement contemplates two different types of reservoir exchanges (a.k.a. contract exchanges) to provide additional flexibility by use of available storage space and stored water at Wolford Mountain Reservoir. The first is the Green Mountain Reservoir to Wolford Mountain Reservoir Exchange (the "Banking Exchange"); the second is the Wolford Mountain Reservoir to Green Mountain Reservoir Exchange (the "Borrowing Exchange").

B.1.c. This Exhibit B Agreement applies only to the River District's rights and interests in or associated with Wolford Mountain Reservoir and does not affect any rights or interests of the City and County of Denver ("Denver Water") or Colorado Springs Utilities ("CSU") in or associated with Wolford Mountain Reservoir.

B.2. PROCEDURES FOR BANKING EXCHANGE

B.2.a. On or before July 31st of each year, the River District will provide to Reclamation (and any other Party upon request) the River District's estimate of (1) the projected demand for releases from Wolford Mountain Reservoir, and (2) the amount of water accounted to storage at Green Mountain Reservoir ("GMR Water") that could be exchanged into Wolford Mountain Reservoir during the period from August 1 through October 31 (the "Allowed Banking Exchange Period"). Any exchange into, and subsequent release from, Wolford Mountain Reservoir of GMR Water shall be subject to the River District's existing contractual, environmental, and recreational commitments.

B.2.b.(1). Reclamation, after consultation with the River District, Northern, the State of Colorado, and other parties Reclamation determines appropriate, will determine how much GMR Water it desires to exchange into Wolford Mountain Reservoir during the Allowed Banking Exchange Period.

B.2.b.(2). Reclamation will notify the Parties of its plan to exchange GMR Water within two weeks after receipt of the River District's estimate of scheduled releases. The Banking Exchange will operate in the following manner: Water that would otherwise be released from Wolford Mountain Reservoir to meet its requirements will instead be released by exchange from Green Mountain Reservoir or other reservoirs with a Green Mountain Reservoir account and exchanged into Wolford Mountain Reservoir. The amount of GMR Water released to meet Wolford Mountain Reservoir's requirements will be credited as GMR Water in a separate designated account in Wolford Mountain Reservoir (the "GMR Exchange Account"). The GMR Exchange Account will be located within the River District's capacity at Wolford Mountain Reservoir and the Banking Exchange shall not affect Denver Water's account or the CSU Substitution Account at Wolford Mountain Reservoir.

B.2.b.(3). The parties recognize that river call conditions often change and any agreed upon exchange and release schedule may have to be modified from time to time.

B.2.c. The River District will release water from the GMR Exchange Account at the direction of Reclamation. Reclamation and the River District will coordinate the releases in a manner that recognizes the physical limitations of the Wolford Mountain dam (a.k.a. Ritschard Dam) and the environmental commitments below the dam. All Parties support the use of an "owed to the river" account as a mechanism to assist with the coordination of releases, consistent with paragraph 10 of the Agreement on Operating Procedures.

B.2.d.(1). Water in the GMR Exchange Account shall spill prior to any spill of water stored pursuant to existing or future storage rights for Wolford Mountain Reservoir, including any other water stored in Wolford Mountain Reservoir under existing agreements, including but not limited to existing substitution agreements. Water exchanged into Wolford Mountain Reservoir pursuant to agreements not in existence as of the date of execution of this Exhibit B Agreement will spill prior to water in the GMR Exchange Account.

B.2.d.(2). Water in the GMR Exchange Account not spilled will be carried over to the following Green Mountain Reservoir Fill and Delivery Year and will be available for use by Reclamation for the purposes of this Exhibit B Agreement.

B.2.e. GMR Water carried over in the GMR Exchange Account as of the Green Mountain Reservoir start-of-fill date shall be accounted toward the fill of Green Mountain Reservoir in the Green Mountain Reservoir Fill and Delivery Year into which it is carried over and shall not count toward the fill of Wolford Mountain Reservoir. This Exhibit B Agreement does not resolve the issue of whether GMR Water that spills from the GMR Exchange Account prior to the start-of-fill date for Green Mountain Reservoir counts toward the fill of Green Mountain Reservoir in the Green Mountain Reservoir Fill and Delivery Year following any such spill.

B.2.f. The River District may charge the GMR Exchange Account with its pro rated share of evaporation losses.

B.3. PROCEDURES FOR BORROWING EXCHANGE

B.3.a. In years when Reclamation does not have sufficient water available in the GMR Exchange Account to alleviate an Operating Limitation at Green Mountain Reservoir, Reclamation (in consultation with Northern and the River District) may request to exchange water in the River District's account in Wolford Mountain Reservoir for water in storage at Green Mountain Reservoir, for subsequent release for uses consistent with the reservoirs' respective decrees. Such a Borrowing Exchange shall be subject to the following limitations:

B.3.a.(1). The Borrowing Exchange shall operate only during the period of March 1 of a calendar year to the Green Mountain Reservoir start-of-fill date (as determined by the Secretary under the Blue River Decree) of the same calendar year.

B.3.a.(2). The Borrowing Exchange shall be limited to times when, as of March 1: (A) the snow pack above Wolford Mountain Reservoir is greater than 120% of average as determined by the Natural Resources Conservation Service, and (B) there is more than 40,000 acre-feet in Wolford Mountain Reservoir (including more than 20,000 acre-feet in the River District's account).

B.3.a.(3). Reclamation determines that there is likely to be 154,645 acre-feet available to the account of Green Mountain Reservoir as of July 15 under the most probable inflow conditions as shown by Reclamation's March 1 forecast.

B.3.a.(4). The maximum amount to be exchanged is 5,000 acre feet, unless otherwise agreed by the River District.

B.3.a.(5). The Borrowing Exchange is limited to the River District's account in Wolford Mountain Reservoir and shall not affect Denver Water's account or the CSU Substitution Account.

B.3.b. Reclamation will notify the Parties as soon as practicable after March 1 as to the amount of water and rates of release of water that it desires to exchange. The Borrowing Exchange will operate in the following manner: Wolford Mountain Reservoir water ("WMR Water") and GMR Water will be exchanged on an instantaneous basis by crediting an account at Green Mountain Reservoir (the "WMR Exchange Account") with WMR Water at the same rate and in the same amount that water released from Wolford Mountain Reservoir is accounted as a release of GMR Water. The River District and Reclamation will coordinate reservoir operations such that the Borrowing Exchange operates to release GMR Water from Wolford Mountain Reservoir as necessary to meet or mitigate any shortage caused by an Operating Limitation prior to the start of fill date of the GMR Fill and Delivery Year.

B.3.c.(1). WMR Water in the WMR Exchange Account does not count against the fill of Green Mountain Reservoir but shall count against the fill of the River District's account at Wolford Mountain Reservoir if it is not released prior to the Wolford Mountain Reservoir start-of-fill date.

B.3.c.(2). WMR Water in the WMR Exchange Account should be released from Green Mountain Reservoir for Wolford Mountain Reservoir purposes prior to November 1 of the same calendar year in which the Borrowing Exchange was conducted. Any WMR Water carried over in the WMR Exchange Account to the GMR Fill and Delivery Year commencing in the calendar year following the calendar year in which the Borrowing Exchange is conducted shall count against the fill of the River District's account at Wolford Mountain Reservoir and shall not count against the fill of Green Mountain Reservoir.

B.3.c.(3). To the extent that Wolford Mountain Reservoir physically stores water in excess of its total decreed entitlement (including any water in the WMR Exchange Account credited toward the fill of Wolford Mountain Reservoir), the amount of WMR Water remaining in the WMR Exchange Account, if any, shall automatically revert to GMR Water stored in Green Mountain Reservoir in an amount up to the amount of excess water stored in Wolford Mountain Reservoir.

B.3.c.(4). Because the WMR Water in the WMR Exchange Account takes up physical storage space in Green Mountain Reservoir, while not counting against the fill, it may be necessary to reduce the storage space available to the pool(s) benefiting from the exchange in order to avoid spilling water from the WMR Exchange Account if the reservoir fills to a level where physical storage space is no longer sufficient for the total water stored in the two pools and the WMR Exchange Account. If this shortage of physical storage space occurs, the pool(s) in Green Mountain Reservoir that benefited from the Borrowing Exchange shall make storage space available by reducing the water available for release in its pool up to an amount equal to the benefit received from the exchange. If both pools received a benefit from the exchange, the required storage space (and the resulting reduction in water available for release) will be divided between the two pools based on their proportionate share of the total benefit from the exchange.

B.3.c.(5). Any WMR Water remaining in the WMR Exchange Account shall automatically revert to GMR Water stored in Green Mountain Reservoir at the start of the Green Mountain Reservoir Fill and Delivery Year in the second calendar year following operation of the Borrowing Exchange.

B.3.d. Reclamation may charge the WMR Exchange Account with its pro rated share of evaporation losses.

B.3.e. WMR Water in the WMR Exchange Account shall neither increase or decrease the amount of water that may be owed to Green Mountain Reservoir by the City and County of Denver and the City of Colorado Springs.

B.4. MISCELLANEOUS

B.4.a. Accounting Issues. The River District will be responsible to account for the exchanged water. Any disputes concerning accounting of exchanged water shall be submitted to the State Engineer (or the Division 5 Engineer if designated by the State Engineer) for resolution. The decision of the State Engineer, or the Division 5 Engineer if so designated, on any dispute will be final.

B.4.b. Costs. The Parties' respective costs in administering this Exhibit B Agreement shall be borne by that Party.

B.4.c. Power. There may be minor changes in power generation at Green Mountain Reservoir that result from the administration of this Exhibit B Agreement. Reclamation agrees that any changes in power generation will be considered incidental and not subject to a power interference payment by either Northern or the River District.

B.4.d. Agreement/NEPA Compliance. To the extent Reclamation determines that a contract or agreement and/or a NEPA analysis is necessary for either execution or implementation of this Exhibit B Agreement, Northern and the River District will cooperate with Reclamation as necessary.

B.4.e. Term. This Exhibit B Agreement is an exhibit to the Agreement on Operating Procedures for Green Mountain Reservoir, and its term is concurrent with the Agreement on Operating Procedures. Therefore, upon termination of the Agreement on Operating Procedures, this Exhibit B Agreement shall also terminate. Upon termination, the River District will continue to release any exchanged water at the direction of Reclamation for no longer than two years, or until the exchanged water has been released, whichever is sooner.

B.4.f. No Alteration of Denver's or Colorado Springs' Rights. Nothing in this Exhibit B Agreement shall alter or modify the rights of the City and County of Denver or the City of Colorado Springs with respect to Wolford Mountain Reservoir under existing or pending agreements or decrees. This Exhibit B Agreement shall not impede or impair Denver's ability to fill its account in Wolford Mountain Reservoir or to provide substitution water pursuant to existing agreements and decrees.

B.4.g. No Alteration of Reclamation's Liability. The Parties agree that the participation of Reclamation in this Exhibit B Agreement does not create any new liability, or alter or modify Reclamation's existing liability, if any, in connection with operation of Wolford Mountain Reservoir or breach of Ritschard Dam. The Parties agree that they will not seek to hold Reclamation liable or responsible for:

B.4.g.(1). Reclamation's inability to deliver all or a portion of water previously exchanged into Wolford Mountain Reservoir, due to circumstances beyond Reclamation's control;

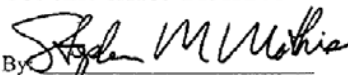
B.4.g.(2). A reduction in the availability of use of water from the 52,000 af pool or 100,000 af pool or a subaccount of the 100,000 af pool in the amount then-utilized by the WMR Exchange Account.

B.4.h. Orchard Mesa Check Case. The River District and Reclamation agree that if the Historic User Pool of Green Mountain Reservoir described in the 1984 Operating Policy ("HUP") is not fully available for HUP purposes due to storage space in the HUP being utilized at that time by the WMR Exchange Account, the amount of water unavailable for HUP purposes

will not be deemed a reduction in the "water available" under paragraph 3.b.(2) of the Stipulation and Agreement dated September 4, 1996, approved and included as an exhibit to the decree dated October 1, 1996 in Case No. 91CW247, Water Division 5 ("Orchard Mesa Check Case Decree") that would result in a determination of less than "66,000 acre feet of water available for release for the benefit of HUP beneficiaries when Green Mountain ceases to be in-priority for its initial fill under the Blue River Decrees."

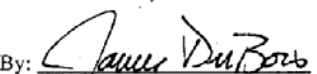
B.4.i. Defined Terms. Capitalized terms in this Exhibit B Agreement that are not defined herein have the same meaning as the same terms defined in the Agreement on Operating Procedures.

COLORADO RIVER WATER
CONSERVATION DISTRICT

By: 
Stephen M. Mathis, President

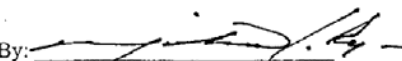
Dated: 12/6/05

UNITED STATES OF AMERICA
SUE ELLEN WOOLDRIDGE
Assistant Attorney General

By: 
JAMES J. DUBOIS, #13206
U. S./Department of Justice Environmental and
Natural Resources Division

Dated: 11/30/05

ATTORNEYS FOR THE
UNITED STATES OF AMERICA

By: 
MICHAEL RYAN
Regional Director, Great Plain Region
U.S. Bureau of Reclamation

Dated: 11/30/05

NORTHERN COLORADO WATER
CONSERVANCY DISTRICT

Dated: 12/1/2005

By: Mike Applegate
Mike Applegate, President and Chairman

STATE OF COLORADO

Dated: _____

By: H.D. Simpson
Harold D. Simpson, State Engineer