

Chatfield Reservoir Reallocation Project

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# Fish, Wildlife and Recreation Mitigation Plan

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**Prepared for:**

The Colorado Parks and Wildlife Commission

In accordance with C.R.S. 37-60-122.2

**Prepared by:**

Chatfield Reservoir Reallocation Project Participants

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# Table of Contents

## Executive Summary

### 1.0 Introduction

- 1.1 Purpose of Document
- 1.2 Project Overview
- 1.3 Regulatory Processes
- 1.4 Stakeholders

### 2.0 Avoidance and Minimization of Adverse Impacts

- 2.1 Avoidance and Minimization of Aquatic and Wildlife Environmental Impacts
- 2.2 Avoidance and Minimization of Wetlands and Recreational Impacts

### 3.0 Benefits of the Project

### 4.0 Mitigation of Unavoidable Adverse Impacts: Fish and Wildlife

- 4.1 Reservoir Operations Plan
  - 4.1.1 General
  - 4.1.2 Definitions
  - 4.1.3 Specific Provisions
  - 4.1.4 Adaptive Management for Operations
- 4.2 Fisheries and Aquatic Habitat
  - 4.2.1 Fishery and Aquatic Habitat in the South Platte River
    - 4.2.1.1 Habitat and Recreation in the South Platte above Chatfield Reservoir
    - 4.2.1.2 Habitat and Recreation in the South Platte below Chatfield Reservoir
  - 4.2.2 Fishery and Aquatic Habitat within Chatfield Reservoir
  - 4.2.3 Chatfield State Fish Unit
  - 4.2.4 Adaptive Management for Aquatic Life and Fisheries
- 4.3 Fluctuation Zone
  - 4.3.1 Fluctuation Zone Mitigation Measures Overview
  - 4.3.2 Plum Creek Restoration
  - 4.3.3 Noxious Weed Control Plan
    - 4.3.3.1 Adaptive Management for Weed Control
  - 4.3.4 Shoreline Stabilization Plan
- 4.4 Water Quality
  - 4.4.1 Water Quality within Chatfield Reservoir
  - 4.4.2 Water Quality in the South Platte River below Chatfield Reservoir
  - 4.4.3 Adaptive Management for Water Quality
- 4.5 Wildlife, Wetlands and Riparian Habitat
  - 4.5.1 Overview of the Compensatory Mitigation Plan

- 4.5.2 CMP Mitigation Approach
- 4.5.3 Summary of CMP Mitigation Measures
- 4.5.4 Adaptive Management for Wildlife, Wetlands and Riparian Habitat
- 4.5.5 Tree Management Plan
- 4.5.6 Adaptive Management for Tree Clearing within the Fluctuation Zone

## **5.0 Mitigation of Unavoidable Adverse Impacts: Recreation**

- 5.1 Recreational Facilities
  - 5.1.1 Recreational Facilities Modification Plan
  - 5.1.2 Marina Replacement Plan
  - 5.1.3 Hiring of Temporary CPW Resident Engineer
- 5.2 Financial Plan

## **6.0 Schedule**

## **7.0 Conclusions**

## **References**

## Figures

- 1 Project Area Map
- 2 Chatfield Project Participants' Service Areas
- 3 Reallocation Alternatives
- 4 Plum Creek Existing Conditions (1)
- 5 Plum Creek Existing Conditions (2)
- 6 Plum Creek Conceptual Stream Restoration Improvements
- 7 Shoreline Stabilization Plan
- 8 Preble's Habitat at Chatfield State Park
- 9 Bird Habitat at Chatfield State Park
- 10 Wetland Habitat at Chatfield State Park
- 11 Locations of Proposed On-site Mitigation Areas
- 12 Lower Marcy Gulch Potential On-site Mitigation Area
- 13 South Platte River Potential On-site Mitigation Area (1)
- 14 South Platte River Potential On-site Mitigation Area (2)
- 15 South Platte River Potential On-site Mitigation Area (3)
- 16 Plum Creek Potential On-site Mitigation Area (1)
- 17 Plum Creek Potential On-site Mitigation Area (2)
- 18 Plum Creek Potential On-site Mitigation Area (3)
- 19 Areas Impacted by Recreational Facilities Relocation, Borrow Areas, and Haul Roads
- 20 Potential Off-site Mitigation Areas
- 21 Sugar Creek Off-site Mitigation Area within the Upper South Platte
- 22 Potential Preble's Critical Habitat Mitigation at Sugar Creek
- 23 West Plum Creek Critical Habitat Unit for Preble's
- 24 Bird Habitat Complex Targeted for Cottonwood Regeneration and Mature Cottonwood Conservation
- 25 Chatfield State Park Recreational Areas
- 26 Chatfield Marina Existing Marina Location (5,426' Elevation)
- 27 Chatfield Marina Existing Marina Location (5,440' Elevation)
- 28 Chatfield Marina Existing Marina Location (5,444' Elevation)
- 29 Chatfield Marina Roxborough Cove Marina Location (5,426' Elevation)
- 30 Chatfield Marina Roxborough Cove Marina Location (5,440' Elevation)
- 31 Chatfield Marina Roxborough Cove Marina Location (5,444' Elevation)

## Tables

- 1 Proposed Mitigations for Proposed Action
- 2 Acute (1-day) low flows (cfs) for the 10-year period 1-Oct-1999 through 30-Sep-2000 for the South Platte River below Chatfield Dam to Marcy Gulch (from Appendix J of FR/EIS)

# Abbreviations

AF	Acre Feet (a measure of water volume equivalent to 325,851 gallons)
BMP	Best Management Practice
CDPHE	Colorado Department of Public Health and Environment
CDWR	Colorado Division of Water Resources
cfs	cubic feet per second, a measure of flow rate
CHU	Critical habitat unit (for Preble's meadow jumping mouse)
CMCC	Chatfield Marina Coordination Committee
CMP	Compensatory Mitigation Plan
CPW	Colorado Parks and Wildlife
CRMC	Chatfield Reallocation Mitigation Company
C.R.S.	Colorado Revised Statute
CSFU	Chatfield State Fish Unit
CWCB	Colorado Water Conservation Board
DNR	Colorado Department of Natural Resources
DWR	Colorado Division of Water Resources
EDAW	EDAW, Inc., a consulting recreational planning firm (now AECOM)
EFU	Ecological Function Unit
EIS	Environmental Impact Statement
ER	Engineering Regulation
ERO	ERO Resources Corporation, a consulting environmental planning firm
ESA	Endangered Species Act
Fed. Reg.	Federal Register
FEIS	Final Environmental Impact Statement
FR/EIS	Feasibility Report/Environmental Impact Statement
FWMP	Fish and Wildlife Mitigation Plan
msl	mean sea level
NEPA	National Environmental Policy Act
OHWM	Ordinary High Water Mark
PCT	Project Coordination Team
RFMP	Recreation Facilities Modification Plan
ROD	Record of Decision
RSUA	Reallocated Storage Users Agreement
SWSI	State Water Supply Initiative, a study by the CWCB
TBD	To be determined
USACE	U. S. Army Corps of Engineers
USDA	U. S. Department of Agriculture
USC	U. S. Code
USEPA	U. S. Environmental Protection Agency
USFS	U. S. Forest Service
USFWS	U. S. Fish and Wildlife Service
WSA	Water Storage Agreement

# Executive Summary

This Fish, Wildlife and Recreation Mitigation Plan has been prepared in response to the requirements of C.R.S. §37-60-122.2. It identifies actions that the Chatfield Reservoir Storage Reallocation Project Participants will implement to mitigate unavoidable adverse impacts the Chatfield Reallocation Project will have on fish, wildlife, and recreation. (C.R.S. §37-60-122.2 does not require that a mitigation plan for recreation impacts be approved by the Colorado Parks and Wildlife Commission, however, significant efforts will be undertaken to mitigate unavoidable impacts to recreation facilities and amenities. These mitigations are included herein to ensure that Colorado Parks and Wildlife concerns are fully addressed).

The Chatfield Reservoir Storage Reallocation Project (Project) is a project whereby agricultural and municipal water users will use reallocated space in an existing federal facility to develop new water supplies. Chatfield Reservoir is a 350,653 acre foot (AF) reservoir south of Denver built and operated by the U. S. Army Corps of Engineers (USACE).

The USACE currently allows 27,405 AF of water to be stored in Chatfield Reservoir for recreational, environmental and water supply benefits. The Project will reallocate an additional 20,600 AF of flood space for water storage to benefit agricultural and municipal water users in the South Platte Basin resulting in up to 48,000 AF of storage space for recreational, environmental and water supply.

The Project began in 1996, when the Colorado Water Conservation Board (CWCB), as the Project sponsor on behalf of 15 water providers, formally requested that the USACE consider reallocating space within Chatfield Reservoir. This request was in response to a 1986 Congressional authorization allowing the USACE to determine whether additional water could be stored in the reservoir for water supply benefits while not compromising Chatfield's flood control function. The USACE has determined that up to 20,600 AF of space can be reallocated without diminishing the reservoir's flood control capability. The Project Participants currently include eleven municipal and agricultural water users and the CWCB.

This Project will contribute to meeting a portion of the water supply needs of the Project Participants. The reallocation of 20,600 acre-feet of storage is estimated to result in an average annual yield of 8,500 acre-feet of new water supplies. The CWCB Statewide Water Supply Initiative (SWSI) projected that Colorado's population will nearly double by 2050. This means that the water supply shortage in the South Platte basin (including the Denver Metro area), will be at least 100,000 AF per year assuming that previously identified projects such as Chatfield Reallocation are 100% successful. To the extent that identified projects are not all successful, the gap in the South Platte and Metro basins could be as large as 360,000 AF per year. As shown in Table 1-2 of the FR/EIS, the water supply shortage for project participants in 2020 is 119,200 AF with 85,000 AF of the shortage coming from agricultural participants. The

opportunity to use an existing reservoir to store water and develop new surface water supplies partially addresses this significant water supply need.

The Final FR/EIS identifies the reallocation of 20,600 AF as the Tentatively Recommended Plan. The Final FR/EIS was made available for a 90 day public review from June through August, 2012, and the Final FR/EIS has been made available for a 30-day public comment period beginning on August 2, 2013. The Record of Decision is projected to be issued by late 2013 or early 2014.

The Project is located in Chatfield State Park, managed by the Colorado Parks and Wildlife (CPW). Environmental resources at Chatfield State Park will be negatively impacted by increased water storage in Chatfield Reservoir. Higher water levels will inundate some recreation facilities and environmental resources that have developed around the reservoir since it was constructed. In its 38 years of operation, the reservoir generally has been managed to maintain water levels within a 9-foot range (elevation 5,423 – 5,432 feet above mean sea level (msl)). The Project will result in an additional 12 feet of water level fluctuations. The Project will also impact environmental resources above and below Chatfield Reservoir. More detail regarding the actions to mitigate all identified adverse impacts are described in the FR/EIS.

The storage of additional water in Chatfield Reservoir is also expected to have beneficial effects to the aquatic and wildlife environmental resources at or near Chatfield Reservoir. These beneficial effects will include improving the in-reservoir fishery, enhancing raptor and bird habitat as a result of an improved in-reservoir fishery, enhancing the habitat for shoreline avian species and flow augmentation and probable temperature reduction in the South Platte River below the reservoir from summer and fall water releases from Chatfield Reservoir. Some of the mitigation measures will provide additional benefits beyond accomplishing the targeted mitigations. For example, improving habitat in Sugar Creek for the Preble's Meadow Jumping mouse will have the additional benefit of improving habitat for the brook trout fishery in Sugar Creek (an off-site mitigation site).

The Final FR/EIS identified what the USACE considers to be the Project's significant adverse impacts and the mitigations necessary to compensate for them. Project Participants will address additional environmental and recreational concerns identified by Colorado Parks and Wildlife through the adoption and implementation of this State Fish, Wildlife, and Recreation Mitigation Plan. This plan is a compilation of, and includes by reference, the following documents:

- The Final FR/EIS
- The Compensatory Mitigation Plan (CMP) (Appendix K of the Final FR/EIS issued on 6/8/2012),
- The Recreation Facilities Modification Plan (RFMP) (Appendix M of the Final FR/EIS)
- The new Marina Mitigation Plan being developed from an ongoing study,
- The Tree Management Plan (Appendix Z of the Final FR/EIS),

- The USACE Adaptive Management Plan (Appendix GG of the FR/EIS), and
- Comparative Review of Reservoir Fluctuation Zone Chatfield Reallocation Project (Appendix HH of the FR/EIS)

There are two key contracts currently being developed for the Project, The Water Storage Agreement (WSA) and the Reallocated Storage Users Agreement (RSUA). The WSA is a mechanism whereby the USACE grants the permanent right to storage in Chatfield Reservoir in exchange for commitments to fulfill all financial and mitigation obligations. The Water Storage Agreement establishes an oversight committee, called the Project Coordination Team (PCT), consisting of representatives from the USACE, State of Colorado and Project Participants. The PCT will oversee the implementation of all aspects of the project. The USACE has ultimate responsibility for approval of Project plans and the completion of mitigation requirements.

The Chatfield Water Providers are committed to responsibly avoiding, minimizing and mitigating the Project's identified adverse impacts. The adverse impacts to the environmental and recreational resources caused by the Project and the proposed measures to mitigate such impacts, including costs, are summarized in the following Table 1.



Table 1: Chatfield Reallocation Project Fish, Wildlife and Recreation Mitigation Plan (FWRMP)				
Proposed Mitigations for Proposed Action				
RESOURCE	IMPACT	MITIGATIONS	SECTION OF FWRMP WHERE DISCUSSED	ESTIMATED COST
<b>WILDLIFE RESOURCES</b>				
<b>Within Chatfield State Park</b>				
<b>In-Reservoir Aquatics</b>				
Fish - Walleye	Disruption of Walleye Spawn period March 1 - April 15	1) Participants commit to ensure releases do not exceed 420 cfs during March 1 - April 15 period, understanding that critical time is March 15-30. 2) Regular coordination meetings between Participants and CPW to forecast upcoming operations - close coordination to minimize adverse impact from releases.	4.1.3.3(B)(1)	-
Fish - Smallmouth Bass	Disruption of Smallmouth Bass spawn period June 1 - June 30	Mitigation dealt with in operations agreements - Participants commit to limit releases May 1-July 15 water decline will not be greater than 8000 AFT, July 16-Aug 31 water level decline not greater than 4000 AFT, May 1-Aug 31 collective daily discharge shall not exceed 420cfs	4.1.3.3(B)(2)	-
Water Quality	Increase in phosphate and ammonia loading; Decreased Dissolved Oxygen; Increased mercury methylation - from anoxic or increased dissolved oxygen in the reservoir	1) Participants agree to water quality monitoring and modeling program in coordination with Chatfield Watershed Authority. 2) Wetland creation and habitat improvements on Plum Creek in the CMP. 3) Plum Creek riparian restoration.	4.4.1; 4.5; 4.3.2	\$1,300,000 (est.) for water quality monitoring and modeling, \$6,088,600 for Plum Creek restoration
<b>Terrestrial wildlife</b>				
Preble's Mouse - Plum Creek Critical Habitat	75 acres of critical habitat/ 65 EFU's	1) From CMP: Onsite: 6 acres / 3 EFUs habitat creation. 2) From CMP: Offsite: unknown acres private land protection and enhancement / 62 EFU's needed.	4.5	\$58,500,000 for CMP
Preble's Mouse - South Platte Critical Habitat	80 acres/ 2.8 miles	1) From CMP: Onsite: 17 acres habitat creation; 2) Offsite: 73 acres private land protection and enhancement. Chatfield Res Mitigation Company will coordinate w CPW in the development of this process; 3) 4.5 miles and 381 acres of Sugar Creek improvements	4.5	-
Preble's Mouse - Non Critical Habitat	298 acres / 210 EFUs	1) From CMP: Onsite: 111 acres of habitat creation / 43 EFUs. 2) From CMP: Offsite: unknown acres private land protection and enhancement / 167 EFU's needed	4.5	-
Other terrestrial wildlife and Birds	586 acres (inundation zone)/ 377 EFUs	1) From CMP: Onsite: 165 acres habitat creation and enhancement / 9 bird EFU's. 2) Plum Creek Restoration Plan; 3) Tree mitigation plan will address impacts as well. 4) From CMP: Offsite: unknown acres / 368 EFU's needed.	4.5; 4.3.2	-
Amphibians/ Reptiles	Grouped into Preble's/wetlands/terrestrial	Mitigation actions covered under Preble's/wetlands/terrestrial resources	4.5	-
Erosion of land area /habitat	Sediment erosion - due to new storage and water fluctuation	1) Bank stabilization / Erosion control/ Plum Creek erosion and stream erosion	4.3.4; 4.3.2	\$716,100 for shoreline stabilization plan
<b>CMP</b>				
			-	-

Mature Cottonwoods and other cottonwoods	42.5 acres	1) 13 acres - new cottonwood generation on-site (in CMP). 2) 22.5 acres - protection of existing off-site habitat (in CMP). 3) 10 acres - new cottonwood generation off-site (in CMP). 4) Recreation modification plan will mitigate for additional cottonwoods. 5) Tree management plan. 6) Res operations plan - water level in summer.	4.5.3; 5.1.1; 4.5.5; 4.1.3.3	
Wetlands	up to 159 acres / 123 EFU's	1) In CMP: Onsite: 47 acres / 30 EFUs. 2) In CMP: Offsite: Unknown acres / 93 EFU's	4.5	
Invasive Species/ Weeds	Increased invasives	1) BMPs to control spread (in CMP). 2) Monitoring and treatment of noxious weeds in project area (greater than 400ft) 3) Weed monitoring and weed control for 5 years in revegetation / mitigation sites (in CMP and AMP). 4) Weed control in fluctuation zone is ongoing obligation (in CMP).	4.3.3	
<b>DOWNSTREAM OF CHATFIELD STATE PARK</b>				
<b>Aquatic Resources</b>			-	-
Downstream aquatic habitat	Decreased streamflow impact on aquatic habitat; Increased low flows / zero flow days	1) 0.5 mi of stream habitat improvement (Chatfield Dam to Marcy Gulch), potential use of CPW water rights to create an environmental pool to mitigate low flow days. 2) Best efforts to target releases to limit zero flow days and mitigate with environmental pool. 3) Potential development of environmental pool for target releases (first goal) and/or environmental flow releases. 4) Required releases for critical low flows.	4.2.1.2; 4.1.3.3(D)	\$265,000 for .5 mile stream enhancement
Aquatic Habitat - water quality	Increase E.coli from reduced flows; Increase temperature from reduced flows	1) Water quality monitoring program below dam. 2) Best efforts to target releases to limit zero flow days (in operations plan add citation). 3) Required releases for critical low flows. 4) Potential development of environmental pool for target releases and/or environmental flow releases.	4.4.2; 4.1.3.3(D)	
Chatfield State Fish Unit	Decreased flows	Agree not to exercise rights senior to the hatchery if would cause curtailment of CSFU rights (only if historic flows would have passed by CSFU).	4.1.3.3(A); 4.2.3	
	Increase in zero flow days	Potential development of environmental pool and/or environmental flow releases	4.2.1.2	
<b>UPSTREAM OF CHATFIELD STATE PARK</b>				
Aquatic habitat	Inundation of upstream fish habitat - Permanent habitat conversion from sediment deposition; Loss of stream channel for native fish - from inundation impacts on Plum Creek	1) Fund habitat improvement for 0.7 miles upstream. 2) Plum Creed Restoration plan. 3) Wetlands improvements in CMP - might mitigate intermittent stream mileage. 4) Sugar Creek Improvements.	4.2.1.1; 4.5.3; 4.3.2	\$369,600 for .7 mile stream enhancement
<b>RECREATIONAL RESOURCES</b>				
<b>WITHIN CHATFIELD STATE PARK</b>				
Facilities and Recreational Use	Loss of facilities due to inundation.	1) RMP details mitigation measures for facilities and recreational uses - includes contingency approach that gives the plan flexibility. 2) New temporary CPW engineering employee hired during design and construction of recreational facilities	5.1.1; 5.1.3	\$31,600,000 for recreational facilities modification plan, \$225,000 (est.) for temporary resident engineer
	Marina - unusable due to inundation	Chatfield Marina Coordination Committee (CMCC) working on separate mitigation plan for the marina.	5.1.2	\$15,700,000

	Loss of wildlife viewing and shade	1) CMP & Tree Management Plans detail mitigation for wildlife viewing and shade - Plum Creek restoration (if approved) would address access to viewing opportunities. 2) 13 acres of on-site mitigation (for mature cottonwoods). 3) 32.5 acres of offsite mitigation. 4) Tree management plan modified to leave trees down to 5432 and use of adaptive management to remove dead or dying trees within the fluctuation zone.	4.5.3; 4.5.5; 4.3.2	
	Facility vulnerability to future flooding	Could be addressed in the design phase to raise the roads by swim beach, balloon area and Deer Creek - to make roads still able to handle 10 year floods	5.1.1	
	Quality of Recreational Experiences	1) Restrict releases to 8,000 ac/ft total from May 1 - July 15th and 12,000 total to August 31st. 2) Fluctuation zone mitigations that includes: vegetation and weed control, new cottonwood regeneration along shoreline and facilities, shoreline stabilization plan, plum creek improvements.	4.1.3.3; 4.3.3; 4.5.3; 4.3.4; 4.3.2	
	Increased Boating Hazards	Funding of contract labor and equipment for hazard removal, signing, operational impacts due to increased inundation and fluctuations. Operational issues will be covered in the financial mitigation plan.	5.2	
	Water Quality - raised elevation causes erosion which will affect access below campground	1) Monitoring and modeling of water quality. 2)Plum Creek restoration plan	4.4.1; 4.3.2	
	Public Understanding	1) Project Participants have agreed to a marketing plan to be implemented prior to construction and continuing after construction is complete - part of financial mitigation plan, when approved.	5.2	\$200,000
Stream fishing	Reduced Recreational Opportunities - reduced fishing from additional zero or low flow days	1) Establish an environmental pool to mitigate low flow days - use of hatchery, downstream uses. 2) Mitigation of 0.5 mi of stream habitat improvement 3) Operations plan language of good faith efforts to strategic releases.	4.2.1.2; 4.1.3.3(D)	
Stream fishing	Reduced Recreational Opportunities - reduced fishing from intermittent inundation	1) 0.7 mi of stream habitat improvements. 2) Sugar Creek improvements	4.2.1.1; 4.5.3	
<b>Revenue and Operating Expenses</b>				
Park Revenue	Decreased revenues during construction and post construction	1) Financial Mitigation plan. 2) WP to cover lost revenue	5.2	\$1,000,000 (est.) for financial plan
Park Operating	Increased operating expenses	WP to cover increased operating costs attributable to project	5.2	
<b>Estimated Cost Totals</b>				
Costs for mitigations required by the USACE				\$107,100,000
Additional costs for FWRMP mitigations				\$8,864,300
Total Mitigation Costs				\$115,964,300

# 1.0 Introduction

## 1.1 Purpose of Document

This Fish, Wildlife and Recreation Mitigation Plan (Mitigation Plan) has been prepared in response to the requirements of C.R.S. 37-60-122.2 and identifies actions that the Project Participants will implement to mitigate the unavoidable adverse impacts that the Chatfield Reallocation Project will have on fish, wildlife, and recreation. The 122.2 Colorado Statute requires that “fish and wildlife resources that are affected by the construction, operation or maintenance of water diversion, delivery or storage facilities should be mitigated to the extent, and in a manner, that is economically reasonable and maintains a balance between the development of the state’s water resources and the protection of the state’s fish and wildlife resources” and that “impacts on [fish and wildlife] resources should be mitigated by the project applicants in a reasonable manner.”

This Mitigation Plan includes mitigation for recreation impacts and represents the complete mitigation package addressing CPW concerns.

## 1.2 Project Overview

The proposed Chatfield Reallocation Project increases the beneficial components of Chatfield Reservoir by reallocating storage space to facilitate new water supply development.

### Chatfield Reservoir and Chatfield State Park

Chatfield Reservoir is located within Chatfield State Park, southwest of Denver at the confluence of the South Platte River and Plum Creek (Figure 1). The reservoir, owned and operated by the USACE, was completed in 1975 to provide flood protection for the metropolitan Denver area following the disastrous South Platte River flood of 1965.

Chatfield Reservoir has a maximum capacity of 350,653 acre feet (AF). Up to 27,405 AF may currently be stored for recreational and water supply purposes. Denver Water is currently the only water user storing water in Chatfield Reservoir. In general the reservoir has been managed to maintain water levels within a 9-foot range (elevation 5,423 to 5,432 feet above mean sea level (msl)). The average range of mean monthly elevations has been approximately 3 feet from low to high reservoir periods. The current Ordinary High Water Mark (OHWM) elevation is 5,432 feet above msl.

Colorado Parks and Wildlife (CPW) manages recreation at Chatfield Reservoir and Chatfield State Park. Chatfield State Park covers about 5,300 acres, 1,500 acres of which include Chatfield Reservoir. The Park annually receives about 1.6 million “visitor days”, generating about \$2.2 million in revenues that support operations and maintenance of Chatfield State Park and contribute to funding the State park system.

Chatfield Reservoir is one of three walleye brood lakes statewide, providing up to 33 million walleye eggs for stocking in Colorado waters statewide. The South Platte River above and below the reservoir is utilized by anglers on a year round basis and, given its close proximity to the Denver Metro area, is particularly valuable because it provides an opportunity to fish close to home.

CPW owns and operates a fish distribution hatchery unit, located below the dam that plays a critical role in enabling CPW to stock various front-range waters in the spring and summer. This unit is intended to function as a fully operational hatchery but does not due to water availability limitations.

### **History of the Chatfield Reservoir Storage Reallocation Project**

In 1986, in Section 808 of the Water Resources Development Act, Congress authorized the USACE to conduct a reallocation study for joint flood risk management -conservation purposes, including whether storage for municipal and industrial water supply, agriculture, recreation, and fishery habitat protection and enhancement could be accomplished without risk to flood control. The authorization required that the Colorado Department of Natural Resources (DNR) be the local sponsor for the reallocation and that the Chief of Engineers conclude the reallocation is feasible and economically justified.

In 1996, on behalf of 15 water providers, the Colorado Water Conservation Board (CWCB) formally requested that the USACE consider reallocating space within Chatfield Reservoir for water supply purposes.

In 1999, a Feasibility Report and Environmental Impact Statement (FR/EIS) process was initiated to conduct the analyses required by the Chief of Engineers' findings (ER 1105-2-100, Ch. 4). The overall FR/EIS study area encompasses the area in the immediate vicinity of Chatfield Reservoir and extends downstream to where the river intersects the Adams/Weld county line (Figure 1).

The FR/EIS used the CWCB's SWSI, and other relevant planning studies, to identify alternatives for reallocation. A total of 37 concepts were evaluated in the initial screening process. The development of alternatives to reallocation and the screening process are described in detail in Chapter 2 of the FR/EIS. The FR/EIS evaluates, in detail, the environmental, social, and economic effects of the Proposed Recommended Alternative, as well as two other alternatives and a No Action alternative.

The alternative reallocating 20,600 AF of storage space in Chatfield Reservoir is both the locally preferred plan and the USACE's Tentatively "Recommended Plan" (hereinafter referred to as the Chatfield Project). The average annual water yield from the Recommended Plan is estimated at 8,500 AF. This provides a partial solution for the estimated 360,000 AF per year (year 2050) gap in water supply for the Front Range identified in the SWSI study. To the extent that identified projects such as Chatfield Reallocation are 100% successful, the remaining 2050 gap is still estimated to be roughly 100,000 AF per year. As shown in Table 1-2 of the FR/EIS, the water supply shortage for project participants in 2020 is 119,200 AF with 85,000 AF the shortage coming from agricultural participants.

The Final FR/EIS was made available for a 90 day public review from June through August, 2012, and the Final FR/EIS is scheduled for completion by September 30, 2013. The Record of Decision is projected to be issued by late 2013 or early 2014.

The Chatfield Project Participants and their share of the reallocated storage space (Reallocation Space) are given below. The Participants' service areas are shown in Figure 2.

		Storage Amount, AF	% of Total
1	Central Colo. Water Conservancy Dist.	2,849.00	13.83%
2	Western Mutual Ditch Company	1,425.00	6.92%
3	Denver Botanic Gardens at Chatfield	40.00	0.19%
4	Centennial Water and Sanitation Dist.	6,434.94	31.24%
5	Castle Rock	1,013.16	4.92%
6	Castle Pines North Metro Dist.	941.58	4.57%
7	Castle Pines Metro Dist.	785.58	3.81%
8	South Metro Water Supply Authority	1,418.42	6.89%
9	Mount Carbon Metro Dist.	400.00	1.94%
10	Center of Colorado WCD	131.32	0.64%
11	Colorado Water Conservation Board	5,161.00*	25.05%
		20,600.00	

\*Note: CWCB storage amount subject to change pending transfers with other entities

Upon final approval of the Project, the Participants will be responsible for the operation, maintenance, and repair of infrastructure, treatment, and distribution facilities associated with their water and their share of the Project rehabilitation and replacement costs. The Participants would fully fund the environmental mitigation and recreation modifications necessary to mitigate the impacts of operating the reservoir under the storage reallocation. The CPW will be integral in the implementation of the mitigation and will be able to ensure the site-specific plans for on-site mitigation are acceptable and consistent with its management of Chatfield State Park resources.

### 1.3 Regulatory Processes

The Project has undergone significant regulatory scrutiny at the federal, state and local levels. At the federal level, USACE performed extensive and detailed project feasibility and environmental studies pursuant to its regulatory and planning requirements. The culmination of the process is a joint Feasibility Report/ Environmental Impact Statement that will serve as the basis for issuance of the Department of the Army Record of Decision (ROD).

The following federal, state and local regulatory approvals are required to implement the Project:

- Federal: Compliance with Section 404 of the Clean Water Act (CWA) for dredge and fill activities in waters of the U. S. associated with the recreational facilities modification plan and other mitigation incident to the reallocation; Compliance with Section 7 of the Endangered Species Act (ESA) related to impacts to Preble’s mouse and its designated critical habitat; and U. S. Forest Service (USFS) approval for work on USFS land (along Sugar Creek).
- State: Approval by CPW Commission and the Colorado Water Conservation Board of this Fish, Wildlife, and Recreation Mitigation Plan pursuant to C.R.S. §37-60-122.2; Colorado Department of Public Health and Environment (CDPHE) construction permits for air quality, water quality certification for any discharge-related mitigation activities, and permits for stormwater and construction dewatering.
- Local: Douglas County permits for construction work along Sugar Creek and at Chatfield Reservoir; and Jefferson County permits for construction work at Chatfield Reservoir.

## 1.4 Stakeholders

The stakeholder entities include:

- Federal: USACE, USEPA, USFS, and USFWS;
- State: DNR, CWCB, CPW, DWR and CDPHE;
- Local: (In addition to the Project Participants) Denver Water, City of Littleton, South Suburban Parks and Recreation District, City and County of Denver, Douglas County Commissioners, Jefferson County Commissioners, Weld County Commissioners, Metro Wastewater Reclamation District, Chatfield Watershed Authority, and Urban Drainage and Flood Control District; and
- Non-governmental organizations: The Greenway Foundation, Audubon Society of Greater Denver, Colorado Environmental Coalition, Sierra Club, Western Resources Advocates, Trout Unlimited, Chatfield Basin Conservation Network, and The Nature Conservancy.

The Project Participants have consulted and conferred with a broad range of federal, state, local and environmental stakeholders to solicit input on appropriate mitigation of adverse impacts associated with the Project. Public participation efforts included notices and public meetings to meet NEPA requirements during the release and review of the Final FR/EIS. Meetings with stakeholder entities started in 1994 and continued with regularly scheduled, usually monthly, meetings hosted by the Colorado Water Conservation Board.

## **2.0 Avoidance and Minimization of Adverse Impacts**

Throughout the process, the Project Participants sought an environmentally responsible project by, first, seeking to avoid adverse impacts to aquatic and wildlife resources whenever possible; second, minimizing unavoidable adverse impacts; and finally, developing mitigation measures to fully compensate for the remaining adverse impacts of the Project. Below are changes to the original Proposed Action made to avoid and minimize adverse impacts associated with the Project:

### **2.1 Avoidance and Minimization of Aquatic and Wildlife Environmental Impacts**

Actions to avoid or minimize adverse aquatic and wildlife environmental impacts:

- Incorporation of Best Management Practices to clear land to be inundated of vegetation to minimize the nutrient loading into the reservoir.
- Agreement on timing and operational limitations on releases of stored water to avoid adverse impact to the walleye egg collection, other fishery operations, recreation and trees.
- Development of a coordinated operations plan to minimize water level fluctuations during critical recreation and fishery operations.
- The use of adaptive management approaches to minimize adverse impacts as management knowledge is gained from Project implementation. Adaptive management responses will be applied to water quality, vegetation, wildlife, wetlands, and threatened and endangered species.

### **2.2 Avoidance and Minimization of Wetlands and Recreational Impacts**

In order to maintain the recreation experience of Chatfield State Park, recreation infrastructure must be relocated. The preliminary Recreation Facilities Relocation plan was presented to the USACE Denver Regulatory Office to discuss 404 permitting implications and how the discharge of fill material into waters of the U. S. could be avoided or the effects minimized. Each recreation related facility was reviewed and evaluated to determine if it could be located or constructed in a way to avoid or minimize the discharge of fill material into wetlands and other potential impacts to wetlands and sensitive resource areas. While it is feasible to accomplish these activities without a discharge, the desired approach for modification of recreation facilities will involve some discharge of material.

Components of the Recreation Facilities Modification Plan revised to minimize the discharge of dredge or fill material into wetlands and preserve unique recreational amenities include:

- Gravel Pond Area. The plan includes the rebuilding of the dike north of the gravel pond with a new park road on top, in the same location as the existing road, in order to minimize impacts to the surrounding area as well as to preserve the gravel pond. The side slopes of



the road/dike were steepened and the road was realigned to further reduce the filling of wetlands. The road on the east side of the Gravel Pond was realigned to completely avoid the discharge of fill material into wetlands and, to preserve the gravel pond from inundation at 5,444 above msl, will include a new dike at an additional cost of approximately \$500,000. These actions preserve the highly valued and relatively rare recreational experiences of scuba diving, long distance swimming, canoeing and kayaking (without the influence of nearby power boats) at Chatfield.

- North Boat Ramps. The extension of the north boat ramps was revised to minimize the discharge of fill material below the OHWM. Early conceptual alternatives for this area were replaced with a more extensive plan involving reconstruction of the parking lot, entry road, and boat ramps in order to minimize excavation below 5,432 feet above msl and to avoid impacts to wetlands.
- Swim Beach. Alternative configurations of the beach and causeway were analyzed to ultimately develop an approach that minimizes the amount of wetlands filled.
- Catfish Flats. The Catfish Flats recreation area was redesigned to avoid any discharge of dredge or fill material into waters of the U. S., including wetlands.
- Marina Area. The breakwaters of the marina were revised to reduce their footprint and the amount of cut and fill below the OHWM. Substantial modifications of this area were made, including relocation of the entry road, parking lot and facilities, and the reconfiguration of the breakwater.
- Plum Creek Area. The relocation of the Plum Creek Trail went through several iterations to minimize the discharge of fill into wetlands.

## 3.0 Benefits of the Project

### Water Supply Benefits:

- Approximately 8,500 AF average year yield of new renewable surface water supplies are developed from this expanded use of an existing reservoir. These new water supplies benefit water users from Park County, to Douglas County, and to Weld County.
- 20,600 AF of new, on channel storage space is developed at a location high in the South Platte basin.

### Environmental and Recreational Benefits:

- A potentially improved in-lake fishery:

- “New Reservoir” effect of additional water, when available, may result in increased primary productivity within the reservoir and a resulting positive benefit to food chain production in virtually all trophic levels;
- Positive impact to gizzard shad and other forage fish during increased pool elevations, except during mid-May to mid-June; and
- Benefit to crayfish populations from increased shallow water areas with a resulting enhancement of forage for smallmouth and largemouth bass populations.
- New recreational and infrastructure facilities built to current codes.
- Additional water provides additional boating, canoeing or kayaking opportunities.
- Potential benefits to shoreline wildlife:
  - Increased exposure of shorelines may benefit migrating piping plovers; and
  - Increased shoreline areas benefit least terns, ducks, geese and other water birds and shoreline bird species.
- Potential benefits to other bird species from enhanced fishery or other factors:
  - Increased food supply for bald eagle and other raptors;
  - Increased fishery food supply for white pelican and other bird species; and
  - As some trees in the inundation area are left standing, herons and cormorants will benefit from the creation of a more secluded area of trees surrounded by water, providing new nesting habitat; cavity nesting birds will benefit.
- Keeping fallen trees as anchored fish structures would create positive shallow water habitat, so long as they are appropriately marked to prevent being boating hazards.
- Water that is released from Chatfield Reservoir during mid to late summer and throughout the fall and winter, to convey that water to downstream users, would improve the downstream fishery by increasing flow rates and possibly lowering otherwise higher water temperatures.
- New wetlands will be created as mitigation for the Project. These wetlands, along with mitigating the loss of other wetlands, are expected to improve upon current water quality conditions in the South Platte River and Plum Creek.
- Improvements to Plum Creek to repair serious existing degradation and provide some degree of channel stabilization will also enhance or improve water quality, restore wildlife habitat and may improve the fishery.
- The Sugar Creek Mitigation project, designed to preserve and enhance the Preble’s Meadow Jumping Mouse habitat adjacent to Sugar Creek, will provide ancillary benefits to the brook trout fishery in Sugar Creek from reduced sedimentation.

## 4.0 Mitigation of Unavoidable Adverse Impacts: Fish and Wildlife

The storage of up to 20,600 additional AF of water in the Chatfield Reservoir will periodically inundate recreation infrastructure and environmental resources and may result in an additional 12 feet of potential water level fluctuations (Figure 3). The following measures address impacts to fisheries and aquatic habitat, wetland and riparian habitat, recreation and wildlife habitat.

### 4.1 Reservoir Operations Plan

The intent of the Reservoir Operations Plan is to ensure close communications between CPW and the Project Participants regarding reservoir operations and to coordinate operations to lessen impacts from the Project. The plan includes specific commitments designed to minimize the potential for adverse impacts on certain species, habitat and recreation.

#### 4.1.1 General

Uncertainty: Reservoir operations are inherently uncertain due to a variety of factors (fluctuating demands, change in water usage, randomness and high variability of natural phenomena, climate change, extreme events, operational variability, and maintenance). The purpose of the Reservoir Operations Plan is to attempt to lessen the uncertainty associated with these factors.

Yield and Usefulness of the Water from use of the storage space: Subject to the commitments made in section 4.1.3.3 below, CPW will not seek any operation that would result in a reduction of the water right yield or significantly impair the usefulness of the storage space to each Project Participant.

Operations Plan only pertains to water stored by the Project Participants: The provisions of this plan do not change the April 3, 1979 agreement between Denver Water and the State of Colorado Department of Natural Resources related to storage in Chatfield.

#### 4.1.2 Definitions:

Parties: CPW and the Project Participants

Fluctuations: Water being stored and released so as to cause the reservoir level to go up and down.

Good Faith Efforts: Whereby all Parties work together to use economically reasonable methods and means to achieve certain goals while maintaining a mutual understanding that in some situations, such as drought, prolonged periods of below average water years, acts of God, or other circumstances beyond the control of the Chatfield participants, these goals may not be fully attained.

### **4.1.3 Specific Provisions:**

#### **4.1.3.1 Meetings**

Parties will meet bi-monthly February through October of each year to share their knowledge of current conditions and discuss forecasts for future Chatfield operations.

At the meetings, the Parties will review current conditions and forecasts; discuss operational strategies and expected diversions into and deliveries from storage and include fish health information to assist in protecting fish and their habitat.

Sources to be used for forecast information may include NOAA, National Weather Service Climate Prediction Center, Colorado Climate Center Precipitation Monitoring, NRCS, the State Engineers Office, current operating conditions of each participant, Denver Water, and others, as determined by the Parties.

The entities attending the meetings, the frequency and dates of meetings may be changed by mutual consent of the Parties.

#### **4.1.3.2. Water Storage**

Chatfield Reallocation Project Participants may store any legally storable water in Chatfield they are entitled to at any time.

#### **4.1.3.3 Water Releases**

- A. In general, Project Participants, in consultation with CPW, will use good faith efforts to adjust the timing and amount of water releases from Chatfield so as to beneficially impact recreation and the environment. Upon request of CPW, water releases to the South Platte River from Participants' storage accounts will be made through the Chatfield State Fish Unit, so long as the water released can be appropriately administered by the State and Division Engineers and creates no injury to other water rights. CPW will be solely responsible for replacing in time, location and amount any out of priority depletions caused by the Project Participants' water being routed through the Chatfield State Fish Unit.
- B. **1.** From March 1 to April 15, to avoid impacts to walleye spawning, Participants commit to limit the decrease in the reservoir water level elevation from the Participants'

storage accounts to no more than 6" per day (which is equivalent to no more than 420 cfs of outflow in excess of inflow). The participants do not anticipate that, under normal circumstances, their releases will cause a rapidly decreasing pool. The Parties recognize that the only time during the period from March 1 to April 15 that releases would be greater than 6" per day is likely during a flood event or in anticipation of a flood event. In such instances, Project Participants are not responsible for decreases in elevation greater than 6". At all times, Project Participants are only responsible for releases that occur as a result of their use of their stored water.

**2.** To avoid impacts on smallmouth bass spawning, Participants will consult with CPW on operational actions to minimize adverse impacts to smallmouth bass propagation.

C. Participants will limit releases from the reallocated project storage space, as accounted for by the Division of Water Resources and recorded on the Chatfield Storage Accounting Sheet, such that:

**1.** Between May 1 and July 15, the water level decline of that space attributed to Participant releases is not greater than 8,000 AF;

**2.** Between July 16 and August 31, the water level decline attributed to Participant releases will not exceed 4,000 AF; and,

**3.** During the period of May 1 to August 31, the collective daily discharge from the reservoir from the Chatfield Participants shall not exceed 420 cfs of outflow in excess of inflow.

However, the commitments under the above three provisions may be suspended for the remainder of a calendar year if the following two conditions are met:

**1.** At any time during the calendar year prior to August 31 the United States Drought Monitor indicates that a "severe drought" (also known as a D2 Severe Drought) exists for four consecutive weeks anywhere within the Participants source watersheds or service areas.

**2.** Participants who provide a municipal water supply impose some measure of watering restrictions on customers within their service areas.

It is expected that the Parties will use the bi-monthly operational meetings described in Section 4.1.3.1 to forecast whether the above conditions are likely occur in a given year and use good faith efforts to minimize environmental and recreational impacts due to the suspension of these operational commitments.

D. Between July 15 and the following May 1, so long as Participants will not lose yield and are reasonably able to make use of a release of water from storage, Participants will make good faith efforts to work with CPW to time the releases out of Chatfield in a manner that would benefit the fishery and riparian environment downstream of Chatfield dam.

This plan may be changed from time to time only by mutual agreement of the parties.

#### **4.1.4 Adaptive Management for Operations**

Adaptive management uses iterative decision-making to adjust compensatory mitigation to meet the core objectives. Results are evaluated and future actions are adjusted on the basis of what has been learned. Both the Fish, Wildlife and Recreation Mitigation Plan and the FR/EIS recognize that adjustments may need to be made as the mitigation activities in those plans are implemented. The details of the adaptive management required by the USACE are in the document entitled Adaptive Management Plan, which is Appendix GG of the FR/EIS. That document describes the core objectives, uncertainties and contingencies for each of the areas of water quality, reservoir operations, weed control, tree clearing, aquatic life and fisheries, and the subject of the CMP, the Target Environmental Resources.

In addition to unanticipated issues and challenges, the following are examples of what could require adjustments in the Fish, Wildlife and Recreation Mitigation Plan as currently proposed:

- All of the mitigation measures may not be completely successful;
- Some mitigation activities may provide more benefit than currently estimated;
- Other opportunities may become available to provide mitigation; and
- Natural disasters, such as forest fires or floods, could adversely affect mitigation activities.

By their very nature, adaptive management actions are implemented on an “as needed” basis and as informed by monitoring. The monitoring of impacts and mitigation will provide important information and feedback for an iterative process of refining action to minimize impacts and address uncertainties. Annual monitoring reports will include information on needed and proposed adjustments and uncertainties. Monitoring will be concluded when all of the core mitigation objectives are met, which will ultimately be decided by the USACE.

The core objectives for operations are:

1. Determine a target elevation range and seasonal schedule of storage and releases that would minimize adverse effects on the target environmental resources and recreation;
2. Determine operations that could meet the target elevation and seasonal schedule of storage and releases on a “best effort” basis without adversely affecting the yield of the Chatfield Water Providers as identified in this reallocation project;
3. Annually monitor the effects of storage in the reallocated space on the target environmental resources;
4. Continue to explore ways to adjust operations as circumstances allow minimizing adverse effects on the target environmental resources and recreation; and

5. Provide feedback and revisions as needed to the CMP regarding the need for more or less mitigation based on operation of the reallocated storage.

The Adaptive Management Plan, Appendix GG of the FR/EIS, gives further details.

## 4.2 Fisheries and Aquatic Habitat

### 4.2.1 Fisheries and Aquatic Habitat in the South Platte River

#### 4.2.1.1 Habitat and Recreation in the South Platte above Chatfield Reservoir

**Impact** The Project will cause fishery and aquatic habitat to be negatively impacted by inundating up to 0.7 miles upstream of Chatfield Reservoir on the South Platte River and Plum Creek. This section of the South Platte River is a cold water trout fishery used for recreational fishing.

**Mitigation** The Project Participants will fund stream habitat improvements on up to 0.7 miles of the main stem of the South Platte River above Chatfield Reservoir above the highest point of potential inundation from the Project. The purpose of the habitat improvements is to improve the cold water trout fishery. The specific site and project design will be done at the direction of the CPW at a cost of up to \$100 per linear foot (a total of \$369,600 for this project), which the Participants and CPW have determined is adequate to accomplish the necessary stream habitat improvements. The habitat improvement work will be targeted to be completed within five years of issuance of the Record of Decision and before the initiation of storage of water in the reallocated storage space.

In addition, as part of the Compensatory Mitigation Plan, the Participants will implement the Sugar Creek Sediment Mitigation Project to substantially reduce sediment inputs into the approximately 4.5-mile reach of Sugar Creek, tributary to the South Platte River above Chatfield Reservoir. This project's primary goal is the restoration of Preble's mouse critical habitat but Sugar Creek in this area is a reproducing brook trout fishery and the sediment reduction efforts (costing an estimated total of \$3,879,000) will have the ancillary effect of improving the aquatic habitat in Sugar Creek. The Sugar Creek Sediment Mitigation Project is a cooperative project among the US Forest Service, Project Participants and Douglas County, includes 29 new sediment traps, 5 culverts removing an existing fish passage limitation, and other features, and is fully described in Appendix E of the Compensatory Mitigation Plan.

As a third mitigation element, the Participants will construct the Plum Creek Restoration, which is described in further detail later in this document. The Plum Creek Restoration rebuilds portions of Plum Creek that have experienced significant erosion and, when the channel is rebuilt, it will have the benefit of providing more stable fishery habitat for two species of concern, the northern red-belly dace and the common shiner.

#### 4.2.1.2 Habitat and Recreation in the South Platte below Chatfield Reservoir

**Impact** Water will be stored in Chatfield Reservoir from the Reallocation Project when the water is both physically and legally available. Increased storage of water in Chatfield Reservoir will result in additional zero and low flow days which may result in additional loss of stream habitat below Chatfield Reservoir.

#### **Mitigation**

1. **Stream Habitat Improvements:** To mitigate the potential impacts of increased storage in Chatfield Reservoir, the Project Participants will fund stream habitat improvements on up to 0.5 miles of the main stem of the South Platte River downstream of Chatfield Reservoir. The specific site and project design will be done at the direction of the CPW at a cost of \$100 per linear foot (or \$264,000 for this project), which the Participants and CPW have determined is adequate to accomplish this work. The habitat improvement work will be targeted to be completed within five years of issuance of the Record of Decision and before the initiation of storage of water in the reallocated storage space.
2. **Reservoir Operations:** The Reservoir Operations Plan (§4.1 above) includes an agreement wherein the Project Participants who release their stored water through the Chatfield Outlet Manifold and then subsequently leave the water in the South Platte River or divert their water at a downstream location will use their individual and collective good faith efforts to strategically coordinate their releases to assist in decreasing the number of low-flow or zero flow days in the South Platte River below Chatfield Reservoir. Such strategic releases of water provide the opportunity to increase the flows below Chatfield Reservoir when the flows are already low from pre-existing conditions.
3. **Minimum Flow Requirements for Critical Low Flows.** In order to avoid potential adverse effects on water quality during critical low flow periods, The USACE has required the Project Participants to pass flows through Chatfield Dam to the South Platte River during storage events that occur during critical low flows or would cause low flows. The Project Participants have the option to, at their discretion, pass flows or release previously stored water. If the Project Participants choose to release previously stored water, the requirement to pass flows will be deemed to have been met. If the Chatfield Water Providers choose to release previously stored water, they may work with the State Engineer to shepherd the released storage water through the reach sought to be protected by this requirement to any diversion point downstream that any of the Providers are legally entitled to use. The passed flow will equal the critical low flow for the month (Table 2), as measured at the Below Chatfield Gage (PLACHACO gage). The occurrence of critical low flows will be determined by monitoring the Below Chatfield Gage and the critical low flows in Table 2. Any releases required by the USACE will be included in determining operations pursuant to section 4.1 above.



**Table 2. Acute (1-day) low flows (cfs) for the 10-year period 1-Oct-1999 through 30-Sep-2000 for the South Platte River below Chatfield Dam to Marcy Gulch (from Appendix J of FR/EIS).**

Location	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Below Chatfield (cfs)	0.2	0.3	0.4	0.7	5.3	2.0	0.2	0.6	0.2	0.1	0.1	0.2

The Project Participants also have been given the option by the USACE of performing studies and monitoring to determine the effects of storage in the reallocated space on water quality during critical low flows or at times that would reduce existing flows to critical low flows or lower and, based on these studies, propose an alternative to the releases required by the USACE. This mitigation requirement and the study option are set forth in more detail in Appendices GG and J of the FEIS; and

4. **Environmental Pool:** The Project Participants agree to collaborate with the State to create an environmental storage space (Environmental Pool) for the primary purpose of timed releases to alleviate low flow conditions downstream of Chatfield Reservoir. Water stored within the Environmental Pool may also be used to maintain water levels in the reservoir or for augmentation purposes at the Chatfield State Fish Unit. CPW will have control over water stored within the Environmental Pool and will have the authority to make releases as it deems appropriate.

The current proposed volume of the Environmental Pool is 1600 acre-feet, with the possibility of expanding in the future. This includes 1000 acre-feet acquired and controlled by CPW and 600 acre-feet acquired by the State. Additional space may be added to the Environmental Pool if the State has additional shares or Central Colorado Water Conservancy District (Central) makes additional space available for use within the Environmental Pool based on future negotiations.

In order to help ensure that the Environmental Pool will have water available at times when the other Participants are storing water, the Participants agree that the 1000 acre-feet controlled by CPW will be filled under the Central’s 1983 water right (adjudicated in Water Court Case No. 83CW184 and subject to an agreement dated May 12, 2005 between Central and Centennial Water and Sanitation District). Central’s 1983 water right is the most senior of the Participant’s Reallocation storage rights. Per the terms of the 5/12/05 agreement, CPW’s 1000 acre-feet would fill under the 1983 right after Central’s Reallocation Project allocation is filled, and after the first 4100 acre-feet of the Centennial Water and Sanitation District’s allocation is filled. Compensation to Central for this use of the 1983 right will be negotiated separately between Central, the Participants, and the State.

The remaining 600 acre-feet acquired by the State and any additional space added to the Environmental Pool will be filled in priority under CPW’s 1990 or 1994 water right

applications when they are adjudicated by the Water Court or CPW's 2009 adjudicated water right. Participants who are parties to CPW's Water Court applications (Consolidated case nos. 90CW123 and 94CW012) agree to assist CPW in successfully adjudicating these water rights provided it can be determined that they will not injure participant's water rights. In addition to the above mentioned water rights, CPW and/or the State may fill the Environmental Pool with any legally available source of water. However, CPW and Central will work collaboratively on ways for a portion of the 600 acre-feet to fill earlier based on mutually beneficial terms.

#### **4.2.2 Fisheries and Aquatic Habitat within Chatfield Reservoir**

In general, the fishery and aquatic habitat within Chatfield Reservoir is expected to potentially benefit from additional stored water and increase in varied habitat along the reservoir's edges. The potential beneficial effects to the in-reservoir fishery result from the additional water and nutrients stimulating the growth of multiple organisms in the food chain and generally improving the aquatic ecosystem. The populations of some fish and related species (for example, gizzard shad and crayfish) are expected to flourish.

**Impact** Walleye spawning could be negatively impacted if storage of water within the reallocated storage space results in larger or more frequent water level fluctuations during the walleye spawning season (March 1- April 15). The smallmouth bass reproduction could be negatively impacted by larger water level fluctuations during the smallmouth bass spawning season. In addition, increased fish migration out of Chatfield Reservoir may occur, due to higher water release rates.

**Mitigation** The Reservoir Operations Plan (§4.1 above) includes a commitment to limit the timing and magnitude of Participants' water releases during the critical walleye spawning period (March 1 to April 15 each year) so as not to cause the reservoir's water level elevation to decrease faster than one-half foot (6") per day. In addition, the operations plan includes the provision that to avoid impacts on smallmouth bass spawning, Participants will consult with CPW on possible operational actions to minimize adverse impacts to smallmouth bass propagation.

#### **4.2.3 Chatfield State Fish Unit**

CPW operates a facility, the Chatfield State Fish Unit (CSFU), below Chatfield Reservoir that receives water to maintain a fish hatchery that presently serves primarily as a fish holding facility supporting the distribution of fish in the metropolitan area. As discussed in section 4.1.3.3 (A), upon request of CPW, water releases to the South Platte River from Participants' storage accounts will be made through the Chatfield State Fish Unit, so long as the water released can be appropriately administered by the State and Division Engineers and creates no injury to other water rights.

CPW owns a 1980 water right to supply water to the facility. The most senior storage water right allowing storage in Chatfield reservoir for the Project Participants has a later priority date than the CPW water right. Thus, the exercise of the Project Participants' Chatfield storage water rights will not cause injury to the CPW water right. Additionally, change cases that have transferred the historic consumptive use of senior water rights upstream in the South Platte River basin for storage in Chatfield do not cause injury to the CPW 1980 water right. CPW intends to enter into an agreement with the CWCB that would define terms to prevent injury to the CPW Chatfield State Fish Unit water right that may result from the CWCB transfer of "orphan" shares to new water users.

#### **4.2.4 Adaptive Management for Aquatic Life and Fisheries**

As explained in §4.1.4, above, adjustments may need to be made as the Project Participants implement the mitigation activities set forth herein and in the CMP. Any necessary adjustments will be determined using the adaptive management principles and plan set forth in the document entitled Adaptive Management Plan, which is Appendix GG of the FR/EIS. That document describes the core objectives, uncertainties and contingencies for each of the areas of water quality, reservoir operations, weed control, tree clearing, aquatic life and fisheries, and the subject of the CMP, the Target Environmental Resources.

Adaptive management actions will be implemented on an "as needed" basis and as informed by the monitoring of impacts and mitigation on an ongoing basis to ensure the core mitigation objectives are met. Monitoring will be concluded when all of the core mitigation objectives are met, which will ultimately be decided by the USACE.

The core objectives for aquatic life and fisheries are:

1. Determine a target seasonal schedule of releases and maximum flow rate that would minimize adverse effects on CPW's walleye brood stock program and that can be implemented in the operations plan on a "best efforts" basis without adversely affecting the yield of the Chatfield Water Providers;
2. Determine operations that could promote strategic releases from Chatfield Reservoir to reduce the stressors on the aquatic habitat and therefore benefit the South Platte River downstream of Chatfield Reservoir on a "best efforts" basis without adversely affecting the yield of the Chatfield Water Providers;
3. Annually monitor the effects of the aquatic life and fisheries provisions of the operations plan for effectiveness;
4. Continue to explore ways to adjust operations as circumstances allow minimizing adverse effects and maximizing benefits to the aquatic life and fisheries within and below the reservoir; and

5. Provide feedback and revisions as needed regarding the need for possible adjustments to the operations plan based on the ongoing experiences operating the reallocated storage pool.

The Adaptive Management Plan, Appendix GG of the FR/EIS, gives further details.

## 4.3 Fluctuation Zone

### 4.3.1 Fluctuation Zone Mitigation Measures Overview

**Impact** Historic reservoir operations have seen approximate water level fluctuations of up to 9 feet. The uses of the reallocated space will add up to 12 feet of water level fluctuations. The resulting “fluctuation zone” could be up to 21 feet. Periodic inundation of up to 587 acres (the land area within the additional 12 feet of fluctuation) may lead to increased shoreline erosion, undesirable aesthetics, increased mosquitoes, creation of large mudflats, loss of wetlands, loss of wildlife habitat, and new weed proliferation.

**Mitigation** It is uncertain to what extent the conditions described above will occur in the future at Chatfield Reservoir. In response to comments about whether the impacts listed above might occur, the USACE conducted an additional study of six other Front Range reservoirs that have similar physical, hydrologic and recreational characteristics as Chatfield. The reservoirs are Barr Lake, Bear Creek Lake, Cherry Creek Reservoir, Jackson Reservoir, John Martin Reservoir and Pueblo Reservoir. The report, entitled “Comparative Review of Reservoir Fluctuation Zone Chatfield Reallocation Project”, dated November 13, 2012, is Appendix HH of the FR/EIS. The report concluded that:

- Mudflats were rarely observed at any of the reservoirs reviewed and are unlikely to commonly be a component of the fluctuation zone at Chatfield Reservoir;
- Noxious weeds were not commonly observed within the fluctuation zone of the reservoirs reviewed and are unlikely to become a significant problem for the fluctuation zone at Chatfield Reservoir;
- The establishment of vegetation within the fluctuation zone can vary widely in terms of vegetation cover and species composition;
- The reservoirs reviewed provide significant wildlife habitat even with, and sometimes because of, their broad fluctuation zones; and
- Reservoirs with substantial elevation swings in the fluctuation zone continue to support substantial recreation visitation.

Nevertheless, the Chatfield Participants propose the following mitigation measures to compensate for the possible adverse impacts from the creation of a larger fluctuation zone:

- 1. Reservoir Operations Plan:** Because the Operations Plan allows the relatively rapid removal of up to 6 feet of the stored water within the months of the growing season, the reallocated storage pool may be operated to lessen the amount of vegetation that is lost from inundation, therefore decreasing the size of a fluctuation zone bare of vegetation. The Operations Plan (§4.1 above) includes the flexibility for release of 8,000 AF of water between May 1 and June 15 and an additional 4,000 AF of water between June 15 and August 31. These releases of water have the potential of lowering the reservoir water level up to 6 feet in this period; if this can be accomplished within the timeframe that the vegetation can tolerate inundation (which, depending on the vegetation, is estimated as being up to three months), then up to 6 feet of vegetation, or approximately 220 acres of vegetation, may not be lost. The resulting fluctuation zone will have retained its upper 6 feet of vegetation, lessening the newly impacted area by up to 50%. The mitigation requirements in the CMP are based on the actual vegetation lost, as measured periodically over time. Thus, the Project Participants are strongly motivated to minimize the amount of lost vegetation and will be able to attempt to remove some of the stored water relatively quickly to prevent vegetation from being lost.
- 2. Plum Creek Restoration:** Plum Creek is currently experiencing environmental impacts from a stream erosion problem located above the area that will be inundated by the Project. Current devastating changes taking place including the major loss of vegetation, wildlife habitat, and degradation of water quality in the reservoir. These conditions have not been caused by the Chatfield Reallocation Project, and, at present, are not being addressed or corrected by any entity. The proposed Plum Creek Restoration is a major construction effort to restore Plum Creek to a more stable condition. The current Plum Creek erosion and vegetation deterioration extends approximately 3,400 lineal feet and is progressing upstream at an estimated rate of approximately 300 feet per year. The proposed construction would be designed to repair the current devastation and to minimize the future threat to the entire Plum Creek riparian corridor within the Chatfield Park boundaries. This mitigation is a major, costly undertaking of such a magnitude (estimated at \$6,088,600) that it is proposed by the Participants (along with Reservoir Operations, weed control and shoreline stabilization) as the means to adequately compensate for the Project's potential adverse effects to the fluctuation zone.
- 3. Noxious and Invasive Weed Control:** The CMP and the Adaptive Management Plan detail measures to address weed control within the fluctuation zone. In short, The Project Participants will take permanent responsibility for controlling the spread of noxious weeds associated with the Project's increase in water level fluctuations.

- 4. Shoreline Stabilization Plan:** The water level fluctuations on the southeast shoreline of the South Platte River arm of the reservoir contains steeper banks where existing fishing, boat docking and picnicking activities will be affected by water level fluctuations. Improvements are proposed to re-contour this area to maintain the recreational uses and improve the trail access in this area.

The Plum Creek restoration, noxious weed control and shoreline stabilization mitigations are more fully described below:

### 4.3.2 Plum Creek Restoration

The following information is a summary of work done for the Project Participants by Muller Engineering in 2012 and 2013 to understand the existing conditions on Plum Creek and to propose measures to eliminate the ongoing environmental degradation and protect the environmental resources that remain.

**Existing Conditions:** Field reconnaissance in 2012 along Plum Creek identified a large area of severe degradation upstream from where the Reallocation Project will impact Plum Creek. Multiple parallel channels have eroded up to at least ten feet deep in the upstream reaches of Plum Creek. As a result of the drop in localized water levels resulting from the erosion, the riparian and wetland vegetation adjacent to the eroded reaches was severely impaired and numerous trees and other vegetation, including wetlands vegetation, were either dead or dying. If the erosion problem continues to spread, it will cause extensive degradation to the Plum Creek riparian corridor and have continued adverse water quality impacts to Chatfield Reservoir from the release of nutrients in the eroded soils and decayed vegetation. The erosion is traveling upstream at a rapid pace (estimated as 300 feet per year), and threatens a large portion of the 395 acre Plum Creek alluvial basin within the USACE’s Chatfield Reservoir property. See Figures 4 and 5.

In general, the Plum Creek channel is a very dynamic stream system. The channel is comprised of sand and small gravel material that is easily mobilized. The valley bottom within the park limits is extremely wide with a typical width of over 1500 feet. Within this



wide valley bottom, there are two to three active channels that are 20 to 40 feet wide and convey base flows and small runoff events. These active channels appear to move and change location yearly and they convey a significant amount of sediment even during base flow conditions. This channel movement and braided condition appears to be primarily the result of a large inflow of sediment from upstream resulting from the gradual readjustment of sediments deposited from the major flood event on Plum Creek in June 1965.

The corridor is well vegetated with riparian and wetland vegetation including extensive stands of woody vegetation, such as sandbar willow shrubs, crack and peachleaf willow trees, and cottonwood trees. Riparian and wetland grasses include cattails, Baltic rush, and woolly sedge. Overall the Plum Creek channel within the park limits is an aggrading and braided stream system. The entire assessment of the condition of Plum Creek and proposed solutions developed by Muller Engineering can be found in their report entitled “Plum Creek Stream Stability Assessment”, dated April 2, 2013.

### **Environmental Impacts:**



The Plum Creek channel degradation and erosion problem has already had significant environmental impacts and these impacts will become more extensive in the future. These impacts include:

- Degradation of water quality in the creek and downstream reservoir due to elevated sediment loads from the channel degradation increasing turbidity and nutrient levels;
- Elevated erosion potential due to concentrated flood flows and increased velocities from the degraded channels;
- Significant loss of wetland and riparian vegetation due to lower groundwater levels in the degraded reaches;
- Weakened floodplain erosion resistance during large flood events; and
- Impaired wildlife habitat due to the loss of wetland and riparian vegetation along Plum Creek. The Plum Creek corridor is habitat for numerous wildlife including coyotes, deer, foxes, amphibians, birds, raptors, rabbits, and mice including the Preble’s meadow jumping mouse, currently a Threatened and Endangered species.

The total area of the current riparian degradation zone is estimated to be 37 acres. The area of the potential future riparian degradation is 395 acres and is shown to extend all the way upstream to the Park limits at the High Line Canal siphon crossing. While the limits of the potential future degradation zone are very conservative and would take many years to occur, it is expected that the current channel degradation and associated riparian degradation will expand and migrate upstream relatively quickly given the easily eroded sand and gravel material within Plum Creek.

### **Infrastructure Impacts:**

The Plum Creek channel degradation and erosion problem is and will continue to impact park infrastructure including:

- Trails and parking lots. One parking lot is located only 400 feet upstream of the active headcuts in the downstream reach. These headcuts are migrating upstream and it is highly probable that in a few years the parking lot will be damaged if no action is taken. Several trails are already being inundated;
- Elevated sediment inflow to the reservoir which is and will continue to reduce water storage capacity; and
- Creation of debris in the reservoir after large flood events due to the numerous dead or dying trees.

### **Conceptual Stream Restoration Improvements:**

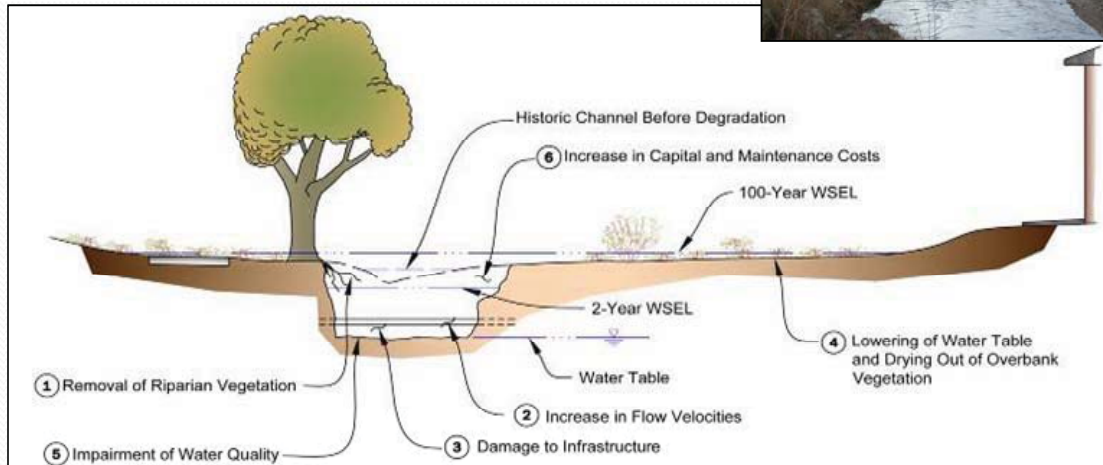
**Drop Structures.** A conceptual plan for stream restoration improvements was developed for the reach. The backbone of the restoration concept consists of raising and restoring the invert of the incised active channels to their pre-incised conditions. To achieve this, small drop structures are proposed to hold the raised condition and provide a



flatter, more stable longitudinal slope of 0.2% compared to its present slope from .32 to .67%. Raising the active channel invert will help to spread flows out into the wide floodplain valley



## Degraded channel

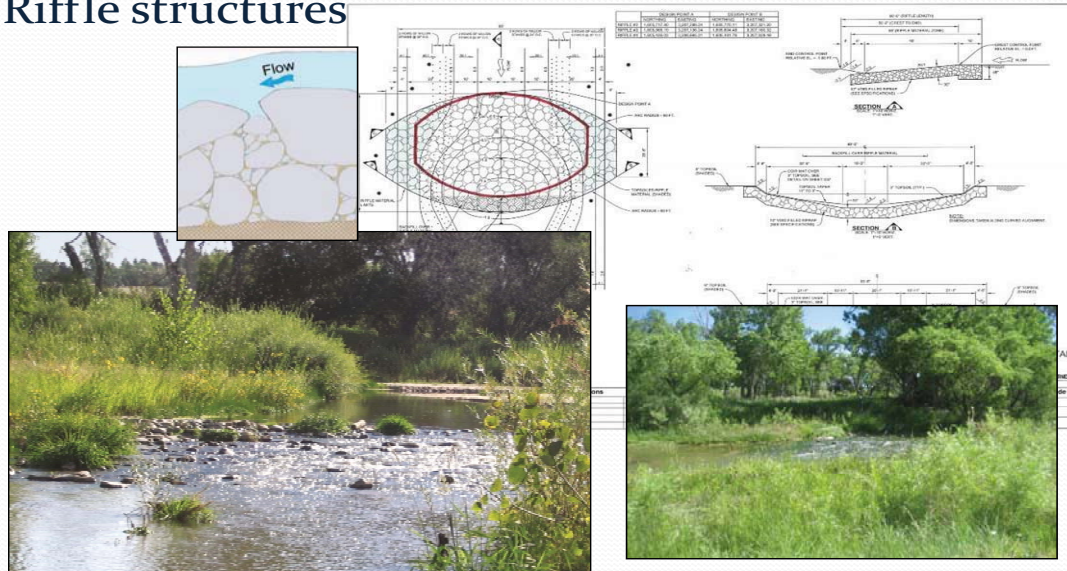


Degradation creates unstable, incised channel with dried-out, stressed overbank vegetation.

during storms and reduce the erosive stresses on the active channel banks. Allowing high runoff events to flood the valley also provides vegetative filtering and soil infiltration both which immobilize pollutants and enhance water quality of the system. In general, Muller Engineering recommends that low height drop structures (approximately 1 to 1.5-foot drop heights) be used. See Figure 6. By using low-height drops, the active channel inverts can be restored in a manner that more closely matches the original channel grades and also provides for a more uniform channel depth throughout the restored reaches. A conceptual layout of drop structures is provided in the full Muller report. The restoration plan recommends a total of 40 drop structures in the downstream reach and 18 drop structures in the upstream reach with drop heights varying in height from 1.0 to 1.3-feet.

Muller Engineering determined that riffle drop structures will work well for Plum Creek given that they are very natural looking in appearance and function well in low drop height situations. Riffle-pool complexes – rocky chutes alternating with deeper stiller water – are commonly found in gravel and cobble bed streams and are nature’s way of dissipating energy. Even low-gradient sand-bed streams, like Plum Creek, develop occasional riffles made up of coarser, gravel material but typically the rock is not large enough to withstand large flood events.

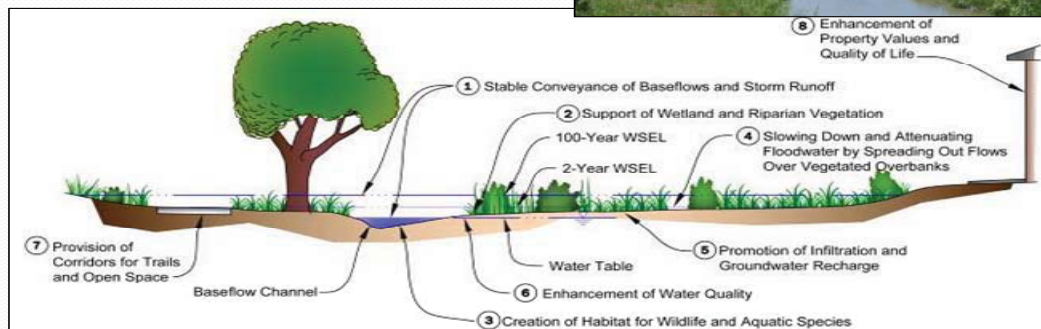
## Riffle structures



**Bank Protection.** The drop structures will also help to improve the stability of the channel banks. With the flatter slope and the raised/restored channel invert, flows will spread out into the adjacent floodplain more quickly and reduce flow velocities within the low flow channel. This will reduce erosive stresses on the banks. Muller recommends additional bank protection at some of the sharper bend locations. The first improvement recommended for banks is to widen the channel and provide a preformed scour hole at the bend locations. Muller observed naturally occurring widening and scour-hole formation at the bends and felt that incorporating these elements at the bends will help to further dissipate flow energy during storms. Secondly, additional riprap toe protection combined with willow logs and stakes is recommended at

## Raise channel invert

- Enhance water quality
- Improve wildlife habitat
- Reduce velocities



several of the sharper bends.

The ultimate design of stream restoration improvements on Plum Creek will be based on a detailed geomorphic evaluation and final design process guided by collaboration with a number of stakeholders and review agencies including the Division of Parks and Wildlife; therefore, the ultimate design configuration for Plum Creek will evolve and be refined from the conceptual approach shown. Sediment equilibrium approaches will be fully investigated, including qualitative and quantitative analyses (comparing anticipated sediment supply to transport capacity of the restored reach over a full spectrum of flow events). Channel alignment and form will also be considered, exploring channel width, depth, sinuosity, and meander length.

#### **Cost Estimate:**

The conceptual level cost estimate for the 3,400 linear feet of the eroded reach from Station 21+00 to 65+00 proposed to be funded by the Project Participants is \$6,088,600. This is approximately \$886,000 less than the estimated costs for this work of \$6,974,636 identified by Muller Engineering. To make up that difference, Participants will aid CPW in attempting to secure the full project amount by using the cash payments as leverage in pursuing grants or other project funding opportunities to obtain additional funding. If such funding cannot be secured, the project will be appropriately scaled back. The project includes the construction of 33 larger riffle drop structures, 7 smaller riffle drop structures, bank protection and significant earthwork, among other project components.

### **4.3.3 Noxious and Invasive Weed Control**

**Impact** There may be a greater proliferation of noxious or invasive weeds due to more frequent water level fluctuations and disturbance of soils as part of new facilities construction and habitat conversions. Future water level fluctuations can also cause noxious weeds to more easily establish in the moist soils available to them as water levels decline. Upland areas within Chatfield State Park will be disturbed during the relocation of recreational facilities; creating opportunities for the establishment of noxious weeds, (e.g., borrow areas, temporary access and haul roads, relocation of utilities, and construction of the relocated recreational facilities).

**Mitigation** The Project Participants will take responsibility for controlling the spread of noxious or invasive weeds associated with the Project's increase in water level fluctuations.

Best management practices (BMPs) will be used to minimize the spread of noxious weeds (List A, B, and C species) at all areas where spreading of noxious weeds might occur. Implementing these BMPs will minimize the dispersal of noxious weeds and reduce the need for future weed control actions. The following BMPs will be implemented with compensatory mitigation actions that involve land disturbance:

- Major equipment (e.g., track equipment, rubber tire loaders, and backhoes) will be cleaned by high pressure air or water spray before being delivered to the project area to avoid introducing undesirable plants and noxious weeds.
- Topsoil containing any noxious weeds (List A, B, or C species) will not be used or otherwise will be strictly managed to preclude the spread of seeds and noxious weed species.
- Fertilizer or other soil amendments will not be used unless recommended by a re-vegetation specialist based on site-specific conditions. The use of fertilizers will be restricted because they can promote noxious weeds and can be detrimental to the native species in the seed mix.
- Disturbed areas will be reclaimed as soon as practicable after completion of construction and seeded with an appropriate native seed mix (certified as noxious weed-free).
- Certified weed-free mulch will be used for re-vegetation. Weed-free straw bales will be used for sediment barriers.
- Locally or regionally available seed and mulch will be used when practicable.

The project area will be monitored to determine if noxious weeds have invaded. Any noxious weeds found will be controlled as soon as practicable to prevent establishment.

The site-specific EFU replacement plans will include the following:

- A list of plant materials to be used including species (common and scientific name), type (e.g., balled and burlap tree, container, bare root, and stakes), size, quantity, and schedule;
- A planting and/or seeding plan including specifications for planting, plant spacing, temporary irrigation, and mulching. Seeding plans will include species (common and scientific name), percent of species in seed mix, seeding rate, seed bed preparation, seed application, schedule, and mulching;
- Weed control plans; and
- A monitoring plan to determine success.

Each disturbance of a vegetated upland within Chatfield State Park will require the restoration and re-vegetation of the disturbance according to established re-vegetation guidelines. The general re-vegetation requirements for disturbances in Chatfield State Park are presented in the CMP; Appendix F, Guidelines for the Restoration and Re-vegetation of Temporarily Disturbed Upland Areas at Chatfield State Park. Detailed, construction-level specifications that follow these guidelines will be included in the construction plans for any activity that temporarily disturbs upland vegetation and/or soil. These plans will be subject to review by CPW.

The re-vegetated sites will be monitored annually, during the growing season. The first two years of monitoring will be qualitative to determine if re-vegetation is progressing. Following the first two full growing seasons, monitoring will consist of the following:

- A visual inspection to determine if the areas seeded have germinated and are becoming established;
- A determination of the presence and distribution of bare areas<sup>1</sup> greater than 400 square feet;
- A determination of the presence and distribution of noxious weeds comprising 10 percent or more of the estimated vegetative ground cover or any area greater than 400 square feet dominated by noxious weeds<sup>2</sup>; and
- Photographic documentation of the re-vegetated area taken from fixed points for year-to-year comparisons.

The presence of bare areas greater than 400 square feet will require reseeding the bare areas per the re-vegetation guidelines. The presence of noxious weeds greater than 400 square feet will require weed control measures. C-list weed species will be controlled in the re-vegetation areas consistent with Chatfield State Parks management of C-list weed species.

The success criteria for vegetation mitigation are:

- Average ground cover is 90 percent or greater than the selected reference area;
- The relative cover of native species is 90 percent or greater than the reference area;
- Noxious weeds comprise less than 20 percent of the average estimated vegetated ground cover; and
- No area greater than 800 square feet is dominated by noxious weeds.

#### **4.3.3.1 Adaptive Management for Weed Control**

As more fully described in §4.1.4, above, adaptive management actions, as determined using the USACE Adaptive Management Plan set forth in Appendix GG of the FR/EIS, will be implemented on an “as needed” basis and as informed by the monitoring of impacts and mitigation on an ongoing basis to ensure the core mitigation objectives are met.

Monitoring will be concluded when all of the core mitigation objectives are met, which will ultimately be decided by the USACE.

The core objectives for weed control are:

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<sup>1</sup> For the purposes of the qualitative monitoring, “bare areas” are defined as areas where seed has not germinated or on average there is less than one desirable plant per square foot.

<sup>2</sup> For the purposes of the Compensatory Mitigation Plan, “noxious weeds” are those weeds listed in the Colorado Noxious Weed Act.

1. Eradicate all “A List” weeds on the State’s noxious weed list ([www.colorado.gov/cs/Satellite/ag\\_Conservation/CBON/1251618780047](http://www.colorado.gov/cs/Satellite/ag_Conservation/CBON/1251618780047));
2. Eradicate salt cedar (Tamarisk ramosissima); and
3. Control leafy spurge (Euphorbia esula), Russian olive (Elaeagnus angustifolia), cocklebur (Xanthium strumarium), and all “B List” species on the state’s noxious weeds list.

The Adaptive Management Plan, Appendix GG of the FR/EIS, gives further details.

#### **4.3.4 Shoreline Stabilization Plan**

**Impact** The increase in water levels along the shoreline on the Southeast side of the South Platte arm of the reservoir contains areas where boaters, fishermen and campground patrons use the existing gradual shoreline and short beach areas. The higher water levels will result in a reduction in this recreational use because the existing landforms consist of relatively steep banks which would not accommodate the same fishing, boat docking and picnicking shoreline activity.

**Mitigation** A plan has been developed, as shown in Figure 7, where a combination of improvements will be made with the goals of:

- Improving access to the area for users of the campground and others by making improvements to 5 access trails in the area. These trails are now often steep, crumbly, and somewhat treacherous, gravel paths. The improvements, consisting of new boulder steps, will significantly improve the safety of using these trails and their long term stability. Approximately 1100 linear feet of total trail improvements will be made.
- Stabilizing the banks using riprap at the existing overlook at the former heron rookery so that higher water levels do not cause degradation of the banks. This work will seek to remove any threat that the overlook will be adversely affected by new water level fluctuations.
- Creating new boat landing and fisherman access areas at higher water level elevations at 4 shoreline locations to accommodate the use by boaters and fisherman in these areas at higher water levels. This is a high use area by users of the several nearby campgrounds.

The improvements will continue the use of the areas as an attractive beach and picnic area for both boaters and users of the nearby campgrounds. The total estimated expense of the improvements is \$716,100.

## 4.4 Water Quality

### 4.4.1 Water Quality within Chatfield Reservoir

**Impact** All of the following impacts currently occur at Chatfield Reservoir, but may increase in frequency and/or magnitude with the Chatfield Reallocation Project. Aquatic species within Chatfield Reservoir could be harmed by:

- The increased erosion of fine sediment caused by wave or wind action from water levels at higher levels from storage of water within the reallocated storage space and increased fluctuations.
- Decreased dissolved oxygen levels within localized areas of the Chatfield Reservoir due to the inundation of vegetation. The decomposition process increases biological oxygen demand.
- Exposure to higher levels of mercury by lower dissolved oxygen causing the methylation of mercury, which may be picked up in the food chain.
- Increased phosphate and ammonia loading as a result of periodic inundation and decomposition of vegetation also lowering dissolved oxygen.

**Mitigation** The following three actions will mitigate the potential impacts to water quality within Chatfield Reservoir:

- 1) **Water Quality Monitoring and Modeling.** As part of adaptive management, a water quality monitoring and modeling program, including the application of a dynamic water quality model, will be developed to assess the water quality changes to Chatfield Reservoir associated with the Project. The monitoring program will be conducted in coordination with the Chatfield Watershed Authority, the state designated water quality protection agency for Chatfield. The monitoring program will follow the specific directions as to the nature and extent of monitoring activities described in the Adaptive Management Plan. If the monitoring indicates the Chatfield Reallocation Project is the cause of adverse impacts to water quality, then compensatory mitigation measures will be implemented. The Participants' mitigation obligation for water quality impacts will be offset by the measured or calculated water quality benefits/improvements resulting from the Plum Creek Restoration or other projects.
- 2) **South Platte River and Plum Creek Wetlands Creation.** The habitat improvements and creation of new wetlands along the South Platte River and Plum Creek as part of the CMP will improve water quality. Wetland design concepts will be reviewed by the Chatfield Watershed Authority to identify design elements that may further enhance water quality. The monitoring program will identify the water quality benefits from creation of new wetlands.

- 3) **Plum Creek Restoration.** The Plum Creek restoration is designed to stop the significant erosion now occurring into Chatfield Reservoir, which has been causing significant nutrients and sediments to enter the reservoir. This project is further described above.

#### 4.4.2 Water Quality in the South Platte River below Chatfield Reservoir

**Impact** The Project may result in an increase in the time when lower flow rates impair water quality downstream of Chatfield Reservoir.

**Mitigation** The mitigation for possible water quality impairment below Chatfield includes the following:

1. **Water Quality Monitoring.** As part of adaptive management, the water quality monitoring program described above will include monitoring within several thousand feet downstream of Chatfield, in coordination with the Chatfield Watershed Authority and other existing water quality monitoring programs. The monitoring program also will make use of the water quality monitoring activities of others on the South Platte River below Chatfield;
2. **The Reservoir Operations Plan.** The Reservoir Operations Plan provides that Project Participants will use their individual and collective good faith efforts to coordinate releases in a strategic manner to assist in minimizing the number of low-flow or zero-flow days in the South Platte River below Chatfield Reservoir and to assist in the flow availability at the Chatfield State Fish Unit. The strategic release of flows during times of otherwise low flows will result in water quality improvement to the stream below Chatfield Reservoir;
3. **Minimum Flow Requirements for Critical Low Flows.** In order to avoid potential adverse effects on water quality during critical low flow periods, The USACE has required the Project Participants to pass flows through Chatfield Dam to the South Platte River during storage events that occur during critical low flows or would cause low flows. The Project Participants have the option to, at their discretion, pass flows or release previously stored water. If the Project Participants choose to release previously stored water, the requirement to pass flows will be deemed to have been met. If the Chatfield Water Providers choose to release previously stored water, they may work with the State Engineer to shepherd the released storage water through the reach sought to be protected by this requirement to any diversion point downstream that any of the Providers are legally entitled to use. The passed flow will equal the critical low flow for the month (Table 2), as measured at the Below Chatfield Gage (PLACHACO gage). The occurrence of critical low flows will be determined by monitoring the Below Chatfield Gage and the critical low flows in Table 2. Any releases required by the USACE will be included in determining operations pursuant to section 4.1 above.



**Table 2. Acute (1-day) low flows (cfs) for the 10-year period 1-Oct-1999 through 30-Sep-2000 for the South Platte River below Chatfield Dam to Marcy Gulch (from Appendix J of FR/EIS).**

Location	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Below Chatfield (cfs)	0.2	0.3	0.4	0.7	5.3	2.0	0.2	0.6	0.2	0.1	0.1	0.2

The Project Participants also have been given the option by the USACE of performing studies and monitoring to determine the effects of storage in the reallocated space on water quality during critical low flows or at times that would reduce existing flows to critical low flows or lower and, based on these studies, propose an alternative to the releases required by the USACE. This mitigation requirement and the study option are set forth in more detail in Appendices GG and J of the FEIS; and

4. **Environmental Pool.** As described in section 4.2.1.2.

#### **4.4.3 Adaptive Management for Water Quality**

As explained in §4.1.4, above, adjustments may need to be made as the Project Participants implement the mitigation activities set forth herein and in the CMP. Any necessary adjustments will be determined using the USACE Adaptive Management Plan set forth in Appendix GG of the FR/EIS.

The monitoring program described in this §4.4 will follow the specific directions set forth in the USACE Adaptive Management Plan. Monitoring will be concluded when all of the core mitigation objectives are met, which will ultimately be decided by the USACE.

The core objectives for water quality are:

1. Internal loading from “new” anoxic sediments attributed to reallocation pool level increases will not be the sole cause for chlorophyll a and total phosphorus standards to be exceeded.
2. External loading from “newly” inundated vegetation attributed to reallocation pool level increases will not cause water quality standards for chlorophyll a and total phosphorus or the total phosphorus TMAL to be exceeded.
3. Expansion of hypoxic conditions and potential release of reduced contaminants from anaerobic sediments will not cause other water quality standards (i.e., other than chlorophyll and total phosphorus) to be exceeded.

The Adaptive Management Plan, Appendix GG of the FR/EIS, gives further details.

## **4.5 Wildlife, Wetlands and Riparian Habitat**

**Impact** Terrestrial wildlife will be impacted from the Project through loss of wetland and riparian habitat from inundation of new areas and facilities construction. The wildlife impacted by the Project includes terrestrial mammals, including the Preble’s meadow jumping mouse and its designated critical habitat, reptiles, amphibians and bird species.

In the worst case of maximum inundation and vegetation destruction to 5,444 ft. above msl, about 789 acres of environmental resources are estimated to be temporarily or permanently impacted by the Project, due to inundation and construction disturbance. Of the 789 acres impacted, 586 acres are impacted from inundation and 203 acres from construction activities.

### **Mitigation**

The Compensatory Mitigation Plan (CMP) has been created by the USACE to address the impacts to wildlife, wetlands and riparian habitat. The CMP is Appendix K of the FR/EIS and is summarized below.

#### **4.5.1 Overview of the Compensatory Mitigation Plan**

The USACE developed the CMP to address unavoidable environmental impacts associated with the Recommended Plan in the FR/EIS, the reallocation of 20,600 AF of storage space. The CMP has been developed at a feasibility level and considers the ecological resources that will be adversely affected to a sufficient degree and detail to enable a reasoned judgment whether the recommended compensatory mitigation will be implementable and adequate to compensate for the functions and values of the resources to be impacted.

The Final FR/EIS identified Preble’s meadow jumping mouse habitat, bird habitat and wetlands as resources of particular concern and warranting specific mitigation strategies for the estimated adverse impacts to those resources. These resources are referred to as the “Target Environmental Resources” in the CMP.

The CMP is a lengthy, detailed document. The CMP describes the proposed mitigation activities with sufficient specificity to understand why the mitigation proposed is appropriate and adequate. Although the CMP focuses mitigation activities on the Target Environmental Resources, it is structured to provide a diversity of ecological functions for a broad range of wildlife including birds, insects, amphibians, reptiles, and mammals.

The USACE's planning process created a plan that first avoided and then minimized negative impacts to the Target Environmental Resources. The CMP addresses the remaining unavoidable impacts associated with the Chatfield Project. The CMP was developed with substantial input from the stakeholders listed in §1.4 above.

The CMP is designed to replace the lost ecological functions and values, called ecological function units or EFUs, of the Target Environmental Resources from the effects of inundation, the relocation of recreational facilities, the use of borrow areas, and other construction activities. It establishes quantifiable objectives and maximizes the amount of mitigation that will occur on USACE lands in the vicinity of Chatfield Reservoir. The CMP also provides for ongoing monitoring, reporting, and adaptive management.

The CMP specifies:

- The location of the mitigation activities (maximizing on-site mitigation);
- The activities that will occur;
- When the activities will occur;
- The approximate scope of the activities;
- The estimated range of EFUs (further described below) to be created; and
- The criteria for determining success of the mitigation activity.

To ensure that the CMP is successfully implemented, the CMP establishes mitigation implementation milestones (section 7.2.2 of the CMP); specifies criteria for determining success of the mitigation activity (Adaptive Management Plan, Appendix GG, page 8); requires periodic monitoring; requires reporting to an implementation activities oversight committee, and requires meeting success criteria as a condition to storage. The mitigation milestones assure that the mitigation will be accomplished. Furthermore, the Project Participants have agreed to set aside 100% of the estimated expense of all mitigation activities into an escrow fund at the initiation of project implementation to assure the availability of all the funds needed to complete the mitigation activities.

The CMP estimates that it will take 6 years to implement the necessary mitigation and cost approximately \$58.5 million (near-term costs only) for on- and off-site mitigation activities, including monitoring and maintenance. Upon final approval of the Project, the Participants will be responsible for the operation, maintenance, and repair of infrastructure, treatment, and distribution facilities associated with their water and their share of the Project rehabilitation and replacement costs. The Participants solely will fund the environmental mitigation and recreation modifications necessary to mitigate the impacts of operating the reservoir under the storage reallocation.

#### State Involvement and Oversight of the Mitigation Process

The CWCB will enter into a storage contract, called the Water Supply Agreement (WSA), with the USACE for the reallocated space. Each of the Project Participants will then enter into an assignment contract with the CWCB, called the Reallocated Storage Users Agreement (RSUA)

where the right to store in Chatfield is assigned in return for taking on the financial and mitigation obligations of the Project. The WSA includes provisions that form the Project Coordination Team (PCT), consisting of co-chairs of the USACE, a CDNR representative and a Participant representative, which will oversee all project implementation actions.

The PCT will be responsible for determining when the defined CMP objectives have been met and the impacts to the Target Environmental Resources have been fully mitigated. The PCT can adjust the environmental mitigation requirements if it is determined that the actual impacts to the Target Environmental Resources are less than the maximum impact estimate.

The Participants also will form a new entity, the Chatfield Reservoir Mitigation Company, to coordinate the Participants' activities to fulfill the financial and mitigation commitments. All Project Participants must be members of the Mitigation Company, which would include the CWCB or any other state entity, if it retains or acquires a storage space allocation.

CPW will have a significant role in overseeing, monitoring and implementing the CMP. For example, CPW will review all design plans for on-site mitigation activities for acceptability and consistency with management of Chatfield State Park, participate in the decision-making related to all construction activities and review all post-construction monitoring reports to see that the mitigation activities satisfy the defined success criteria.

#### **4.5.2 CMP Mitigation Approach**

The CMP is ecologically based. The "currency" of the CMP is ecological functional units (EFUs). This ecological functions approach was taken because of the substantial geographic overlap in the Target Environmental Resources. For example, Preble's habitat is generally located adjacent to wetlands in riparian areas. The EFUs capture the ecological functions provided by the individual Target Environmental Resources as well as their overlap. The methodology to calculate EFUs is explained in section 7.1.4 of the CMP.

The mitigation actions will include habitat conversions, such as changing upland grasslands to new wetlands, habitat improvements or enhancements, such as adding new vegetation or weed control, or habitat restoration at disturbed areas. EFUs will be used as the quantification of improvements by measuring the EFUs in a given area before and after the mitigation activities.

Thus, the CMP discusses mitigation obligations in terms of the EFUs that are lost and must be replaced. The 789 acres impacted by the project has been determined to be equivalent to 1,180 EFUs lost. The success of mitigation activities will be determined by the amount of EFUs gained, which will be measured as part of annual reporting.

The CMP uses the following conservative assumptions as further protection to assure that the mitigation measures proposed will cover the full range of potential future conditions:

- All of the existing Target Environmental Resources will be lost below 5,444 feet in elevation (the high water level in the 20,600 AF plan);
- None of the Target Environmental Resources will re-establish below 5,444 feet in elevation;
- Off-site mitigation areas are generally limited to reaches of Plum Creek, West Plum Creek, and their major tributaries for which Preble's critical habitat has been designated; and
- Only 15 percent of the private land in the off-site target mitigation area will be available for habitat enhancement and protection.

The estimate that 1,180 EFUs may be lost is significantly influenced by the first two of these conservative assumptions. The CMP defined process of annual monitoring will determine what are the total of EFUs actually lost from the construction activities and the future operations of the Project over time and therefore if possibly less EFUs are required because the impacts are less than estimated. For example, if the vegetation surrounding the reservoir is not permanently lost up to 5,444' from inundation, then less EFUs will need to be developed. The annual determination of EFUs owed and EFUs gained from mitigation activities will continue until it is judged by the PCT that the mitigation actions have proven to be reasonably sustainable and, therefore, that the mitigation obligations have been satisfied.

Preble's habitat has a diversity of components (wooded riparian, riparian wetlands, and adjoining uplands), it supports a broad diversity of wildlife including birds, large and small mammals, reptiles, amphibians, and insects. Mitigation of impacts to Preble's habitat tends to drive mitigation of the other target environmental resources because:

- Preble's habitat is geographically limited to well-developed riparian corridors with reliable sources of water;
- Preble's habitat has substantial functional and geographic overlap with bird habitat and wetlands;
- Preble's is a threatened subspecies protected under the ESA; and
- Impacts to Preble's designated critical habitat are required to be mitigated within the same critical habitat unit.

Therefore, the impacts to many of these other species will be addressed through mitigating impacts to Preble's habitat. The CMP is composed of three primary components, which focus on Preble's mitigation:

- On-site mitigation – Activities within the Chatfield State Park include the conversion of upland areas above 5,444' to wetland, riparian and Preble's habitat, the enhancement of habitat and the restoration of temporarily disturbed areas.

- Off-site mitigation – the permanent protection of private lands in the Plum Creek/West Plum Creek watershed upstream of Chatfield Reservoir, with management and enhancement to benefit the target environmental resources.
- Off-site Preble’s “critical habitat” mitigation – the enhancement, restoration, and control of sediment along 4.5 miles of Sugar Creek in the Pike National Forest and the permanent protection, and enhancement and management as needed, of private lands in the West Plum Creek critical habitat unit (CHU) designated to support a large recovery population of Preble’s.

Mitigation activities are based on the following criteria:

- Maximize on-site compensatory mitigation and then satisfy any remaining mitigation obligations with off-site mitigation;
- Target mitigation activities to occur within the Chatfield Reservoir Watershed;
- Locate off-site mitigation as close to Chatfield State Park as possible;
- Focus on mitigation activities that can provide benefits to all of the target environmental resources;
- To the degree practicable, implement off-site mitigation in a way that will expand connections to existing protected lands forming longer continuous corridors of protected lands; and
- Select locations for mitigation activities that provide a high likelihood for successful mitigation.

### 4.5.3 Summary of CMP Mitigation Measures

The mitigation measures are a combination of on-site and off-site mitigation. The table below gives the overview of the quantifications of the impacts, in EFUs, acres or stream miles, and the areas where the mitigation activities will be undertaken. A summary of the proposed mitigation activities are given in the table and text below and their proposed locations are shown in the referenced figures.

#### Overview of Mitigation Measures

Impacts			Mitigation			
Nature of Impact	Acres	EFUs	On-Site		Off-Site	
			Acres	EFUs	Acres	EFUs
Inundation	586	775	165	85	TBD	690
Recreation Facilities Construction	203	405	203	384	TBD	21
TOTALS	789	1,180	368	469	TBD	711

## On- Site Mitigation Activities

On-site mitigation is mitigation that will occur on property owned by the United States and managed by the USACE in the vicinity of Chatfield Reservoir. The on-site mitigation will be maximized to the degree practicable. Figures 8, 9 and 10 show the existing on-site Preble's, bird, and wetland habitats, respectively.

The mitigation measures will include habitat conversion, habitat enhancement and restoration of disturbed areas from construction. The greatest gain in EFUs will be from habitat conversion activities. The greatest gain in EFUs per acre would result from converting upland grasslands to wetland habitat that also provides high value riparian habitat for Preble's.

In many cases, a combination of these activities will likely be necessary to create desired mitigation conditions. Using currently available mapping, 165 acres on-site will be converted to a mosaic of riparian shrublands (89 acres), wetlands (33 acres), and riparian forest (43 acres). The proposed sites for creation of new wetlands on-site are shown in Figures 11 through 18.

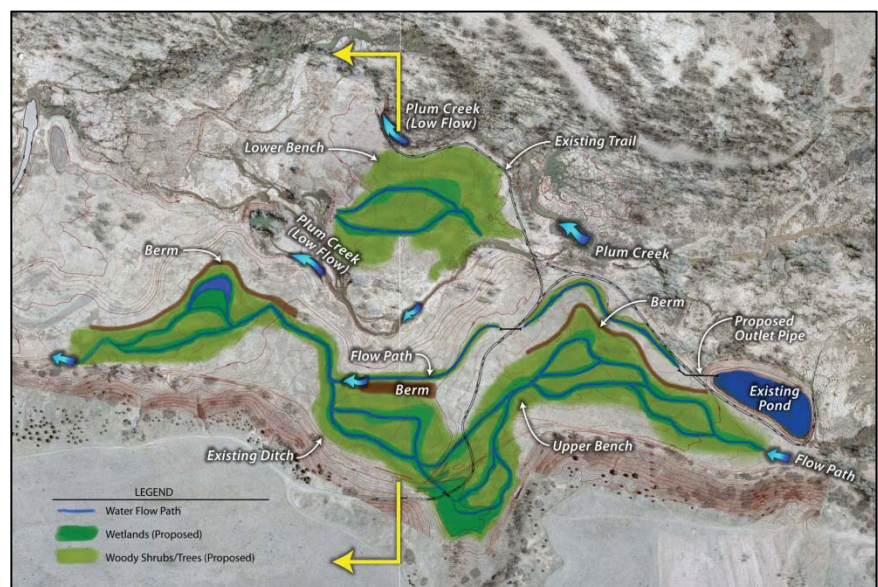
The on-site mitigation areas proposed in the CMP are conservative outlines of areas estimated to have the best opportunities to provide mitigation that will result in a significant gain in EFUs. Engineers and wetland ecologists will design site-specific detailed plans to provide the most EFUs in the most cost-efficient manner.

The general land conversion mitigation approach is described below and examples of the mitigation approach are shown in the figures on this and the next page:

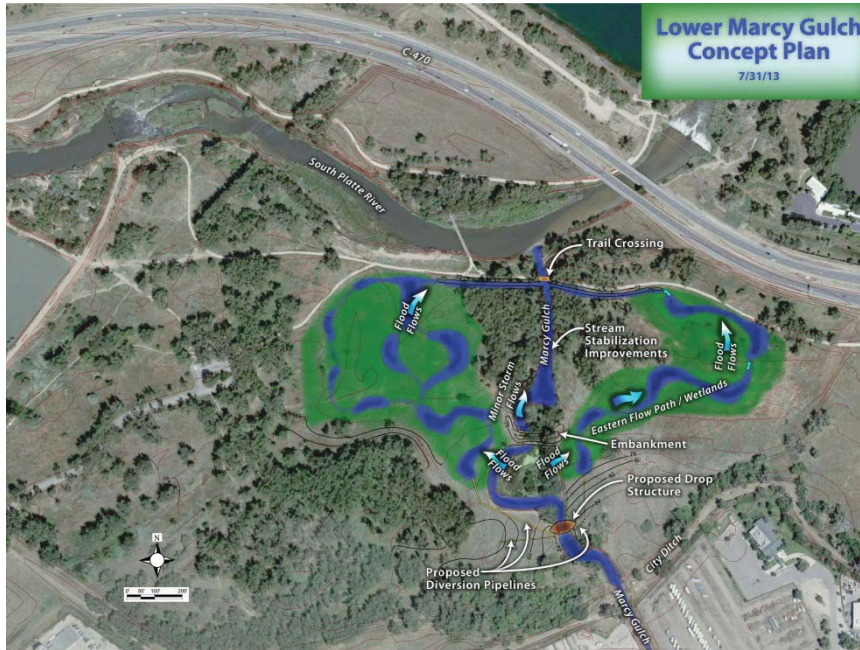
- Use an existing water source, such as a previously-created gravel pond or agricultural pond fed by regional groundwater flow, a tributary stream, such as Marcy Gulch, or existing groundwater from the lowering of the ground surface where material has been removed from a borrow area as the water source,

- Locate the new converted land, if possible, on terraces adjacent and above the stream flood plain,

- Use existing land features, such as previous irrigation ditches, or develop new land features from re-grading the land, to spread out and redirect new water flows over existing upland grasslands creating a new mosaic of wetland and riparian vegetation.



- If adjacent to an existing pond, possibly re-grade or bring in fill to the perimeter of the pond to create new fringe wetlands and riparian vegetation along the shoreline,
- Maintain some open water for waterfowl habitat, and
- Enhance the recreational potential of the area by possibly expanding trail systems.



In addition to compensatory mitigation activities, restoration activities will be undertaken to restore areas that are disturbed during relocation of the recreation facilities but are not part of the permanent footprint of the facilities. These areas include the borrow areas, haul roads, and the majority of areas filled to elevate the relocated facilities. These areas are shown in Figure 19.

Construction plans for disturbed and borrow areas will include plans and specifications that follow guidelines developed for use in these areas (Appendix F of the CMP).

The approach for creation of wetlands and cottonwood riparian areas is to select and modify mitigation sites as needed to provide a supportive hydrology to sustain the wetland and riparian vegetation. The area of wetlands and riparian habitat that are proposed to be created do not exceed the maximum acres of wetlands and riparian habitat that have been estimated to be impacted by the inundation from the reallocation project. Therefore, the consumptive use associated with the creation of new wetlands and riparian habitat would not exceed the consumptive use of wetlands estimated to be lost.

**Off-Site Mitigation Activities:**

The CMP recognizes that mitigation requirements will exceed land available on-site. Approximately 5,917 acres of private lands, providing potentially 8,035 EFUs (more than enough), have been identified within the Chatfield Reservoir watershed that could be permanently protected and managed in a way that benefits habitats (Figure 20). Each private property or portion of a private property considered for permanent protection will need to be evaluated for the following:

- Fair market value of land to be protected (real estate appraisal);



- Baseline EFUs associated with the property and the potential net gain of EFUs associated with protection, enhancements and long-term management; and
- Suitability of property to contribute to meeting the off-site compensatory mitigation objectives.

The Project Participants will coordinate with the PCT, and any of its advisory committees, regarding the protection of properties. Mitigation areas will be permanently protected by deed restrictions or conservation easements put in place on property purchased from willing property owners or through conservation easement agreements with willing property owners.

All protected property will have a management plan developed by the Project Participants that is submitted to the PCT for review and final approval by the USACE. The management plan will identify specific management activities that, by example, may include:

- Managing livestock grazing and adverse recreation impacts by either eliminating grazing or erecting and maintaining fences to protect the riparian corridor;
- Providing signage and meeting with neighbors and the public to increase awareness of conservation efforts;
- Reducing the threat of fires using mowing, fire breaks, or controlled burns where needed;
- Coordinating fire response with local, state, and federal fire management entities; Stabilizing erosion or channel down-cutting, as needed, caused by increased urban runoff;
- Planting or seeding with native species to improve habitats; and
- Controlling invasive nonnative plants if necessary and feasible.

The mitigation measures for Preble’s critical habitat and for cottonwood trees occur both on-site and off-site and are discussed in more detail below.

**Preble’s Meadow Jumping Mouse Critical Habitat Mitigation Measures**

Critical habitat for Preble’s has been designated on the South Platte River and Plum Creek arms of Chatfield Reservoir (75 Fed. Reg. 78430 (December 15, 2010)). Per U. S. Fish and Wildlife Service requirements, all mitigation for adverse impacts to designated critical habitat for Preble’s will occur within the same critical habitat unit (CHU) in which the impacts occur. The Plum Creek arm of Chatfield Reservoir occurs in the West Plum Creek CHU and the South Platte River arm occurs in the separate Upper South Platte CHU.

With the exception of the South Platte River arm of Chatfield Reservoir, the Upper South Platte CHU occurs on the Pike National Forest. Opportunities for on-site critical habitat mitigation are limited, so most of the mitigation for loss of Preble's critical habitat on the South Platte River arm will occur off-site on the Pike National Forest. Following an analysis of the potential Preble's mitigation sites shown in Figure 21, Sugar Creek was selected as the site of greatest potential benefit from mitigation activities.

Because most of this critical habitat mitigation will occur in the montane environment of the Pike National Forest, and not the plains environment in the vicinity of Chatfield Reservoir in which the ecological functions approach and EFUs were developed, impacts and mitigation for critical habitat in the Upper South Platte CHU are expressed in acres or stream miles and not in EFUs.

The following proposed mitigation for impacts to Preble's designated critical habitat has been discussed with the USFWS and was included in the Biological Assessment submitted to the USFWS.

- Reduction of sediment inputs into Sugar Creek, a tributary to the South Platte River on the Pike National Forest, and its associated wetlands and riparian areas that are Preble's designated critical habitat;
- Creation and enhancement of riparian habitat. Figure 22 shows Sugar Creek mitigation site in greater detail.

The activities involving the reduction of sediment material into wetlands and riparian habitats bordering Sugar Creek and related improvements include:

- Construction of stilling basins for culvert rundowns from sediment traps to minimize bank erosion;
- Construction of low head water control structures to raise alluvial ground water levels to provide supportive hydrology to expanded riparian areas; and
- Replacement of road crossings of Sugar Creek with culverts designed to promote fish and small mammal passage.

The required offsetting of impacts to Preble's will be determined through the ESA Section 7 consultation process between the USACE and the USFWS. A Biological Assessment addressing ESA compliance has been prepared by the Corps as part of the Final FR/EIS (Appendix V of Final FR/EIS). The USFWS's Biological Opinion will be included in the final FR/EIS. The Biological Opinion will identify conservation activities that address adverse impacts to Preble's and its designated critical habitat.

The mitigation of designated critical habitat within the Plum Creek arm will be mitigated in the West Plum Creek CHU. About 6 acres and 4 EFUs will be mitigated within the proposed designated critical habitat within the on-site Plum Creek arm of the reservoir. The remainder of the mitigation for impacts to the Plum Creek critical habitat would be addressed through off-site mitigation within the West Plum Creek CHU. The West Plum Creek CHU covers generally

the same area as the off-site mitigation target area (Figure 23). The Preble’s mitigations are summarized in the table below:

**Preble’s Designated Critical Habitat Summary**

Location	Impacted Area			Mitigation				
	Acres	Stream Miles	EFUs	On-Site, Acres		Off-Site		
				Stream Miles	EFUs	Acres	Stream Miles	EFUs
South Platte Arm	80	1.3	--	17	--	381*	4.5*	--
Plum Creek Arm	75	2.8	65	6	3	--	--	62**

\* Sugar Creek  
 \*\* West Plum Creek

**Cottonwood Tree Mitigation Measures**

There will be loss of wetlands and trees, including mature cottonwoods, which also provide habitat for terrestrial mammals. The CMP includes activities specifically intended to compensate for adverse impacts on up to 42.5 acres of mature cottonwood bird habitat. Because mature cottonwood habitat has been specifically identified as an important habitat type in Chatfield State Park, mitigation for this resource will include compensating for lost acres. The CMP addresses the actions to be taken to mitigate impacts to riparian habitat, including mature cottonwood woodlands.

Proposed activities include designating at least 13 acres of on-site mitigation for recruitment of new cottonwood growth, protecting at least 22.5 acres of existing mature cottonwood habitat in off-site compensatory mitigation areas, and designating at least 10 acres of off-site mitigation areas for recruitment of new cottonwood growth. Areas designated for new recruitment will contribute to the long-term persistence of multi-aged patches of cottonwoods, including future stands of mature cottonwoods.

The locations of the cottonwood regeneration areas are shown in Figures 14 and 15 and labeled as SPR 2, 3, 5 and 8. The bird habitat complexes targeted for cottonwood regeneration and mature cottonwood conservation off-site are shown in figures 24.

Areas suitable for cottonwood preservation and regeneration have been defined. Conditions suitable to support large stands of mature cottonwood off-site are limited to stream reaches with broad floodplains and perennial sources of both surface and ground water. The CMP recognizes that the existing mature cottonwood habitat that will be impacted is part of a larger habitat complex supporting a variety of bird species including several uncommon and sensitive species. Mitigation activities for mature cottonwood habitat will take place within the boundaries of the mapped bird habitat complex. The cottonwood tree mitigation is summarized below:

### **Cottonwood Tree Mitigation Summary**

Impacted Acres	Mitigation, Acres			
	On-Site Regeneration	Off-Site Preservation	Off-Site Recruitment	Total
42.5	13.0	22.5	10.0	45.5

#### **4.5.4 Adaptive Management for the Wildlife, Wetlands and Riparian Habitat**

As explained in §4.1.4, above, adjustments may need to be made as the Project Participants implement the mitigation activities set forth herein and in the CMP. Any necessary adjustments will be determined using the USACE Adaptive Management Plan set forth in Appendix GG of the FR/EIS. Adaptive management actions will be implemented on an “as needed” basis and as informed by the monitoring of impacts and mitigation on an ongoing basis to ensure the core mitigation objectives are met. Monitoring will be concluded when all of the core mitigation objectives are met, which will ultimately be decided by the USACE.

The core objectives for the Target Environmental Resources are:

1. Provide up to 796 EFUs to offset the 796 EFUs conservatively estimated to be permanently lost with reallocation, comprised of up to 211 EFUs for noncritical Preble’s habitat, up to 65 EFUs for West Plum Creek critical habitat, up to 396 EFUs for bird habitat, and up to 124 wetland habitat EFUs that will contribute to the estimated maximum total of 796 EFUs conservatively estimated to be permanently lost;
2. Mitigate for the conservatively estimated loss of 1.3 miles of designated critical Preble’s habitat along the South Platte River arm; and
3. Compensate for the conservatively estimated loss of 42.5 acres of mature cottonwood bird habitat by protecting up to 22.5 acres of cottonwood woodlands off-site and creating up to 13 acres (on-site) and 10 acres off-site of cottonwood recruitment areas, all of which will contribute to the compensatory mitigation goal of 796 EFUs.

The Adaptive Management Plan, Appendix GG of the FR/EIS, gives further details.

#### **4.5.5 Tree Management Plan**

The FR/EIS includes a separate Tree Management Plan (Appendix Z of the Final FR/EIS). There is some degree of uncertainty in estimating the elevation at which trees would likely be killed from periodic inundation resulting from the Reallocation Project. The uncertainty is due in part to the variability in the availability of water for storage, variability in how reservoir operations

would occur under the proposed reallocation, and uncertainty in how the trees would respond to inundation.

In the Tree Management Plan, a conservative approach was taken by limiting the trees to be removed to those areas where it is judged highly likely that the trees would be killed, at elevations up to 5439 ft. above msl. The plan currently calls for clear-cutting trees below elevation 5439 subject to periodic determinations by CPW of whether to remove trees.

For areas between 5439 and 5444 ft. above msl, which includes approximately 61.1 acres of trees, an adaptive management approach is planned. The adaptive management approach would entail leaving these trees in place and then monitoring the trees for signs of severe stress and mortality, and removing unhealthy and dead trees from this area on an as needed basis to eliminate potential risks to visitors and dam safety.

The USACE Adaptive Management Plan allows the Tree Management Plan to be more flexible. Understanding that trees and other vegetation below 5439' ft above msl may not necessarily be inundated to a point of killing the trees and other vegetation, Project Participants and CPW agree that Project Participants may first seek to operate their storage space in a manner that minimizes the length of inundation between elevations 5,444 and 5,439 ft above msl.

If the trees between 5,432 and 5,439 ft. above msl are not cleared and grubbed, Project Participants would need to:

- Remove the dead and down trees along with all other debris on the ground;
- Perform selective thinning to provide a healthier environment and ease of access for implementation of BMP's;
- Require a yearly evaluation and monitoring of trees from 5,432 to 5,444 ft. above msl; and
- Increase debris removal in the reservoir, as needed, and provide funds to offset additional operational costs. Debris will need to be removed and taken off site.

These activities will provide a more pleasing aesthetic look at lower water levels, more bird habitat and possibly new rookery areas. In addition, the activities will maintain or increase watchable wildlife opportunities and possibly decrease required mitigation including off-site mitigation.

#### **4.5.6 Adaptive Management for the Tree Clearing within the Fluctuation Zone**

As more fully described in §4.1.4, above, adaptive management actions, as determined using the USACE Adaptive Management Plan set forth in Appendix GG of the FR/EIS, will be implemented on an "as needed" basis and as informed by the monitoring of impacts and mitigation on an ongoing basis to ensure the core mitigation objectives are met. Monitoring will be concluded when all of the core mitigation objectives are met, which will ultimately be decided by the USACE.

The core objectives for the tree clearing within the fluctuation zone are:

1. Limit tree clearing to areas where trees have a high likelihood of being killed by inundation as determined by CPW;
2. Leave trees in selected areas below 5,439 ft msl for fish and wildlife habitat, to the degree practicable and safe;
3. Decisions on trees removed (including stumps) and trees retained, must also consider dam, boater and visitor safety;
4. Maximize the use of downed trees for fish and wildlife habitat; and
5. Remove downed woody material from the area below 5,439 ft msl to minimize impacts to water quality except as placed or retained for aquatic and wildlife habitat.

The Adaptive Management Plan, Appendix GG of the FR/EIS, gives further details.

## **5.0 Mitigation of Unavoidable Adverse Impacts: Recreation**

### **5.1 Recreational Facilities Mitigation**

The CPW and the Project Participants have worked together to ensure reasonable mitigation measures will be in place for the Chatfield Reallocation Project. These measures address impacts to fisheries and aquatic habitat, wetland riparian and wildlife habitat as well as financial and recreational impacts. Table 1 summarizes the proposed mitigation components.

#### **5.1.1 The Recreational Facilities Modification Plan: A Summary**

##### **Impact**

The Recommended Plan, storing up to 20,600 additional A.F. of water in the Chatfield Reservoir, will inundate recreation infrastructure and environmental resources and result in an additional 12 feet of potential water level fluctuations (Figure 3).

##### **Mitigation**

The Recreation Facilities Modification Plan (RFMP), Appendix M of the Final FR/EIS, has been prepared under the guidance of CPW to address the required mitigation from the inundation of recreational facilities. The Plan includes a separate study of the marina, as discussed below.

The development of the RFMP included considerations of operating conditions, including the relationship between water levels and existing facilities and how visitors use the park. The plan is based on the like-kind replacement of facilities and their operational functions in order to maintain a quality of recreational experience as similar as possible to that presently experienced by park visitors.

Major facilities at Chatfield include 197 campsites, 10 group sites, 4 major group picnic areas, 139 family picnic sites, 3 major boat ramps, 20 miles of hard surface trail, 2,528 parking spaces, 33.3 miles of paved highway, 9.6 miles of unpaved roadway, 38 restrooms, 6 shower buildings, a maintenance shop, and a swim beach complex. Recreational activities include hiking, fishing, biking, picnicking, swimming, model airplane flying, horseback riding, boating, hot air ballooning, bird watching, wildlife viewing, and environmental education programs.

Below is a summarized list of impacted areas, modifications to occur, and estimated cost for the modifications. Appendix M includes additional details about the recreation facilities modifications. Figure 25 shows the location of these facilities within Chatfield State Park.

- *North Boat Ramp:* Construction of new boat ramps. Changes in ramp gradients, and facility relocation. Parking areas, concrete boat ramp, trails, day use shelter, picnic tables, trash receptacles, bollards, grills, regulatory signs, and water hydrants. Estimated cost: \$1,220,183.
- *Massey Draw:* Relocation of facilities. Restroom, asphalt trails, picnic tables, benches, trash receptacles, grills, beach volleyball court, and horse shoe pit. Estimated cost: \$686,301.
- *Eagle Cove:* Reconstruction of facilities and parking. Parking area, portable restroom, dumpsters, trash receptacles, regulatory signs, and fencing. Estimated cost: \$426,589.
- *Deer Creek Day Use and Balloon Launch area:* Reconstruction of facilities and parking and road relocation. Parking area, trails, picnic tables, trash receptacles, grills, and regulatory sign. Estimated cost: \$1,494,655.
- *Swim Beach:* Reconstruction of beach, facility and parking and road relocation. Parking area, shower/restroom building, concession, first aid station, information kiosk, picnic tables, benches, water fountain, dumpsters, trash receptacles, bollards, grills, regulatory signs, fencing, beach volleyball court, horse shoe pits, sand and utilities. Estimated cost: \$9,799,203
- *Jamison Area:* Reconstruction of facilities and parking and road relocation. Parking area, trails, restroom, picnic tables, benches, water fountain, dumpsters, trash receptacles, grills, regulatory signs, utilities, and electrical transformer. Estimated cost: \$1,917,629

- *Catfish Flats:* Relocation of facilities and parking. Parking areas, trails, restroom building, group picnic shelters, picnic tables, benches, water fountain, dumpsters, regulatory signs, utilities, and electrical transformer. Estimated costs: \$1,731,060
- *Fox Run:* Relocation of facilities and parking. Trails, group picnic area, picnic tables, benches, water fountain, dumpsters, trash receptacles, regulatory signs, beach volleyball court, and horse shoe pits. Estimated cost: \$307,955
- *Kingfisher Area:* Creation of new parking areas, facility relocation. Parking area, portable restrooms, dumpsters, trash receptacles, regulatory signs, fencing. Estimated costs: \$295,884.
- *Gravel Ponds Area:* Creation of new parking areas, facility relocation. Construction of bridge over South Platte River. Parking area, portable restrooms, picnic tables, dumpsters, trash receptacles, regulatory signs and fencing. Estimated cost: \$217,943.
- *Platte River Trailhead Area:* Construction of new trails. Estimated cost: \$112,337.
- *Roxborough Cove:* Facility relocation. Restroom, regulatory signs, picnic tables, trash receptacles, grills, and sand. Estimated cost: \$410,320.
- *Plum Creek Picnic Area:* Relocation of parking area, entry road, and day use area, rerouting of trail and relocating sanitary sewer line. Parking areas, trails, restroom building, picnic tables, benches, dumpsters, regulatory signs, fencing, and volleyball court. Estimated cost: \$479,351.
- *Roads and Bridges at multiple locations:* Estimated cost: \$12,502,055.
- *Gravel Pond Area Preservation:* Gravel Pond Area. The plan includes the rebuilding of the dike north of the gravel pond with a new park road on top, in the same location as the old road. This addition was made in order to minimize impacts to the surrounding area as well as to preserve the gravel pond and its unique recreational features. The side slopes of the road/dike were steepened to 3:1 and the road was realigned to further reduce the filling of wetlands. The road on the east side of the Gravel Pond was realigned to completely avoid the discharge of fill material into wetlands and, to preserve the gravel pond from inundation at 5,444 feet above msl, will include a new dike at an additional cost of approximately \$500,000. These actions preserve the highly valued and relatively rare recreational experiences of scuba diving, long distance swimming, canoeing and kayaking (without the influence of nearby power boats) at Chatfield. Estimated cost: \$500,000 (This cost is included in the estimate for roads and bridges above)



- Total Cost for all Recreation Facilities Modifications: \$31,600,000

All parties agree that the RFMP is a conceptual design and best efforts were used to determine the final costs of the RFMP. There are instances in the RFMP where there are items listed but associated costs with the item or facilities were not included. It is the intent of the Project Participants to make sure that every facility or infrastructure listed or not listed in the RFMP that is affected by the reallocation project will be relocated or modified to the same functionality to the extent possible that is currently in place. These issues will be addressed and refined in the design process for the project. Two specific issues are further discussed below:

- One of the concerns of CPW is how the park will function during a 10 year flood event. Currently Chatfield is able to stay open during a 10 year flood event and the Deer Creek entrance is not effected, the North Ramp is usable, and access is not restricted on the west side of the park. Post reallocation, under the RFMP, it may be that the Deer Creek entrance and the west side of the park would have to be shut down. This issue will be further addressed in the final design.
- There are three different easements on the west side of the park that are impacted by the reallocation project and not included in the RFMP. Denver Water has transformers and a pump station at Fox Run. South Chatfield Water District has a waterline running from the water board road that crosses the South Platte River and provides water to residents south of Chatfield. Trailmark has an easement for gas out of the Catfish Flats parking area. The Project Participants will work with each of these entities to determine how to mitigate the impacts to their easements.

## 5.1.2 The Marina Replacement Plan

### Impact

The Project will inundate portions of the Chatfield marina area and the additional 12 feet of potential water level fluctuations will impact the operations of the marina facilities and increase its exposure to wind and wave action.

### Mitigation

The following summary provides an update on planning and design for the development of replacement facilities within the marina area on the reservoir in Chatfield State Park. It describes the process used to build consensus around the meaning of “like-kind,” and provides an overview of the solutions for relocating and replacing existing facilities.

The mission of the Chatfield Marina Coordination Committee (CMCC) is to advance plans for replacement of the current marina area improvement with like-kind facilities. The CMCC

includes representatives from key stakeholders including the Chatfield Water Providers (Providers), Colorado Parks and Wildlife (CPW), and Chatfield Marina, Inc. Through a competitive proposal process, the CMCC selected the consultant team of SmithGroupJJR (SGJJR) and Wright Water Engineers (WWE) to assist with the project. The standards for like-kind replacement were established through analysis of the existing project facilities, interviews with key stakeholders and meetings with the CMCC, review of existing data, and the collection of new wind and wave data.

Two alternative design concepts are described within this summary and illustrate different approaches for developing like-kind replacement facilities. While both solutions are valid, the alternatives have different implications with regard to the complexity of construction phasing and potential for interruption to existing marina operation and park usage. Future work will be completed to verify the feasibility of each of the alternatives and allow the CMCC to finalize its selection of a preferred alternative.

### **Planning Process**

The formation of the CMCC was critical in establishing a consensus on the definition for like-kind replacement. Actively engaging each group in one planning process allowed members to share individual perspectives while developing a broader understanding of the goals and challenges that surround development of replacement facilities.

The planning process was key to building consensus among the diverse interests of the stakeholders, and helped to advance the project. The SGJJR / WWE team toured the project area and completed a series of individual interviews with CMCC members and other key stakeholders (i.e. vendors servicing the marina, regulatory agencies, etc). The observations and results of the individual sessions were reviewed with the entire CMCC so that all members were able to raise questions, seek clarifications and provide additional input. Over the course of the meetings, the CMCC arrived at a shared understanding of:

- The current and future water levels and the effects of these conditions on existing and future replacement facilities;
- The physical improvements that will require replacement or relocation;
- The functional considerations critical to maintaining marina operations;
- The recreational opportunities afforded within the current park areas; and
- The influence new code requirements have on the design of replacement facilities.

### **Like-Kind Determination**

The definition of “like-kind” facilities is based on details documented within an Existing Conditions Inventory and Analysis. The analysis is organized into four primary sections (described below). Within each section, the existing conditions are documented in both quantitative and qualitative terms. The elevation of each existing physical improvement is

identified along with the frequency of inundation based on historic water levels within the reservoir. Through an analysis of the existing conditions, a basis of design section defines the specific standards that like-kind facilities must achieve.

The four primary sections of the Existing Conditions Inventory and Analysis are summarized below.

- Hydraulic Analysis – Analysis of the current and future projected wind, wave and ice influences on current and future like-kind facilities.
- Upland Improvements and Infrastructure – Quantitative and qualitative aspects of facilities such as the number and size of shelters, and important relationships between elements such as parking areas and recreational amenities which are critical in providing similar recreational opportunities and access.
- Marina Facilities and Operations – Important factors like the operable range of water levels for access ramps and anchorage, vendor service requirements, and the level of maintenance and staffing required to manage and operate facilities.
- Codes and Regulations – Requirements for the development of replacement facilities resulting from changes to codes and regulations.<sup>3</sup>

The basis of design discussion within each section establishes the requirements for like-kind replacement facilities, and is the foundation for development the marina area modification alternatives.

### **Marina Area Modification Alternatives**

Both alternatives presented as part of this summary fulfill the like-kind replacement requirements for facilities within the marina area. While the alternatives consider different organizational patterns, development of the replacement facilities will be accomplished within the same general project area. Similarly, the development of either alternative requires a similar amount of earthwork to raise the upland areas in response to increasing water levels and result in comparable levels of disturbance and environmental impact. Other similarities between the two alternatives include:

- Reuse of a majority of the existing marina’s floating infrastructure including such elements as the dockage, administration building, sanitary and fueling systems;
- Reliance on new floating wave attenuators to mitigate waves and help address concerns over ice impacts on the docks;

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<sup>3</sup> Current facilities comply with the existing codes and regulations. Changes to existing elements to accommodate the Reallocation Project trigger the need to modify or upgrade certain elements in ways not specifically required by the “like-kind” replacement standards.

- Use of a series of gangways to provide access to marina facilities and the new floating fishing platform;
- Reconstruction of a new launch ramp and access drive located in approximately the same area as the existing launch;
- Development of a trail system that connects regional trails to and through the project area;
- Creation of new beaches that allow for use through the full range of anticipated pool levels;
- Replanting of disturbed areas to achieve a similar landscape character and shade recreational users; and
- Installation of a new anchoring system for the docks, administration building and new attenuators that accommodate increased water levels.
- Construction of like-kind replacement facilities are estimated to cost approximately \$12.1 million. A recommended construction contingency of 20% and design/engineering allowance of 15% bring the total budget range for either alternative to approximately \$15.7 million.

#### **Alternative A (Existing Marina Location)**

This alternative maintains the same general organization for replacement facilities (see Figures 26, 27 and 28). Fill material from excavation of the western shoreline, and other material imported from off-site borrow pits, is used to raise upland areas to accommodate the increased water level. Segments of the shoreline to the west and east of the marina are shaped to create new beaches. The replacement parking lots, service areas, picnic and overlook areas, utilities and other facilities are rebuilt to meet like-kind requirements.

Water level increases within the reservoir result in the existing peninsulas being submerged a majority of the time. Therefore, floating wave attenuators will replace the docks along the northeast and northwest sides of the marina. These new structures will provide comparable levels of tranquility for boat slips while remaining available for mooring of boats. A new anchoring system, designed to accommodate the increased water elevation and fluctuation, is used for the docks, floating fishing pier, attenuators and administration building. Two new sets of gangways link upland facilities with the floating docks.

#### **Alternative B (Roxborough Cove Marina Location)**

Unlike Alternative A, this alternative flips the organization of the major site features. The marina moves into Roxborough Cove and the bay where the marina is currently located becomes part of a beach cove that supports outdoor recreation activities (see Figures 29, 30 and 31). Dredging within Roxborough Cove creates sufficient depth to accommodate the

marina and a channel is cut through the existing peninsula to provide access to the marina.<sup>4</sup> Fill generated from the dredging and excavation work, along with some material from off-site borrow pits, is used to raise the upland areas. As with the first alternative, the replacement parking lots, service areas, picnic and overlook areas, utilities and other facilities are rebuilt to meet like-kind requirements.

While the existing peninsula between the two coves is submerged a majority of the time, the Roxborough Cove marina is also protected with floating wave attenuators. As with Alternative A, a new anchoring system is employed and sets of gangways are used to link the upland improvements with the floating docks.

Although both alternatives are valid, the CMCC preference is toward Alternative B. This alternative offers some unique advantages that include:

- The ability to complete earthwork operations and construct the marina improvements and upland support facilities within and around the perimeter of the near south bay while the existing marina and park facilities remain operable;
- Minimizing or eliminating required marina concessionaire compensation resulting from lost revenue due to interruptions in operations, lower than normal slip occupancy resulting from boaters transferring to slips at other facilities, or employee compensation for lost wages due to shortened seasons<sup>5</sup>;
- An increased level of natural protection for marina facilities from extreme storm events; and
- The opportunity to generate the greatest amount of fill material from excavation and dredging of the near shore and lakebed areas for use in elevating upland areas in response to the new reservoir pool levels.

Future work commissioned by the Water Providers will confirm the validity of each alternative and aid in determining the final preferred solution for developing like-kind replacement facilities.

### **Conclusions and Next Steps**

CMCC consensus on the standards that constitute like-kind replacement facilities represents a critical project milestone. It results in a set of common goals and expectations that become the foundation for current and future planning and design efforts.

---

<sup>4</sup> It is assumed that dredged material from within Roxborough Cove is suitable for reuse as fill within the upland areas. Preliminary review of analyses completed by the COE do not suggest significant amounts of sediment within the cove area are the result of stream sediment deposition. However, future work should be undertaken to confirm the viability of dredged sediment reuse and confirm that deposition from Plum Creek will not create long-term issues with relocated facilities.

<sup>5</sup> Compensation for lost revenue is not reflected in the estimated cost for developing like-kind replacement facilities identified within this section of this summary.

While the two alternatives presented as part of this summary meet the consensus like-kind replacement requirements, the CMCC prefers Alternative B. Additional work will be necessary to confirm this preference and validate assumptions related to the feasibility of reusing material from dredging of the marina basin and near shore excavations as fill to raise upland areas above the new pool level. Once these additional investigations are complete and the preferred plan is selected, detailed design, engineering and permitting will be advanced.

### **5.1.3 Hiring of Temporary CPW Resident Engineer**

The project participants will fund the temporary hiring by CPW of a qualified engineering employee during the design and construction activities related to recreational facilities modifications and environmental mitigation within the Chatfield State Park property. This temporary employee will function as a full-time resident engineer and will be involved in the development of information and products of the project related to the CPW interests at the Chatfield State Park. This mitigation measure is being undertaken to assure that CPW is intimately involved in all of the decision-making during the on-site recreational facility and on-site environmental design and construction phases of the project. It is estimated that this process of employing a temporary CPW resident engineer will take a total of three years and cost an estimated \$225,000.

## **5.2 Financial Plan**

### **Mitigation Company**

The Mitigation Company will be a Colorado non-profit corporation named the Chatfield Reservoir Mitigation Company (CRMC). It will be formed to accomplish the financial and mitigation obligations from the Chatfield Reservoir Reallocation Project (Reallocation Project)

### **Reservoir Incremental Water Level Fluctuation Costs**

**Background:** After construction, reservoir water levels may fluctuate more than they have in the past as a result of the Reallocation Project. It is uncertain when these fluctuations will occur but the potential for wider fluctuations will continue as long as the Water Providers use Chatfield Reservoir for water storage purposes.

Chatfield State Park will likely experience incremental costs to manage these wider water level fluctuations. The Park Manager estimates these costs might include temporary personnel plus related equipment and supplies, as described below.

**Purpose:** To provide Chatfield State Parks with sufficient funds to manage the impacts of these wider water level fluctuations.

**Steps:**

1. CPW and Water Providers agree on the definition of reservoir water level fluctuations above current (pre-Reallocation Project) water level fluctuations and the types of incremental costs that are eligible for reimbursement. There are two general types of incremental costs: temporary personnel and related equipment and supplies.
2. Each fall, prior to October 15th, the Chatfield Park Manager estimates and the Water Providers approve estimated costs for temporary personnel and related equipment and supplies for the following year. These two figures become a basis for the annual authorization amounts. Temporary personnel are expected to include 3 to 5 temporary staff, 9 months per year.
3. Water Providers direct the Mitigation Company to authorize payment for costs associated with the incremental water level fluctuations up to the Annual Authorization Amounts from the CPW Escrow Account. The CPW Escrow Account will be replenished by the Water Providers on an annual basis as it is depleted. Mitigation Company authorizes funding for these purposes up to the Annual Authorized Amounts, to reimburse CPW for costs incurred. CPW may submit invoices on a monthly or less frequent basis. If CPW determines during the year that supplemental funds are needed, they will present a supplemental funding request with supporting documentation to the Water Providers for approval before expenditures are made. Water Providers will give reasonable consideration to requests for supplemental expenditures. If a supplemental request is granted, the Annual Authorized Amount(s) will be adjusted.
4. CPW will be reimbursed for costs as follows:
  - CPW hires temporary personnel for the following summer. CPW bills the Mitigation Company monthly for actual temporary personnel costs incurred in connection with managing the impacts of fluctuating water levels. Upon approval by the Mitigation Company, it pays invoices from the escrow account to reimburse CPW up to the Annual Authorized Amount.
  - CPW purchases equipment or supplies and submits invoice to Mitigation Company for reimbursement of expenses. Upon approval by the Mitigation Company, it pays invoices issued by Chatfield Park Manager from the CPW Escrow Account to reimburse CPW up to the annual authorized amount. Examples of equipment that might be needed are: trucks or all-terrain vehicles for staff, chainsaws, tools and radios. Examples of supplies that might be needed are: signs and sign hardware, buoys and buoy hardware, sand, portable trash cans, trail supplies, lumber and temporary worker uniforms.

- If a dispute arises regarding CPW’s request for funding or for reimbursement, a 3-person panel will convene to propose a resolution of the dispute. The panel will consist of one person selected by CPW, one person selected by the Water Providers and one person selected jointly by those two people.
5. This section of the agreement continues at least for the duration of the current lease between CPW and the Corps (year 2028). At that time, and at the end of each subsequent lease period between the Corps and CPW, a determination will be made by the parties of the reasonableness of continuing this section.

### **Chatfield State Park Revenues**

**Background.** Chatfield State Park revenues from annual and daily passes, marina and livery concessions, individual campground fees, group campground and picnic fees flow into the State Parks “Cash” Fund (Actual Revenues). Chatfield State Park revenues are a significant portion of the statewide total. CPW and the Water Providers agree that there may be adverse financial impacts to these revenues during construction that are attributable to the Reallocation Project. After construction, there may be adverse financial impacts for up to five years as prior year visitors are welcomed back and new visitors are invited to experience Chatfield State Park.

**Purpose:** To agree on and adopt a method to calculate and reimburse CPW, as needed, for future revenue impacts to the State that are attributable to the Reallocation Project.

**Steps:**

1. Parties have set annual Baseline Revenues, based on actual revenue figures, using 2009 through 2013. Baseline Revenues for the year 2014 are \$2,119,529. The Baseline Revenues will escalate at two percent (2%) per year, compounded each year through construction, for three years after construction and potentially for two additional years as described in this section of the agreement (Baseline Revenues). As an illustration, Baseline Revenues for 2015 are \$2,161,920. If the revenue reimbursement agreement is still in effect for years nine and ten, the baseline revenue will not escalate at 2% per year but will remain at the baseline revenue that has been calculated for year eight.
2. Each year during construction of the Reallocation Project facilities that impact Chatfield recreation activities the following formula will be used to calculate whether a payment is due to CPW:

*Formula During Construction:*

Actual Revenues – Baseline Revenues = Payment to CPW if the result is positive or negative.



Any abnormal events at the park such as fires, floods or other events that result in a park closure or limited recreational opportunities that obviously decrease Actual Revenue other than Reallocation Project activities will be given consideration in estimating the payment to CPW, upon request of the Water Providers.

3. The duration of construction of the Reallocation Project facilities that impact Chatfield recreation activities is defined by the parties for purposes of these calculations as follows: The Start of Construction is the date when the contractor mobilizes equipment inside Chatfield State Park for recreational mitigation construction activities, following a “Notice to Proceed” from the CRMC. Current estimates are that this construction activity may take about 36 months, which might extend more than three State fiscal years. The Completion of Construction is when the owner, contractor and engineer, as may be appropriate, each sign a “Recommendation for Final Acceptance/Payment and Release of Retainage”, or equivalent document, for the last recreational facility constructed.
4. Any payments to CPW will be documented in an invoice to the Water Providers. The invoice will be paid by the Mitigation Company from the CPW Escrow Account 30 days after receiving an invoice and verifying the documentation.  
In any year after construction, if Actual Revenue is greater than Baseline Revenue, then no payment is due to CPW and a credit will accrue to the Water Providers against the current year and continue into future years (Cumulative Credit). A new credit is added to the Cumulative Credit only if the Actual Revenues – Baseline Revenues are positive for that year. The amount of the new credit would be the difference between the Actual Revenues and Baseline Revenues. If the (Actual Revenues + Cumulative Credit) – Baseline Revenues calculation is zero or negative, the Cumulative Credit is lost. The Water Providers are not eligible for a credit during construction.

*Formula After Construction:*

(Actual Revenues + Cumulative Credit, if any) – Baseline Revenues = Payment to CPW of the result if the figure is negative and Credit to Water Providers of the result if the figure is positive

5. Water Providers will make payments, if necessary, through construction plus three years and possibly four additional years, depending on the conditions described below.
  - a) After construction, the same formula as noted above in Step 4 will continue for another three years and, if at the end of that period the Water Providers are in a credit position, the obligation of the Water Providers to make payments to CPW will terminate.
  - b) At the end of the first three years after construction, if payments are due to CPW, then this portion of the agreement will extend for four more years and then terminate. The formula noted above in Step 4 will continue to be utilized for this last four year period. At termination, whether three or seven years after construction, any cumulative credit to the Water Providers will be cancelled.

6. The Chatfield Water Providers have agreed with CPW to defer \$1,150,000 of 122.2 Plan Mitigation projects until the termination of the Parks revenue reimbursement program. The projects affected are:
  - a) Stream Enhancement Downstream - \$265,000
  - b) Shoreline Stabilization - \$716,100
  - c) Slight reduction Plum Creek Restoration - \$168,900

The Providers and CPW also agreed that if the revenue reimbursements under the reimbursement agreement totaled \$2,150,000 or more the obligation to complete the abovementioned projects by the Water Providers would be rescinded. It was also agreed that if the Water Providers revenue reimbursement was less than \$2,150,000, they would fund the abovementioned projects for the difference between the actual revenue reimbursement amount and \$2,150,000 up to a maximum of \$1,150,000.

7. Mitigation Company will retain a specialist to manage Reallocation Project-related marketing and public relations needs during and after Reallocation Project construction. This will include information on a unique page of the Chatfield Reallocation Project web site which is updated regularly with ongoing construction information. Mitigation Company and CPW will collaborate regarding message content, schedule and methods of distribution. The objectives are to inform users and stakeholders regarding progress during construction and to welcome prior and new users to Chatfield after Project construction is complete. This effort will begin with Project construction and will continue as long as annual payments are due to CPW or for 8 years, whichever occurs first. Mitigation Company commits to spend approximately \$20,000 per year for each year that the marketing and public relations initiative is in effect. Mitigation Company will provide CPW \$5,000 per year for Project-related marketing and public relations as long as annual payments are due to CPW or for 8 years, whichever occurs first.

### **CPW Escrow Account**

An independent escrow agent will be selected and paid for by the Water Providers to manage mitigation contributions and payments and prepare an annual report documenting activity. Instructions regarding the escrow account will be developed based on CRMC direction, per its governance provisions. Upon execution of this Agreement, the Water Providers will establish an interest-bearing CPW Escrow Account with initial funding equivalent to 12 months of future, expected annual mitigation payments so that CPW is assured that funds would be available. For the term of the Agreement, the minimum balance will be \$100,000 in cash or credit.

The escrow agent will receive contributions from individual Water Providers, based on their percentage of participation, make payments to State Parks, consistent with the terms of the Agreement and provide annual reports to State Parks and the Water Providers. The obligation to fund the escrow account will be effective when this or other agreements require funding and prior to the Start of Construction.

### **Financial Mitigation – Chatfield State Park Concessionaires**

This agreement affirms that the Water Providers will present a mitigation proposal to the marina and livery concessionaires that CPW determines to be fair and reasonable. The intent of the proposals is to backfill adverse financial impacts including increased operating costs and lost revenue to these concessionaires that are attributable to on-site construction and post construction impacts of the Project that impact their operations.

## **5.0 Schedule**

The general schedule for Project implementation is as follows:

Record of Decision signed	2013 or 2014
Water Storage Agreement signed	2014
Recreational modifications completed	2017
On-site environmental mitigations completed	2017
Storage initiated, if escrow account used (See CMP, p. 67)	2017
Stream enhancements completed	2019
Off-site environmental mitigations completed	2024

## **6.0 Conclusion**

This Fish, Wildlife and Recreation Mitigation Plan sets forth mitigations that are “economically reasonable and maintains a balance between the development of the state’s water resources and the protection of the state’s fish and wildlife resources” per C.R.S. 37-60-122.2. All impacts are mitigated in a reasonable manner.

The Chatfield Reallocation Project brings needed new surface water supplies to a basin considered to be severely short of water supply. The yield from the project of 8,500 AF/yr. is only a part of the solution for the identified water supply shortage in the South Platte basin of from 100,000 to 360,000 AF/yr in 2050. This Plan includes the mitigations required by the USACE, which will cost an estimated \$107,100,000, and additional fish, wildlife and recreation mitigations specifically in response to CPW concerns which will cost an additional estimated \$8,864,300. The total of all mitigations combined are \$115,964,300.

These mitigation measures and their estimated costs are summarized in the table below:

Mitigation Measures Required by the USACE:		Near-term costs
Compensatory Mitigation Plan		\$ 58,500,000
Recreation Facilities Modification Plan		31,600,000
Marina Plan		15,700,000
Water Quality Monitoring and Modeling (est.)		1,300,000
Required Releases for Critical Low Flows		--
Sub Total		\$107,100,000
Additional C.R.S. 37-60-122.2 Mitigation Measures Included in Response to CPW Concerns:		
Plum Creek Restoration Plan		\$ 6,088,600
Financial Plan (est.)		1,000,000
Stream Enhancement Upstream		369,600
Stream Enhancement Downstream		265,000
Hiring of Temporary CPW Resident Engineer (est.)		225,000
Shoreline Stabilization Plan		716,100
Marketing/ Public Relations Plan		200,000
Commitments in Reservoir Operations Plan		--
Assistance with Environmental Pool and/or Environmental flow releases		--
Sub Total		\$8,864,300
Grand Total		\$115,964,300

The proposed mitigation measures strike the appropriate and economically reasonable balance between comprehensive, responsible mitigations to mitigate the CPW concerns and the development of additional, urgently needed new water supplies.

## References

1. Colorado Water Conservation Board, Statewide Water Supply Initiative. Final Report. January, 2011.  
<http://cwcb.state.co.us/public-information/publications/pages/studiesreports.aspx>.
2. U. S. Army Corps of Engineers, Final Integrated Feasibility Report and Environmental Impact Statement, July 2013.
3. ERO Resources Corporation and Tetra Tech EC, Final Compensatory Mitigation Plan, February, 2013. Appendix K of the Final FR/EIS.
4. EDAW/AECOM, Chatfield Reservoir Recreation Facilities Modification Plan, January 2010. Appendix M of the Final FR/EIS.
5. SmithGroupJJR, Draft Marina Area Modification Plan, June 2013.
6. U. S. Army Corps of Engineers, Tree Management Plan, June 2012, Appendix Z of the Final FR/EIS.
7. ERO Resources Corporation, Chatfield Reallocation Project Adaptive Management Plan, March 12, 2013, Appendix GG of the Final FR/EIS.
8. ERO Resources Corporation, Comparative Review of Reservoir Fluctuation Zone Chatfield Reallocation Project, November, 2012. Appendix HH of the Final FR/EIS.
9. Muller Engineering Company, Inc., Draft Plum Creek Stream Stability Assessment Chatfield State Park, April 2, 2013.

Figure 1

Project Area Map

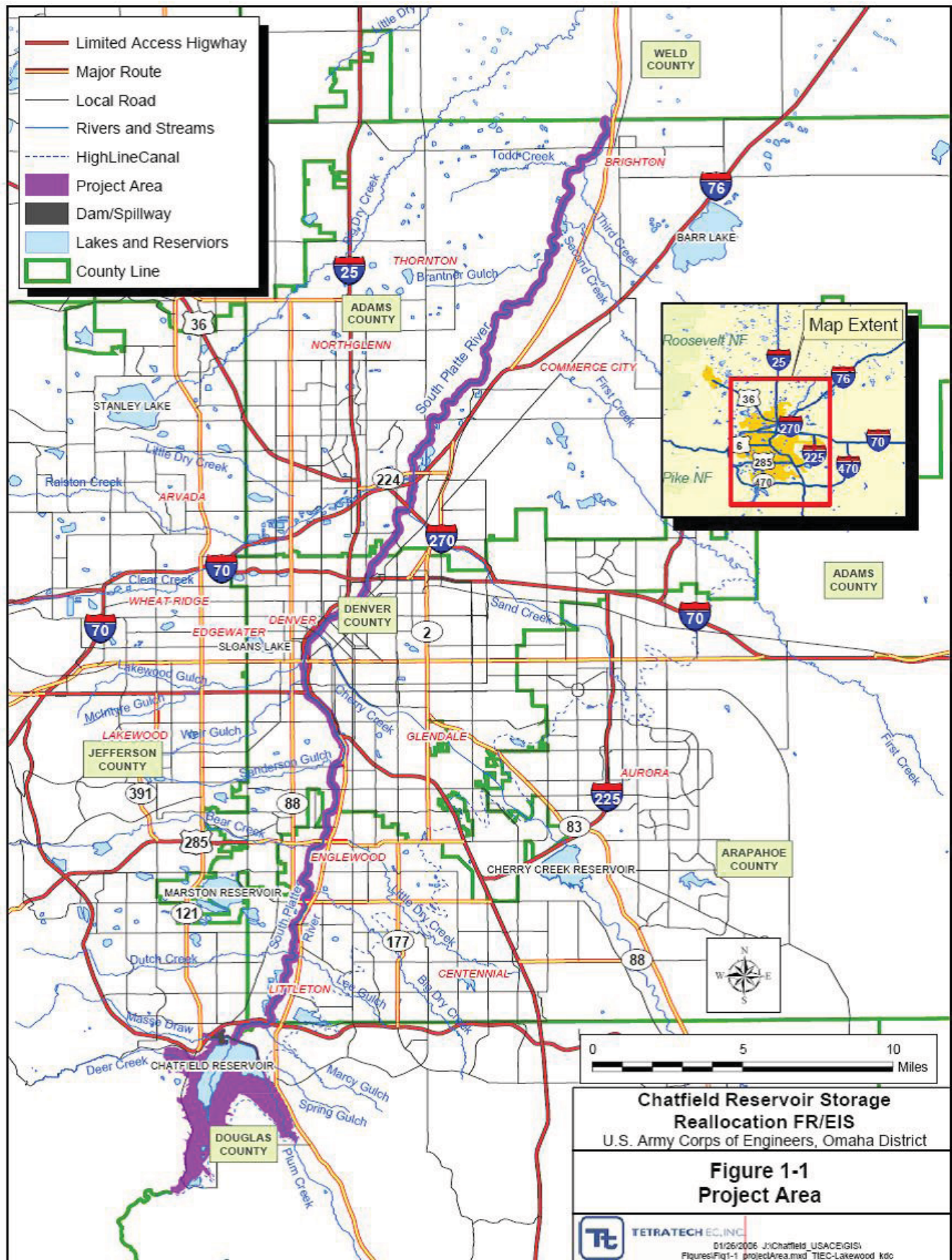


Figure 2

# Chatfield Project Participant's Service Areas

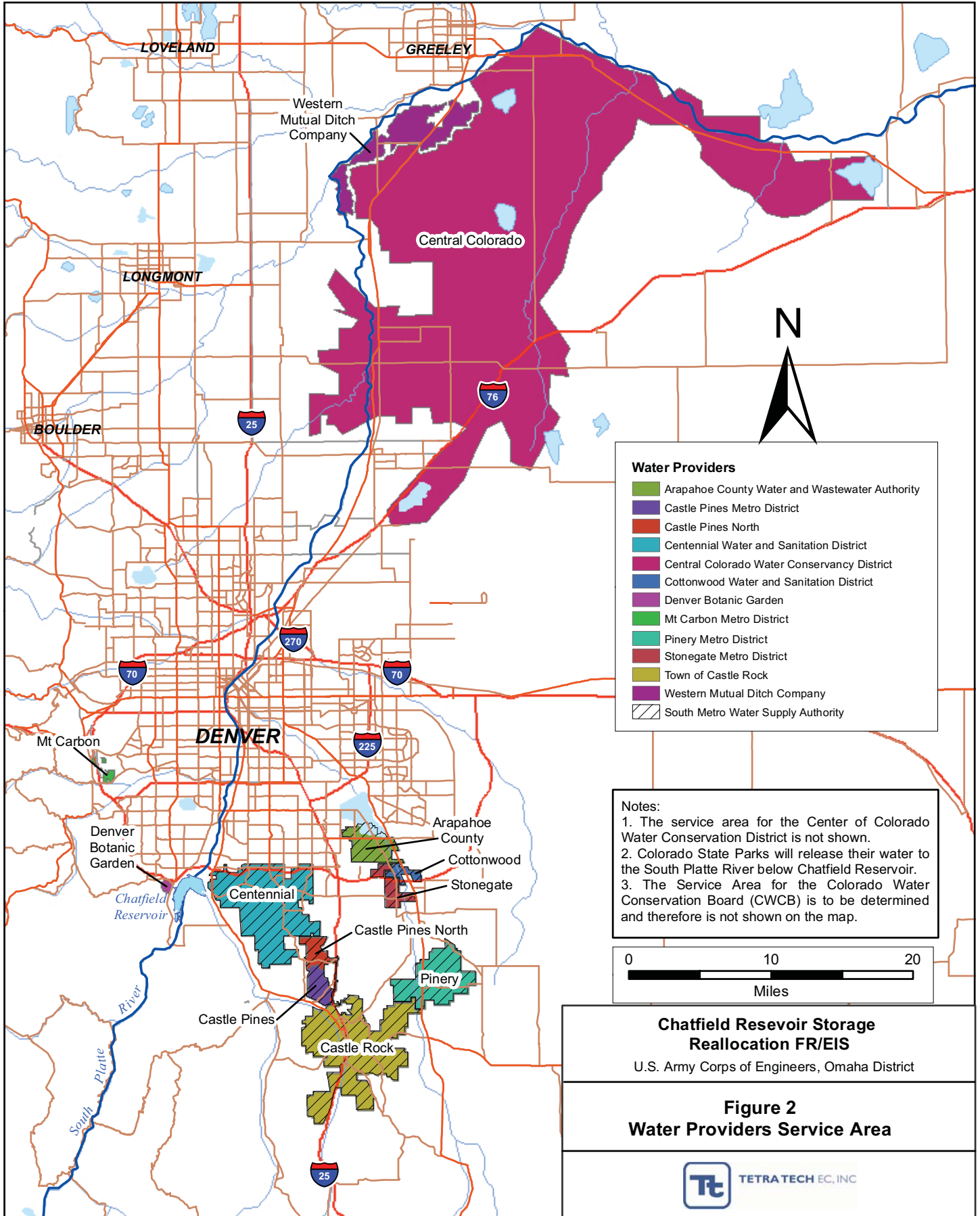
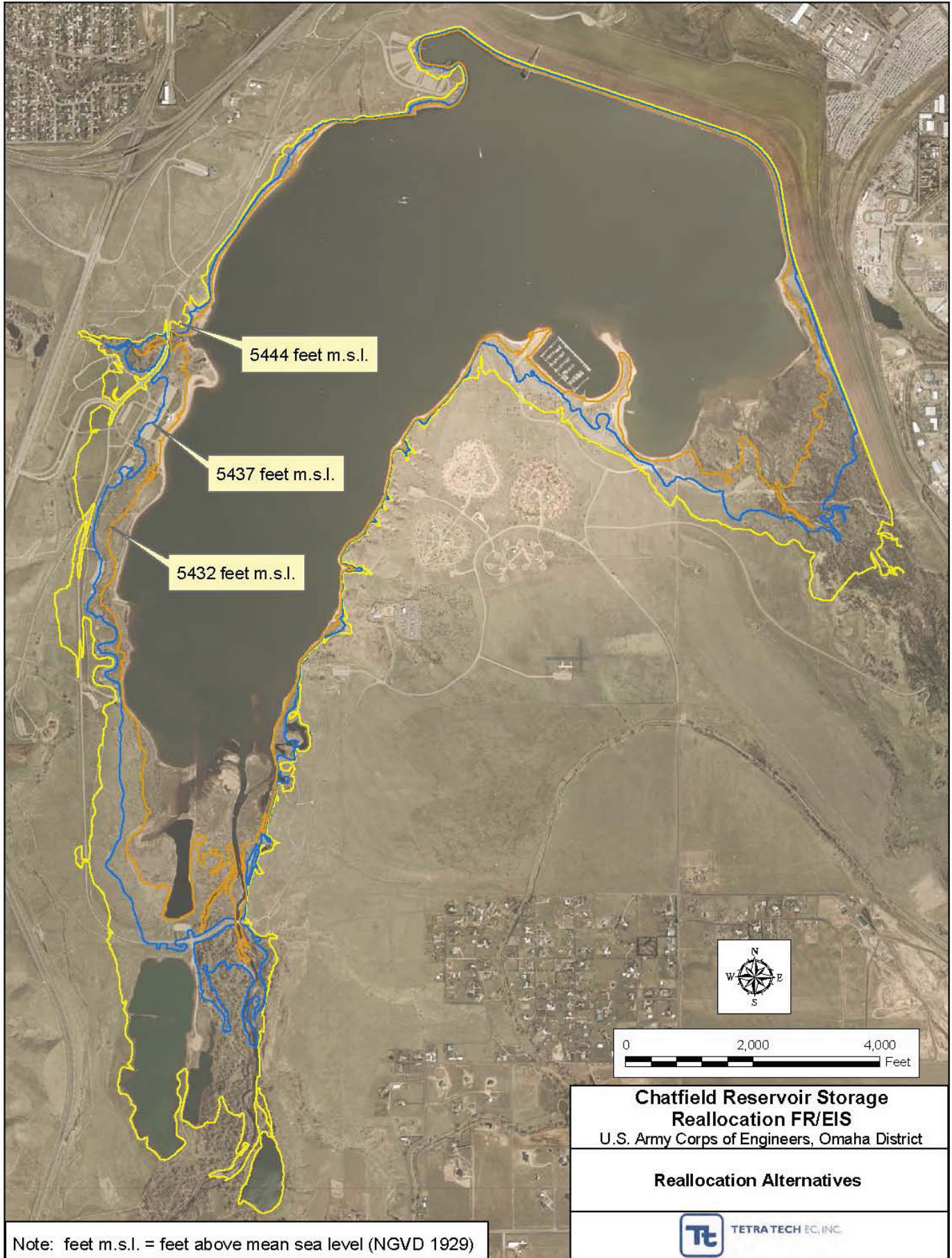
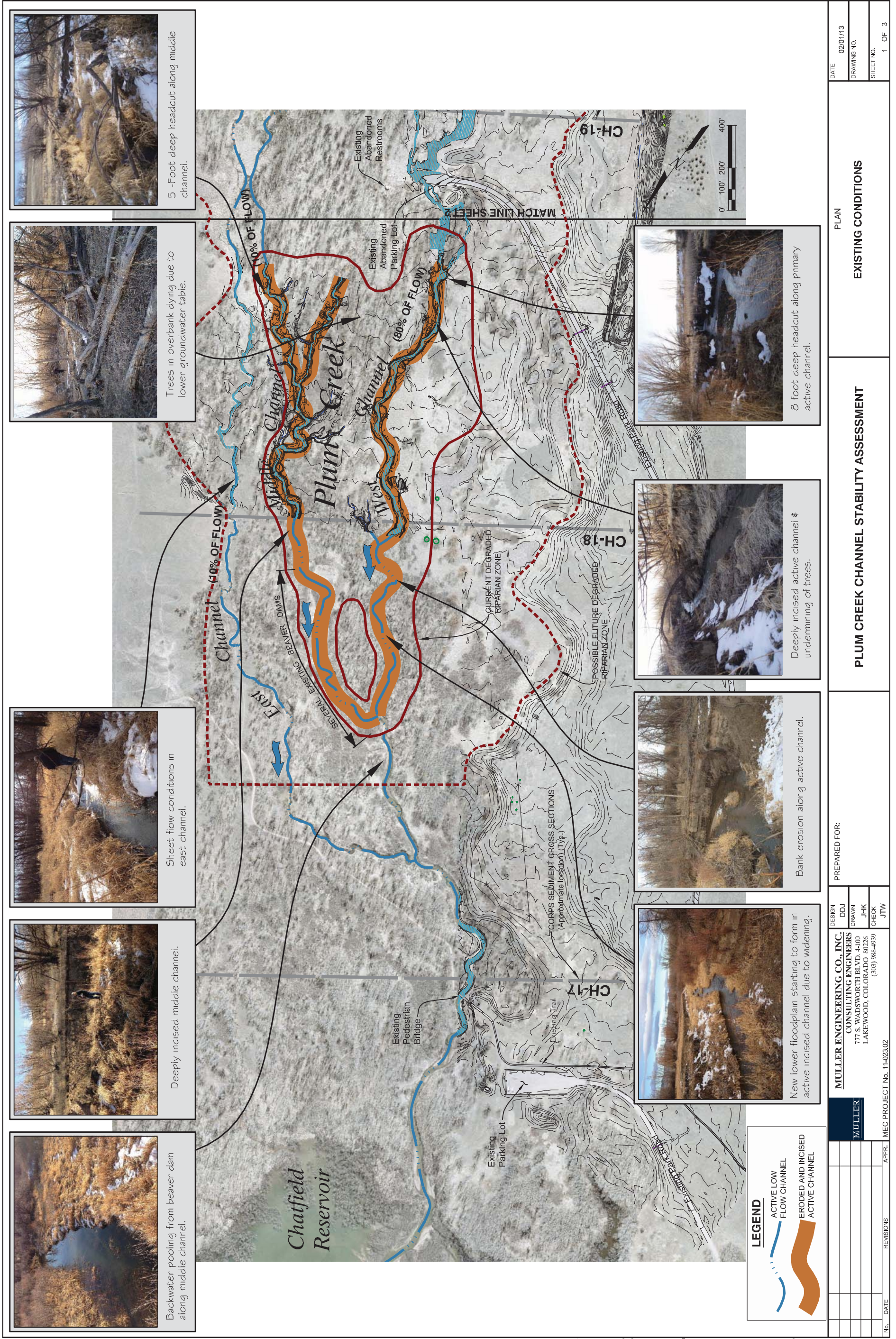


Figure 3

Reallocation Alternatives



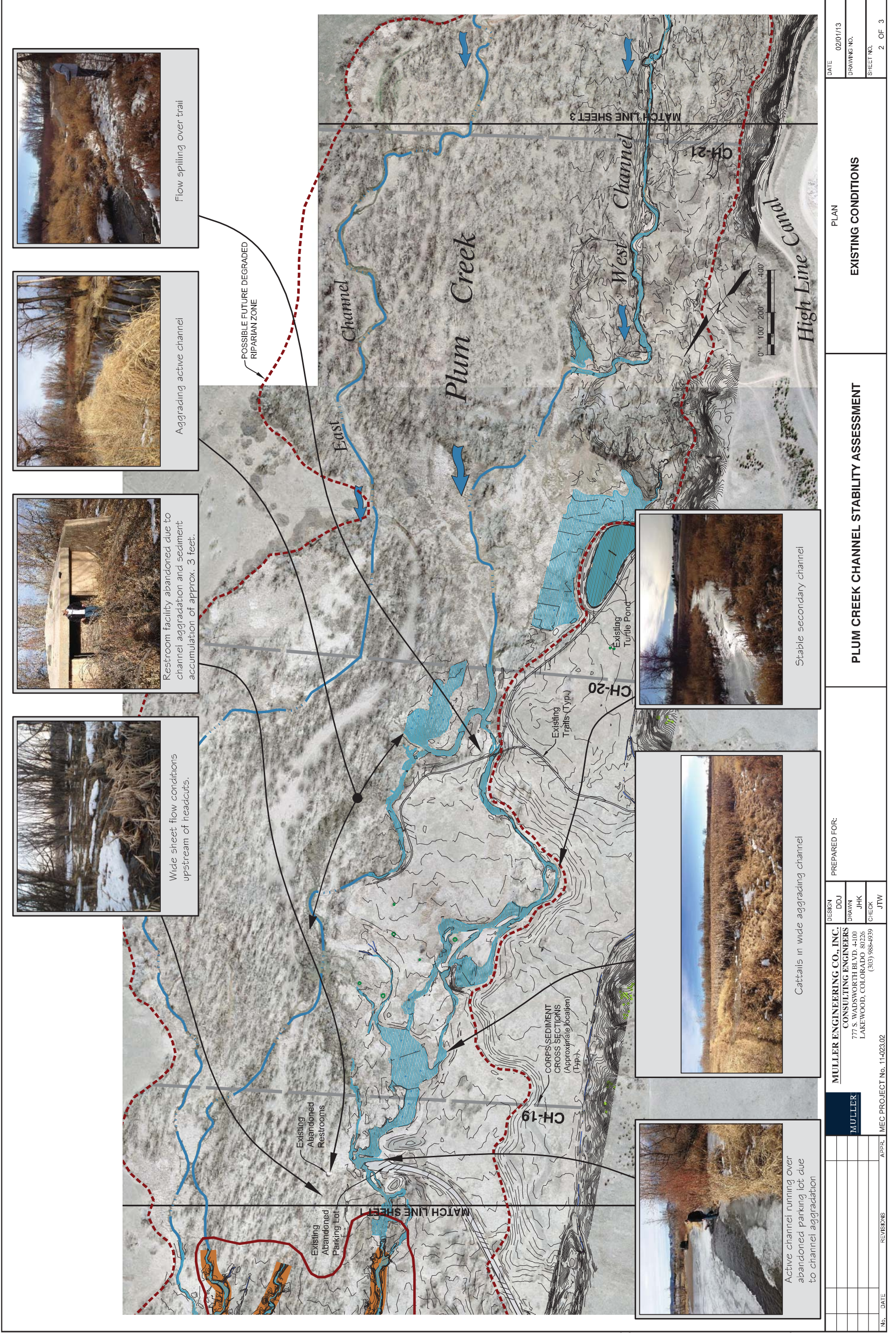




NO. DATE REVISIONS APPR.		DESIGN DDJ		PREPARED FOR:		PLAN		DATE 02/01/13	
		DRAWN JHK		MULLER ENGINEERING CO., INC.		EXISTING CONDITIONS		DRAWING NO.	
		CHECK JTW		CONSULTING ENGINEERS		PLUM CREEK CHANNEL STABILITY ASSESSMENT		SHEET NO.	
				777 S. WADSWORTH BLVD. 4-100				1 OF 3	
				LAKEWOOD, COLORADO 80226					
				(303) 988-4939					
				MEC PROJECT No. 11-023.02					

Figure 5

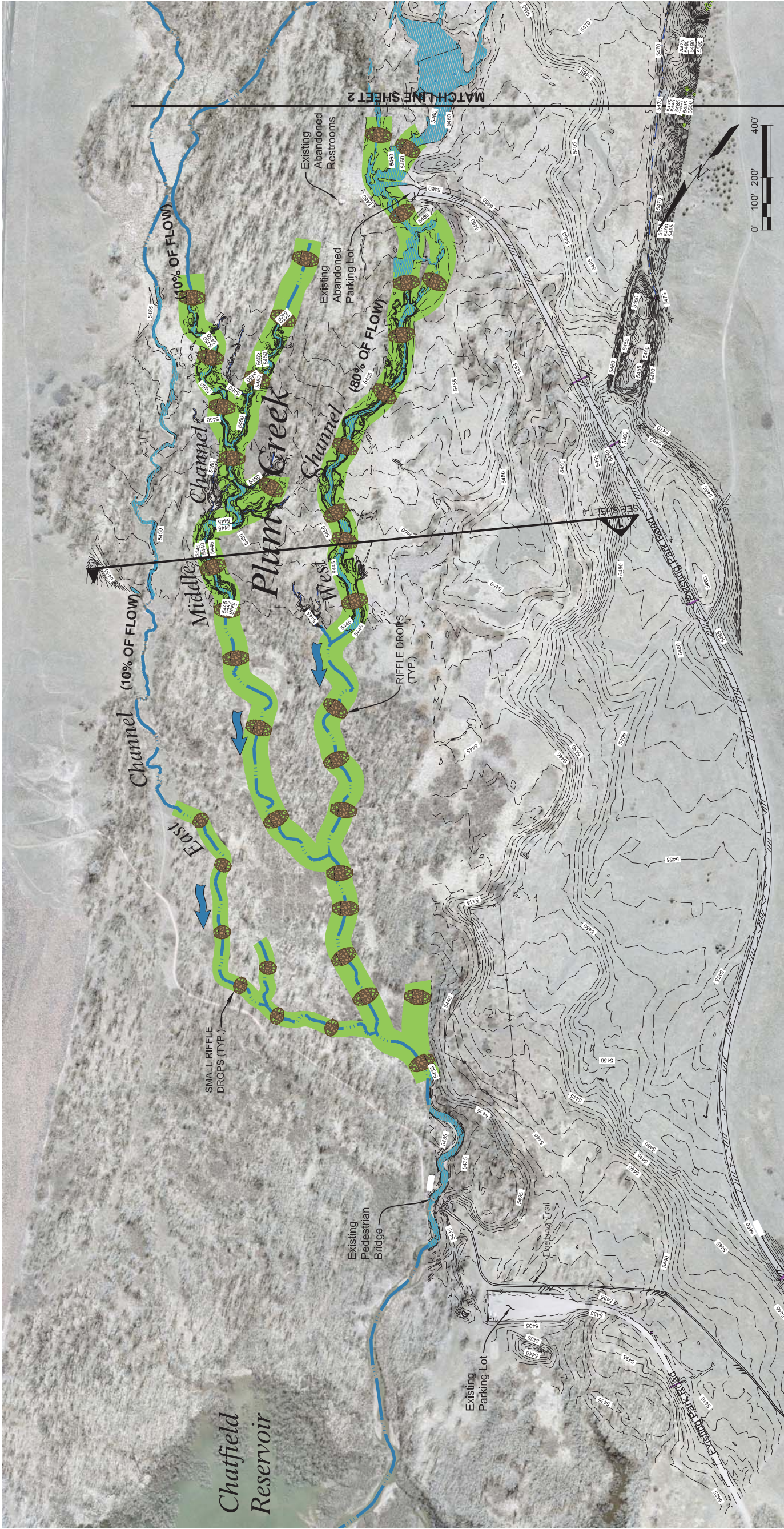
Plum Creek Existing Conditions (2)



<p>DATE: 02/01/13 DRAWING NO.:</p>		<p>PLAN</p>		<p>EXISTING CONDITIONS</p>	
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<p>MULLER ENGINEERING CO., INC. CONSULTING ENGINEERS 777 S. WADSWORTH BLVD. 4100 LAKEWOOD, COLORADO 80226 (303) 988-4939</p>		<p>MULLER</p>		<p>MEC PROJECT No. 11-023.02</p>	
No.	DATE	REVISIONS	APPR.		

Figure 6

Plum Creek Conceptual Stream Restoration Improvements



- LEGEND**
- ACTIVE LOW FLOW CHANNEL
  - AREAS OF PROPOSED CHANNEL IMPROVEMENTS INCLUDING FILLING/RAISING INCISED CHANNELS, BANK GRADING, BANK PROTECTION, AND REVEGETATION
  - PROPOSED RIFFLE DROP STRUCTURES

NOTE: TOPOGRAPHIC MAPPING IS ON THE NGVD29 VERTICAL DATUM.

NO.	DATE	REVISIONS	APPR.	MEC PROJECT No. 11-023.02	MULLER	PREPARED FOR:			PLAN	DATE	DRAWING NO.	SHEET NO.
						MULLER ENGINEERING CO., INC. CONSULTING ENGINEERS 777 S. WADSWORTH BLVD. 4-100 LAKEWOOD, COLORADO 80226 (303) 988-4939	DDJ	JHK				
					PLUM CREEK CHANNEL STABILITY ASSESSMENT							

Figure 7

# Shoreline Stabilization Plan

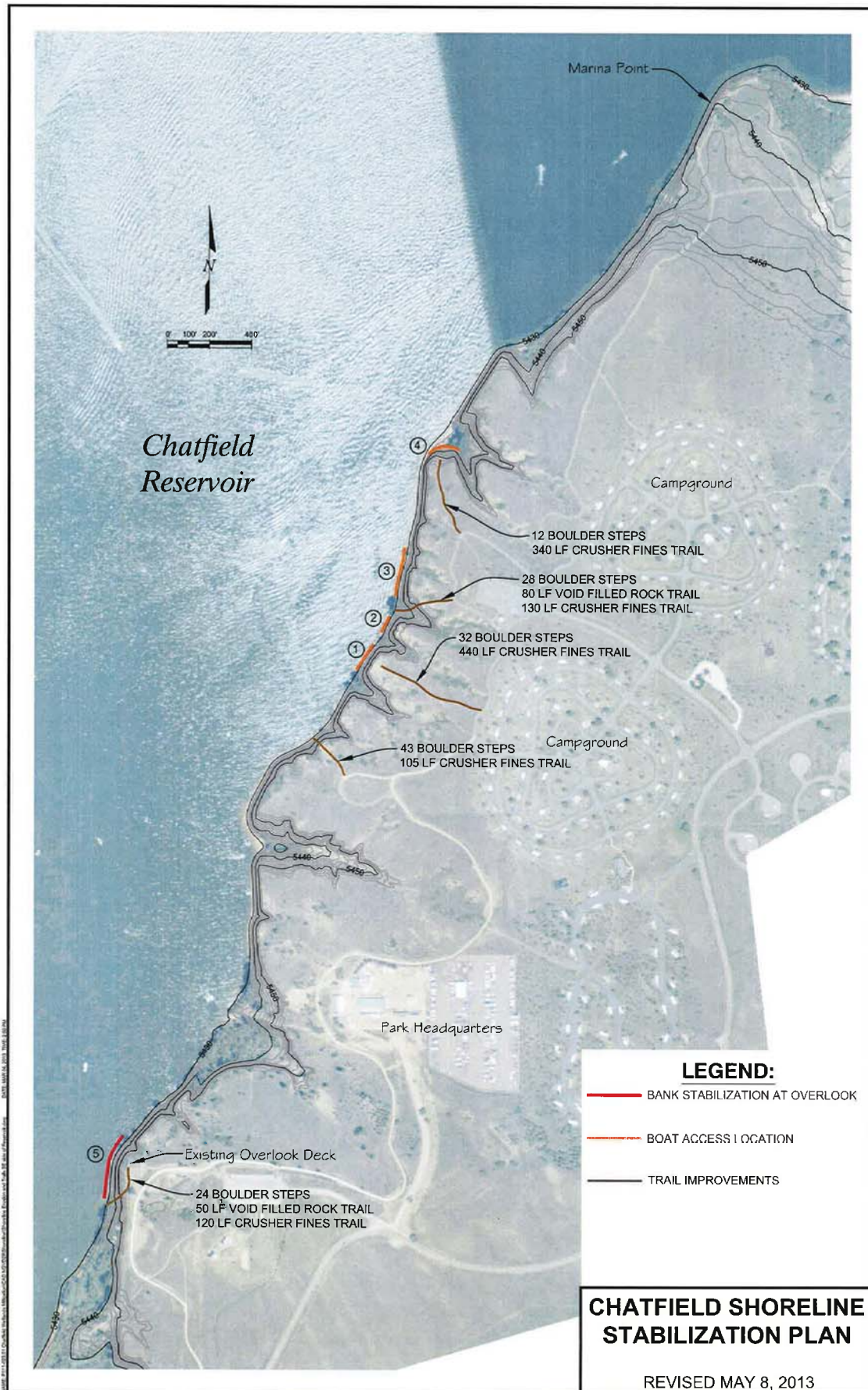
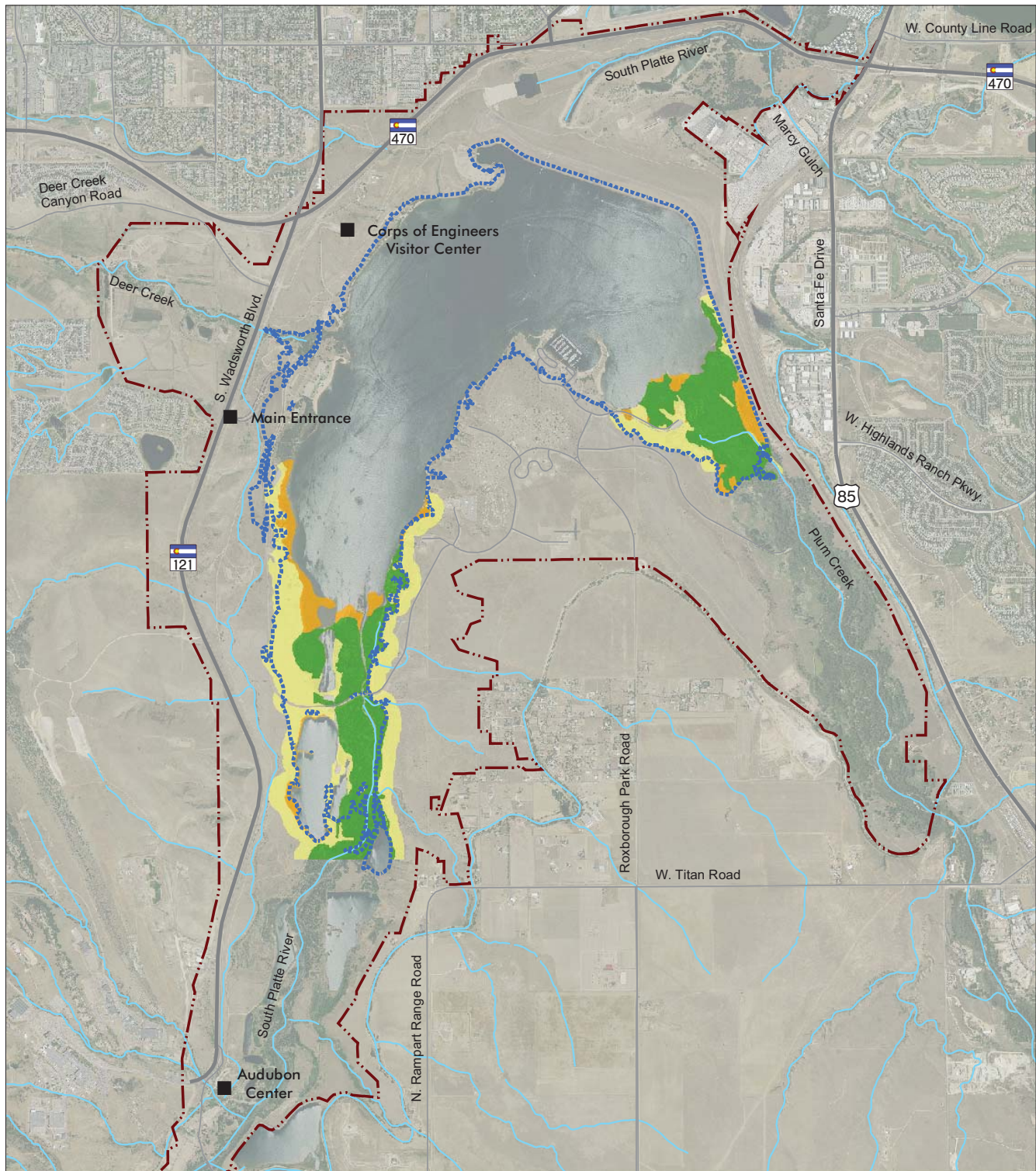


Figure 8

Preble's Habitat at Chatfield State Park

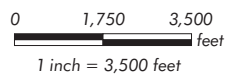


**Chatfield Reallocation Study**

- High Value Riparian Habitat
- Low Value Riparian Habitat
- Upland

- 5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
- Chatfield State Park

Imagery Source : Landiscor©, June 2008  
Pool Elevations: Tetratech



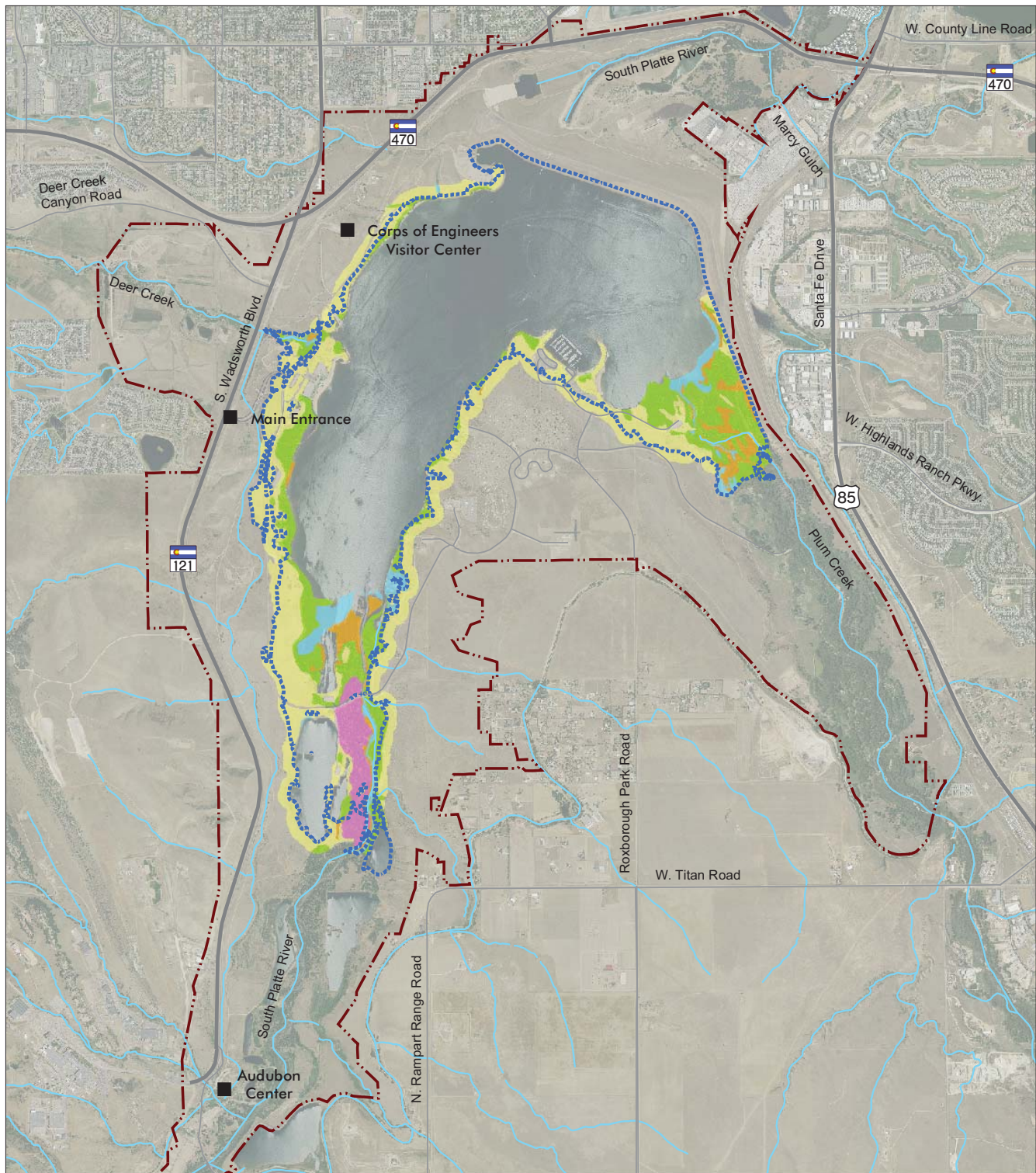
**Preble's Habitat**

File: 4048 Figure C-1 PMJM Habitat.mxd (6S)  
November 2009



Figure 9

Bird Habitat at Chatfield State Park

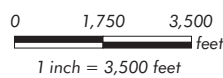


**Chatfield Reallocation Study**

- Mature Cottonwood
- Shrub
- Trees
- Upland
- Wetland/Nonwoody

- 5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
- Chatfield State Park

Imagery Source : Landiscor©, June 2008  
Pool Elevations: Tetratech



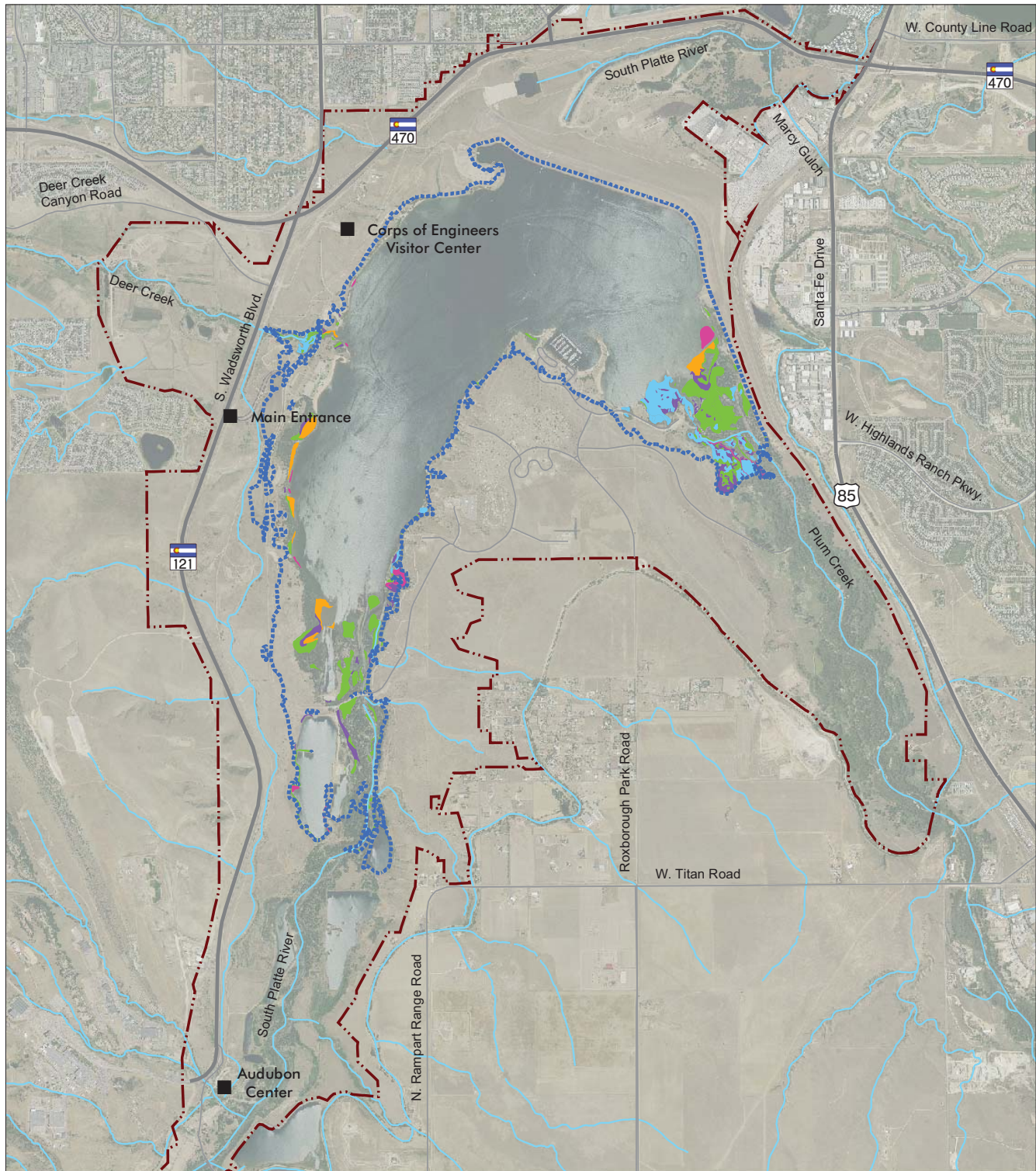
**Bird Habitat**

File: 4048 Figure C-2 Bird Habitat.mxd (GS)  
November 2009



Figure 10

# Wetland Habitat at Chatfield State Park



**Chatfield Reallocation Study**

- Lacustrine Emergent
- Palustrine Aquatic Bed
- Palustrine Emergent
- Palustrine Forested
- Palustrine Scrub-Shrub

- 5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
- Chatfield State Park

Imagery Source : Landiscor©, June 2008  
Pool Elevations: Tetrattech

0 1,750 3,500 feet  
1 inch = 3,500 feet



**Wetland Habitat**

File: 4048 Figure C-3 Wetland Habitat.mxd (GS)  
November 2009



Figure 11

Location of Potential On-Site Mitigation Areas

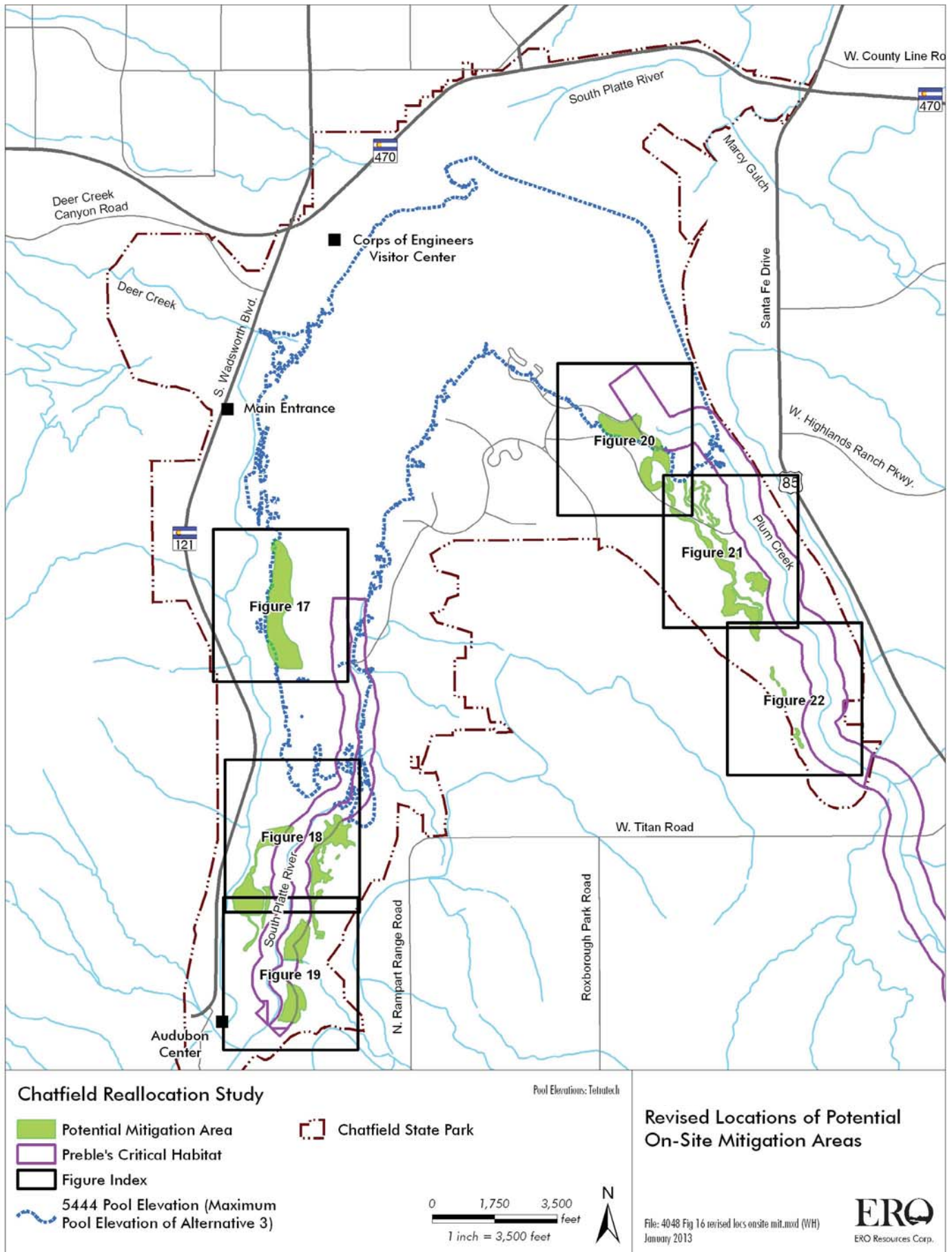




Figure 12 Lower Marcy Gulch Potential On-Site Mitigation Area



The numbers and locations of the ground water monitoring wells are approximations and may be adjusted in the field to better define site locations and variability within and among sites.

**Chatfield Reallocation Study**

- Potential Mitigation Area
- Ground Water Monitoring Well
- Sheet Pile Cutoffs
- Diversion Channel

Imagery Source : LandisCor©, June 2008  
Pool Elevations: Tetrattech

- 5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
- Chatfield State Park

0 250 500 feet  
1 inch = 500 feet



**Lower Marcy Gulch Potential On-Site Mitigation Areas**

File: 4048 Figs 8-15 onsite mit mapbook.mxd (WH)  
February 2011



Figure 13 South Platte River Potential On-Site Mitigation Area (1)



**Chatfield Reallocation Study**

-  Potential Mitigation Area
-  Ground Water Monitoring Well
-  5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
-  Chatfield State Park

Imagery Source : LandisCor©, June 2008  
Pool Elevations: Tetratech

0 250 500 feet  
1 inch = 500 feet

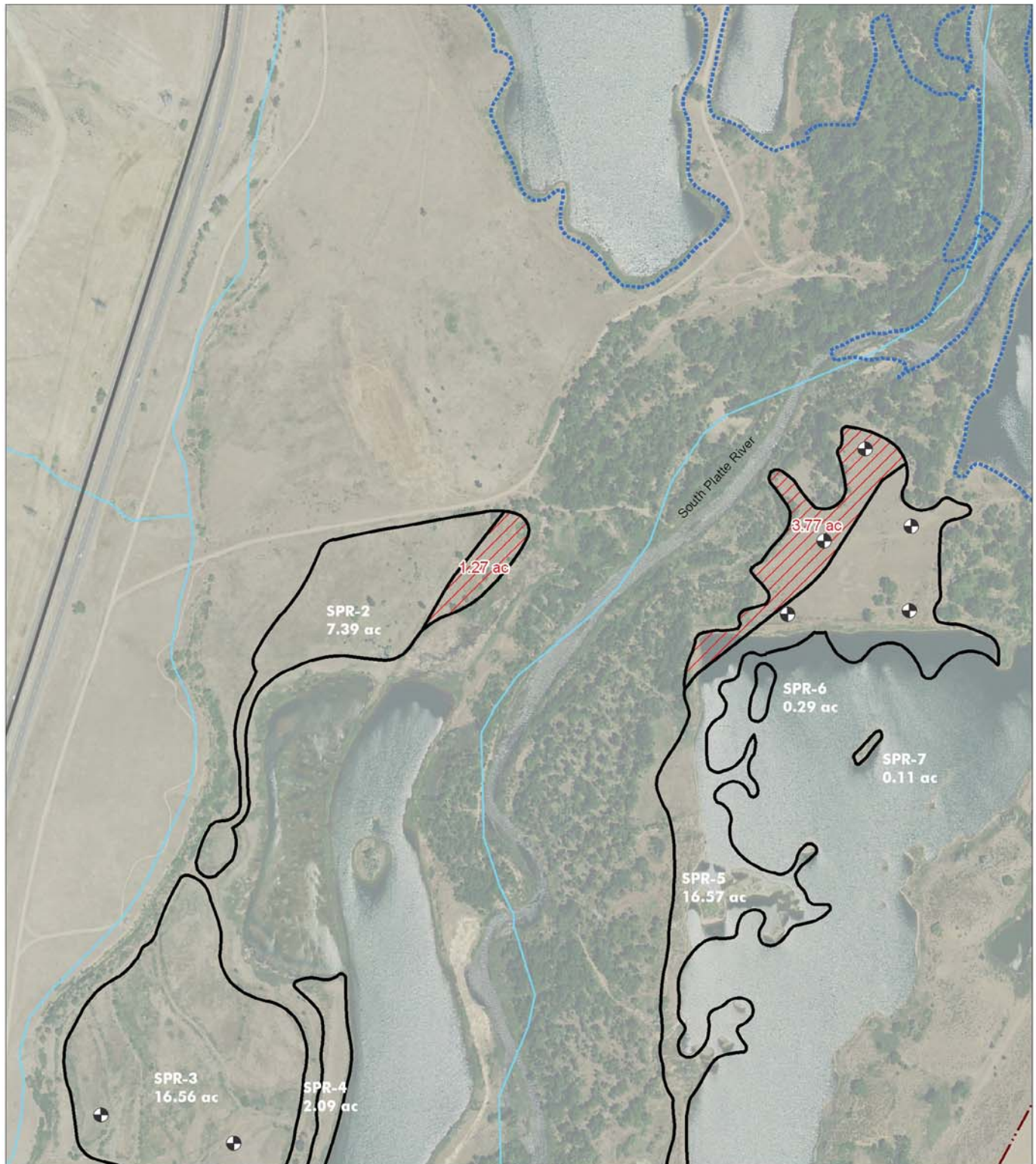


**South Platte River  
Revised Potential On-Site  
Mitigation Areas**

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January 2013



Figure 14 South Platte River Potential On-Site Mitigation Area (2)

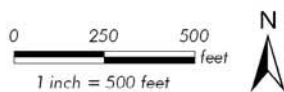


Chatfield Reallocation Study

- Potential Mitigation Area
- Preble's Critical Habitat
- Potential Mitigation
- Ground Water Monitoring Well
- 5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)

Imagery Source : Landiscor©, June 2008  
Pool Elevations: Tetratech

Chatfield State Park



South Platte River  
Revised Potential On-Site  
Mitigation Areas





File: 4048 Figs.17-22 rev onsite mit mapbook.mxd (WH)  
January 2013



Figure 15 South Platte River Potential On-Site Mitigation Area (3)

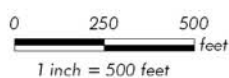


**Chatfield Reallocation Study**

-  Potential Mitigation Area
-  Preble's Critical Habitat Potential Mitigation
-  Ground Water Monitoring Well
-  5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)

 Chatfield State Park

Imagery Source : Landiscor©, June 2008  
Pool Elevations: Tetratech



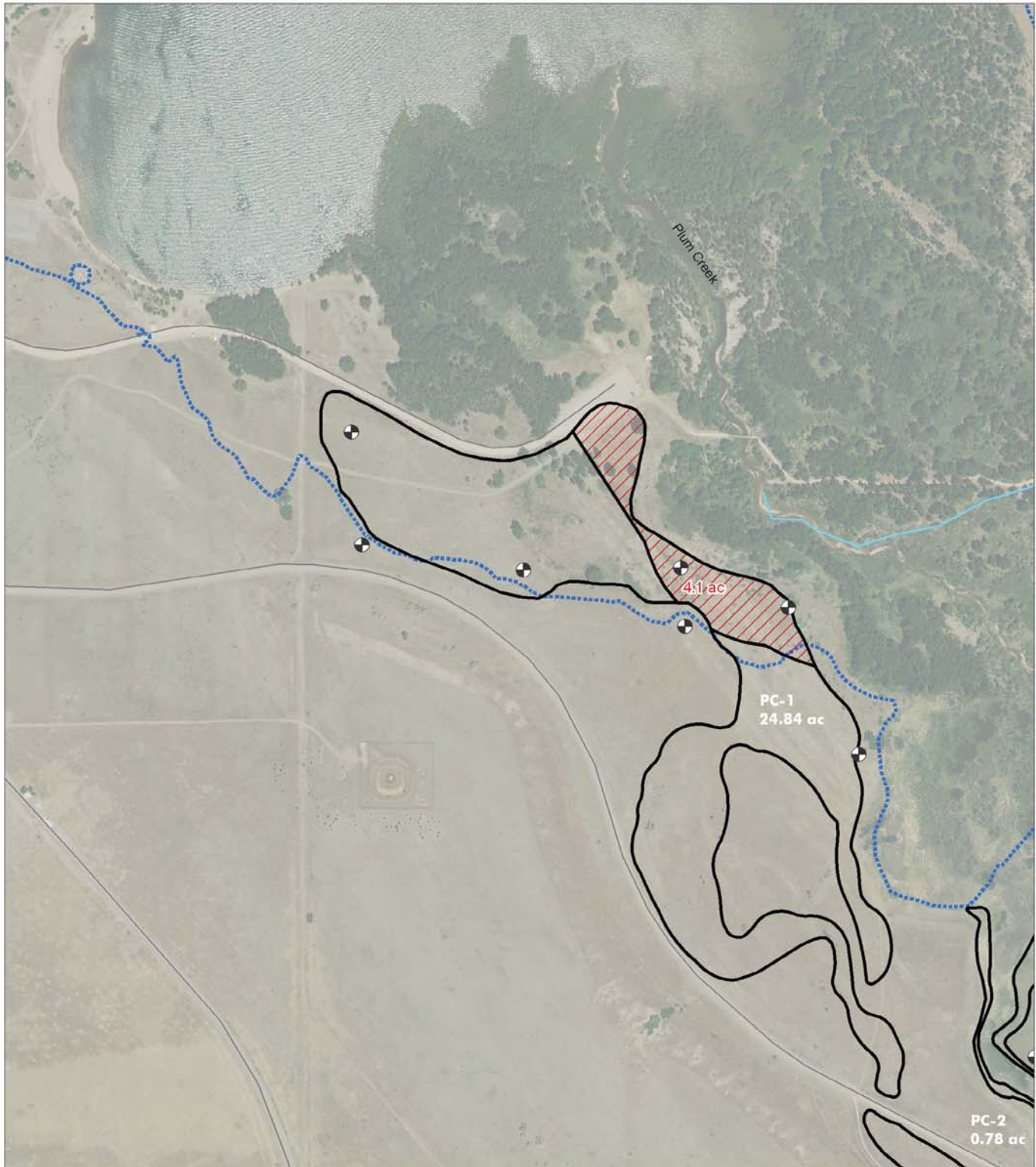
**South Platte River  
Revised Potential On-Site  
Mitigation Areas**

File: 4048 Figs 17-22 ter onsite mit mapbook.mxd (WH)  
January 2013



Figure 16

Plum Creek Potential On-Site Mitigation Area (1)



Chatfield Reallocation Study

- Potential Mitigation Area
- Preble's Critical Habitat Potential Mitigation
- Ground Water Monitoring Well
- 5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)

Chatfield State Park

Imagery Source : Landsat©, June 2008  
Pool Elevations: TetraTech

0 250 500 feet  
1 inch = 500 feet



Plum Creek  
Revised Potential On-Site  
Mitigation Areas

File: 4048 Figs 17-22 rev onsite mit mapbook.mxd (VH)  
January 2013



Figure 17

Plum Creek Potential On-Site Mitigation Area (2)

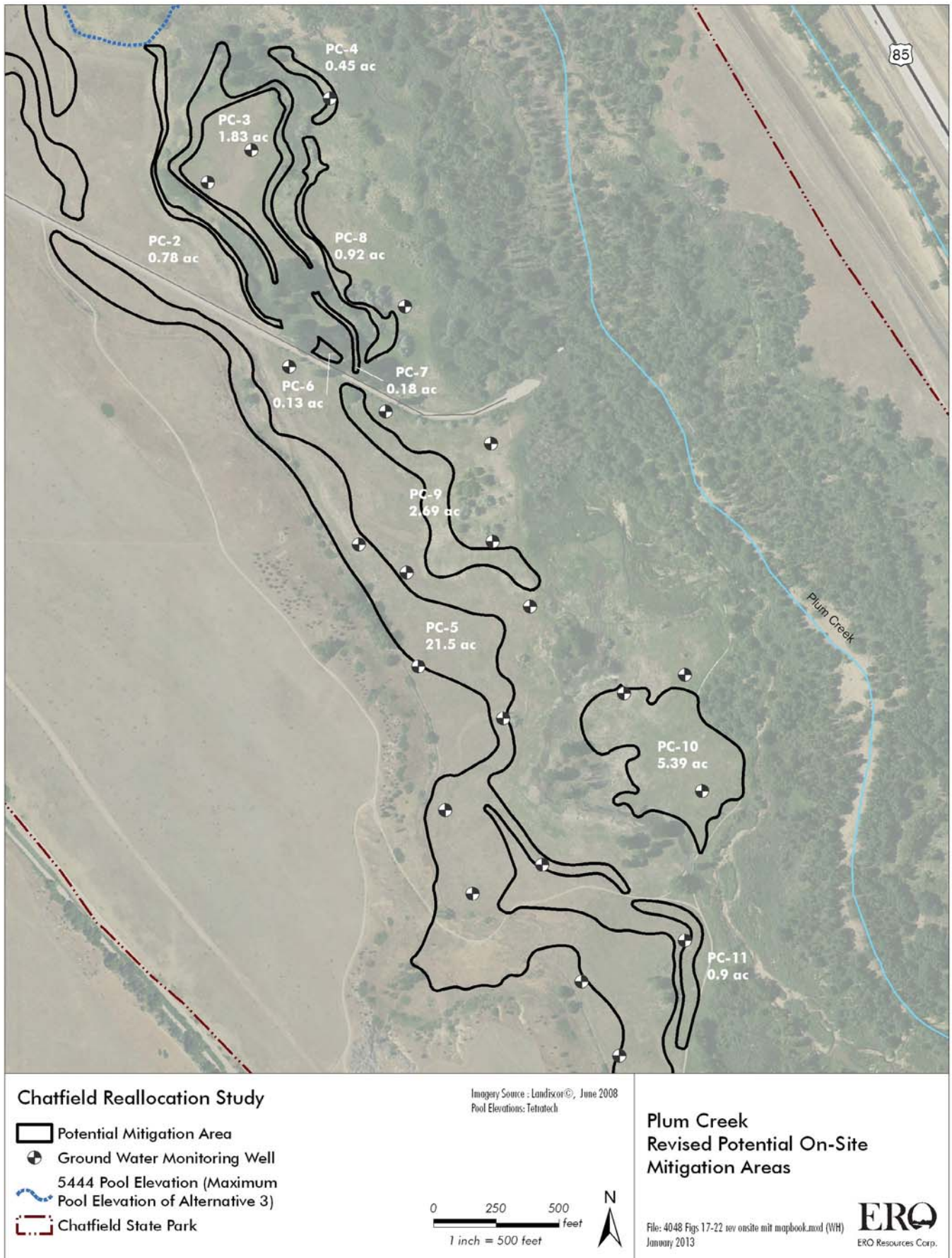
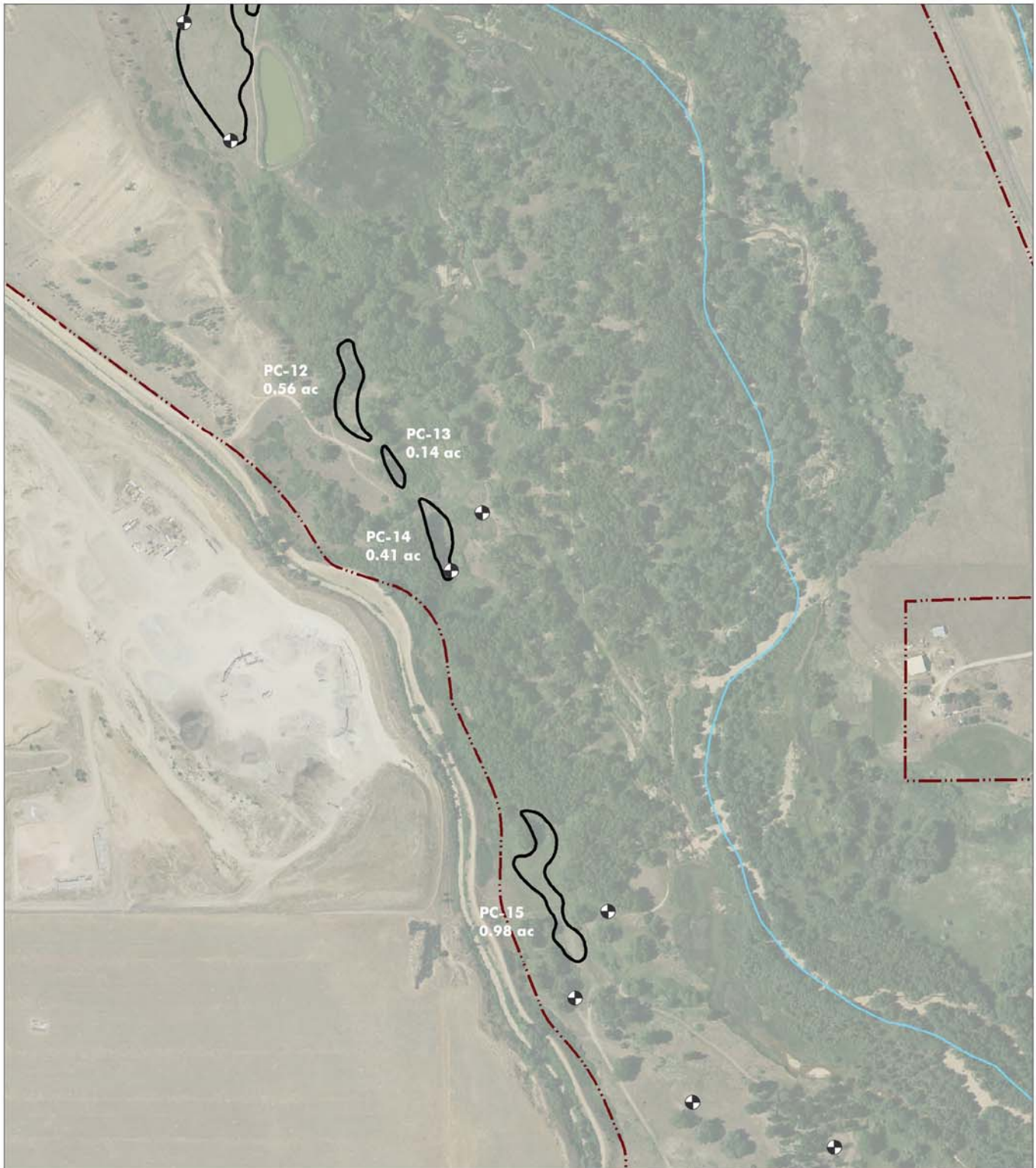


Figure 18

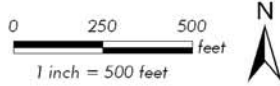
Plum Creek Potential On-Site Mitigation Area (3)



**Chatfield Reallocation Study**

-  Potential Mitigation Area
-  Ground Water Monitoring Well
-  5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
-  Chatfield State Park

Imagery Source : Landsat ©, June 2008  
Pool Elevations: TetraTech

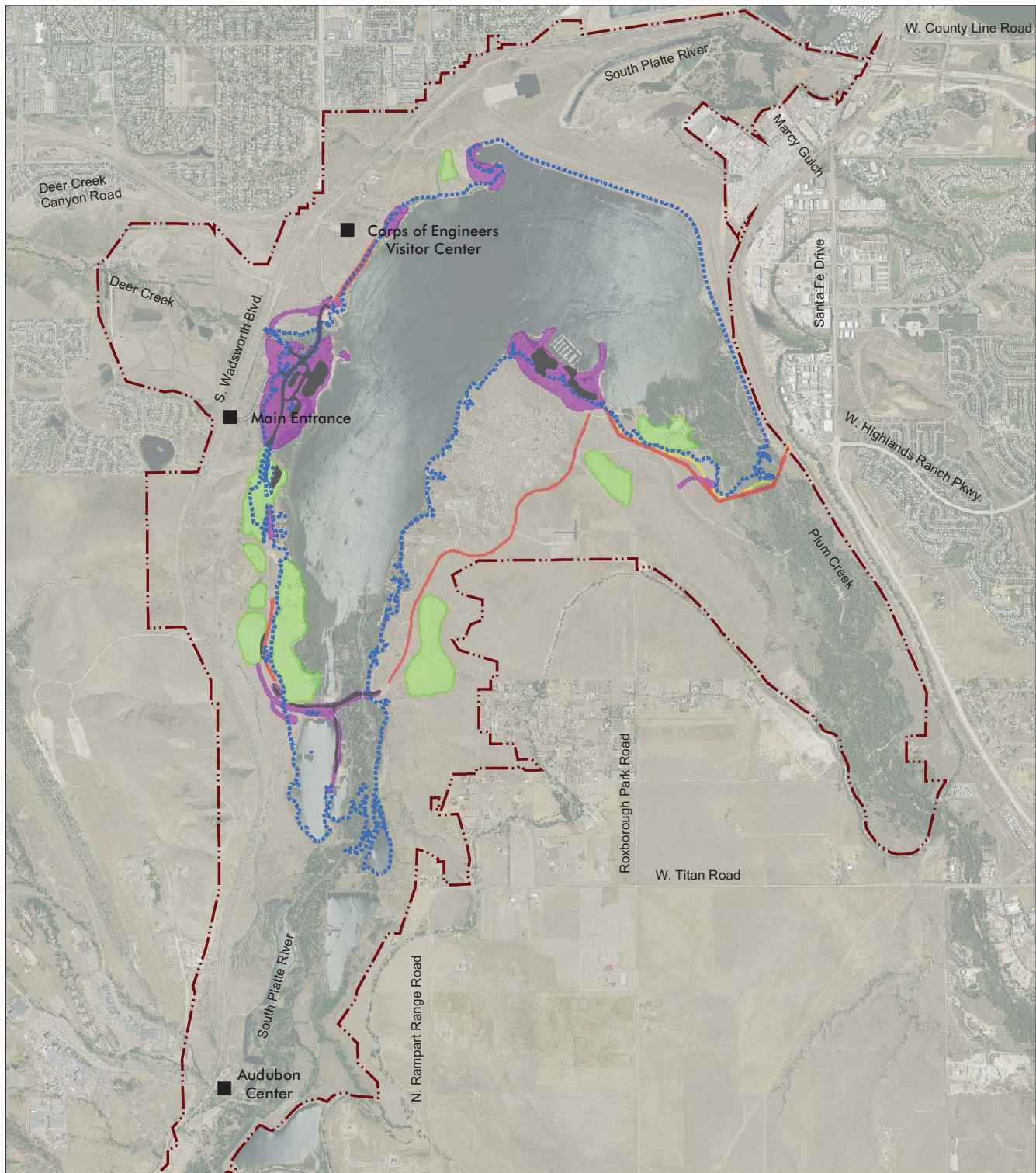


**Plum Creek  
Revised Potential On-Site  
Mitigation Areas**






File: 4048 Figs 17-22 rev onsite mit mapbook.mxd (WH)  
January 2013



**Figure 19** Areas Impacted by Recreational Facilities Relocation, Borrow Areas, and Haul Roads



**Chatfield Reallocation Study**

-  Borrow Area
-  New Trail
-  Recreation Facility Relocation
-  Utility/Haul Road
-  Non-Habitat

-  5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
-  Chatfield State Park

Imagery Source : Landiscor©, June 2008  
Pool Elevations: Tetrattech

0 1,750 3,500  
feet  
1 inch = 3,500 feet



**Impacts Associated with Recreation Facility Relocation and Borrow Areas**

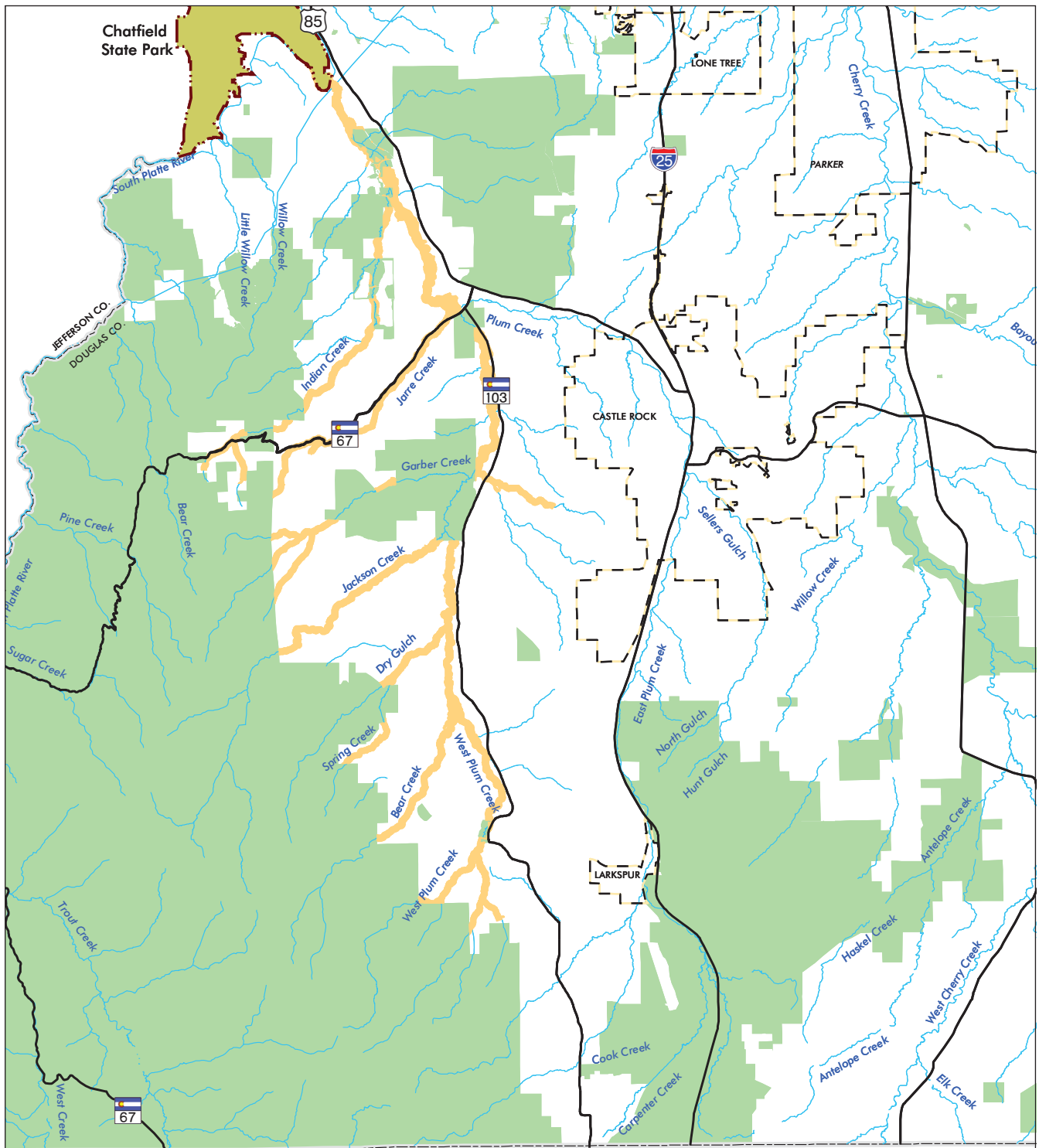
File: 4048 Figure 16 Rec Facs and Borrow areas.mxd (GS)  
February 2011





Figure 20

Potential Off-Site Mitigation Areas

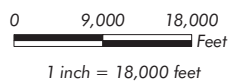


**Chatfield Reallocation Study**

-  Primary Target Off-Site Mitigation Area
-  Protected Lands
-  Incorporated Towns
-  Chatfield State Park

Unshaded areas are unprotected lands in Douglas County

Imagery Source : Landiscor©, June 2008  
Pool Elevations: Tetrattech



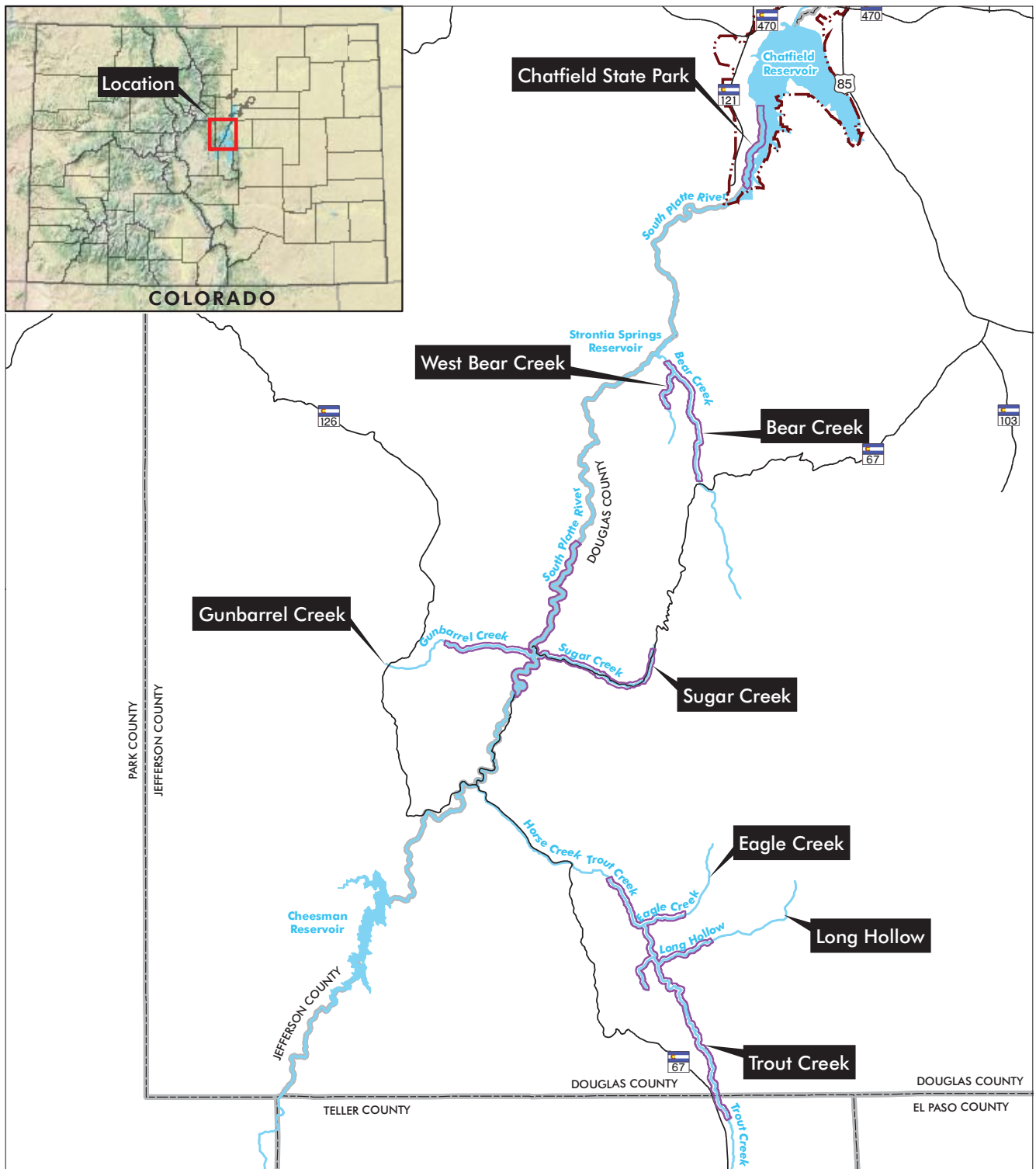
**Off-Site Mitigation Target  
Habitat within Private  
Douglas County Parcels**

File: 4048 - Figure 18 Off-Site Mit Target.mxd (GS)  
February 2011








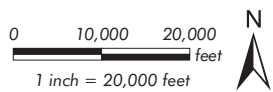
ERO Resources Corp.

Figure 21 Sugar Creek Off-Site Mitigation Area within the Upper South Platte



**Chatfield Reallocation Study**

-  Preble's Critical Habitat
-  Stream
-  Chatfield State Park
-  Major Road
-  County Boundary



**Upper South Platte River  
Critical Habitat Unit for Preble's**

File: 4048 - Figure 22 UPSPR.CH.mxd (WH)  
February 2011



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Figure 22

Potential Preble's Critical Habitat Mitigation at Sugar Creek

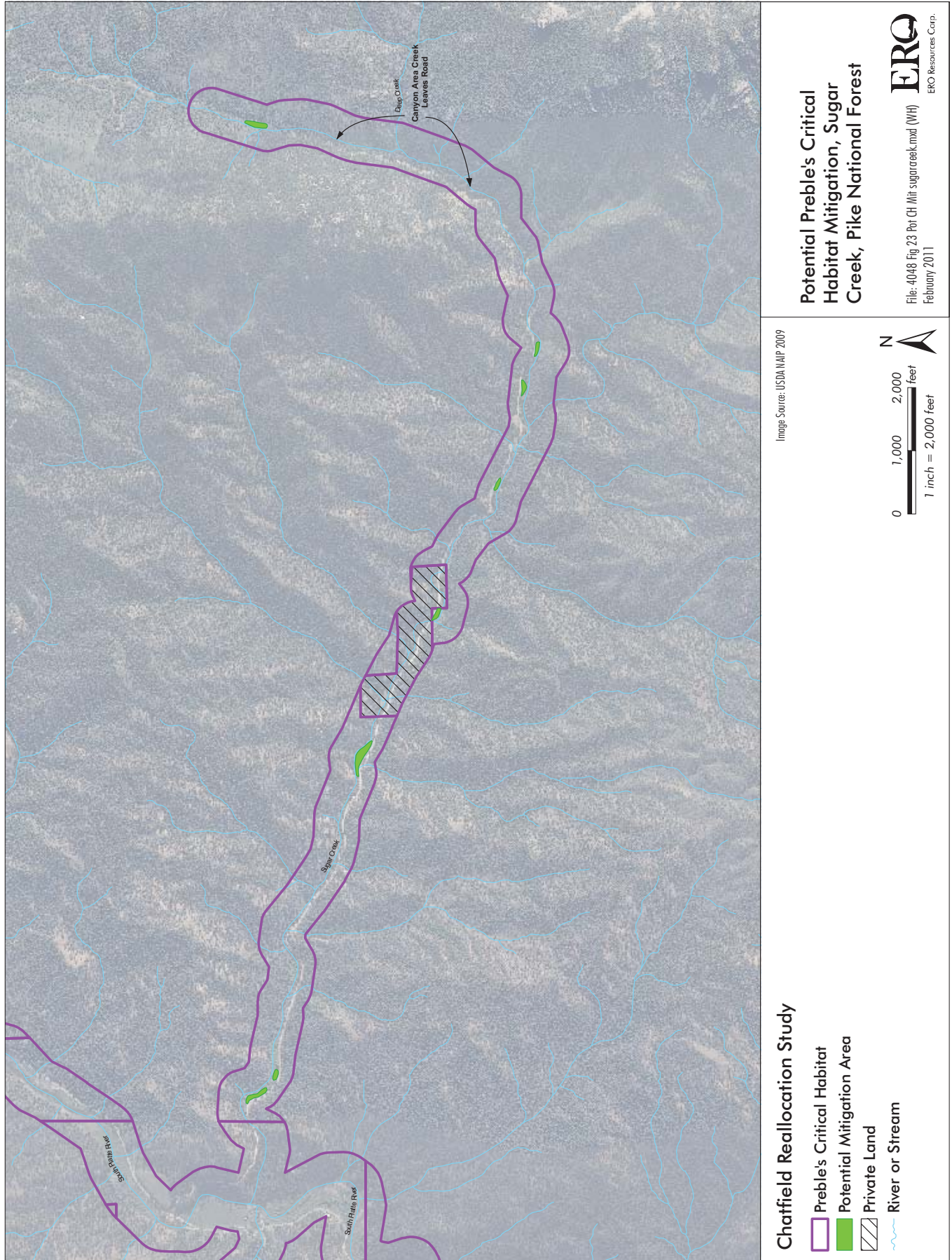
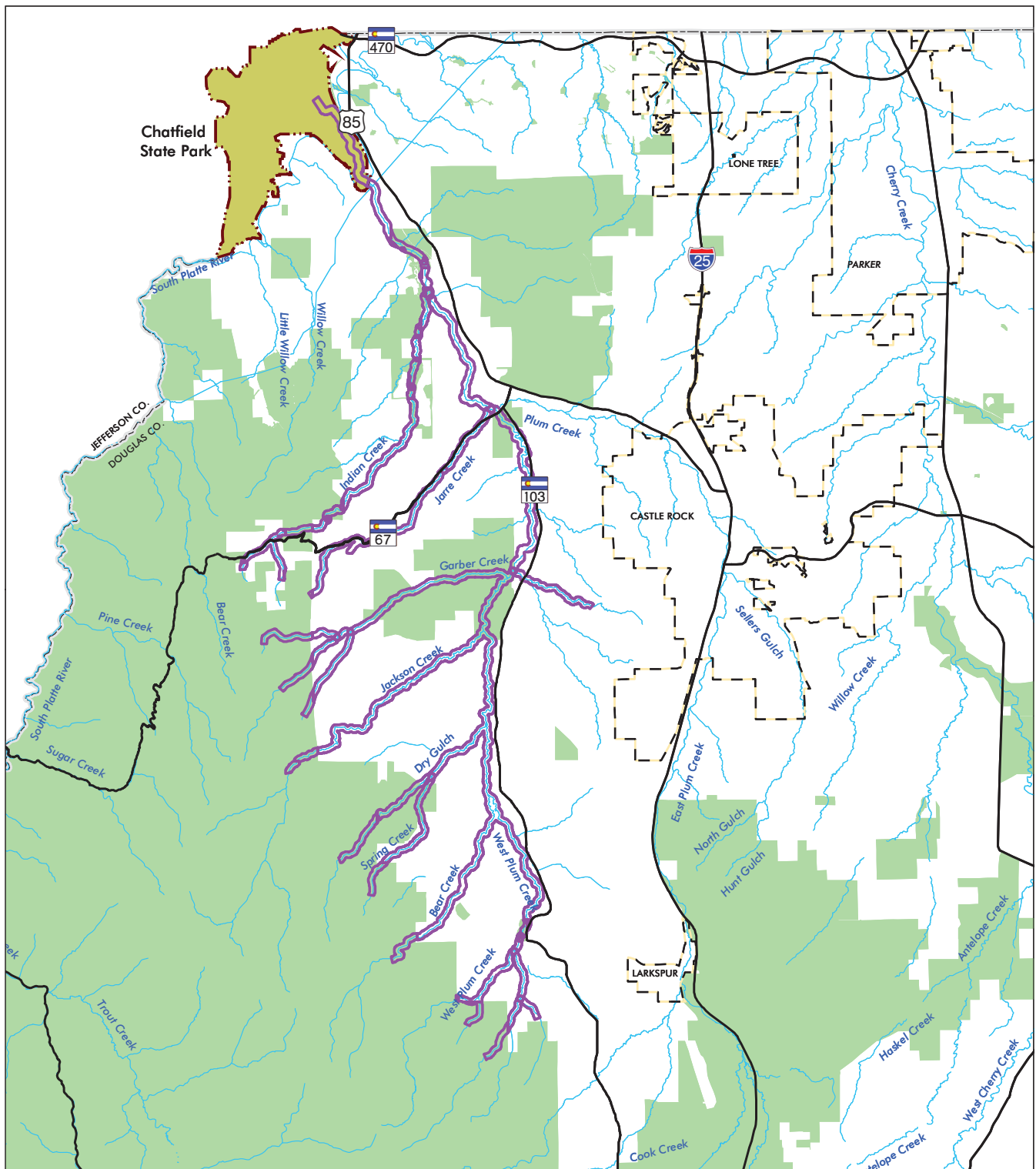


Figure 23

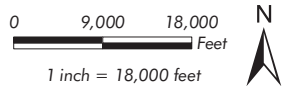
West Plum Creek Critical Habitat Unit for Preble's



Chatfield Reallocation Study

- Preble's Proposed Critical Habitat
- Protected Lands
- Incorporated Towns
- Chatfield State Park

Unshaded areas are unprotected lands in Douglas County

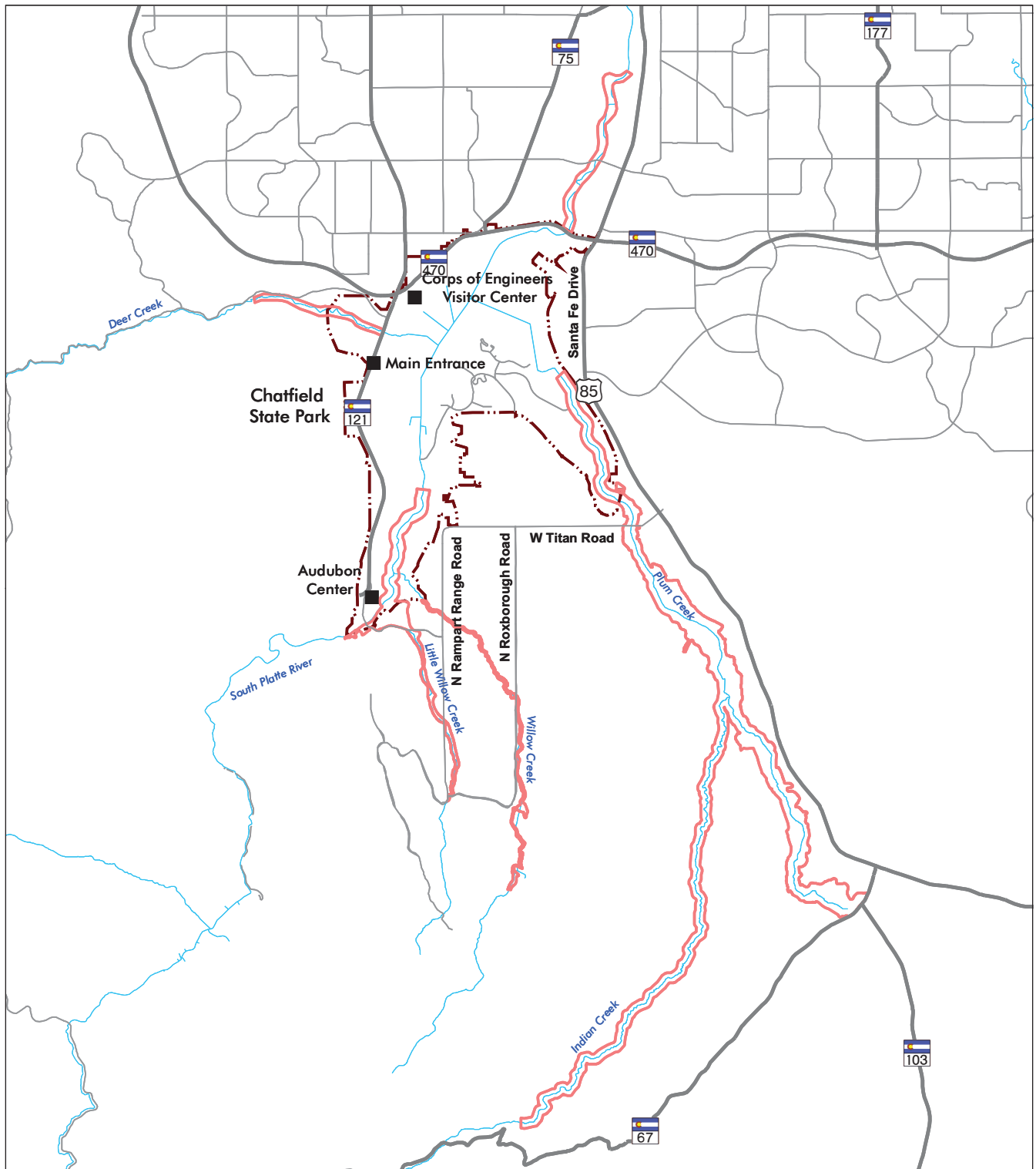


West Plum Creek Critical Habitat Unit for Preble's

File: 4048 - Figure 21 West Plum Creek.CH.mxd (WH)  
February 2011

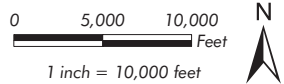


**Figure 24** Bird Habitat Complex Targeted for Cottonwood Regeneration and Mature Cottonwood Conservation



**Chatfield Reallocation Study**

- Bird Habitat Complex Boundary
- Chatfield State Park



**Bird Habitat Complex Targeted for Cottonwood Regeneration and Mature Cottonwood Conservation**

File: 4048 - Figure 20 Bird Hab CW Regen Target.mxd (65)  
January 2010



Figure 25

Chatfield State Park Recreational Areas

# Chatfield State Park

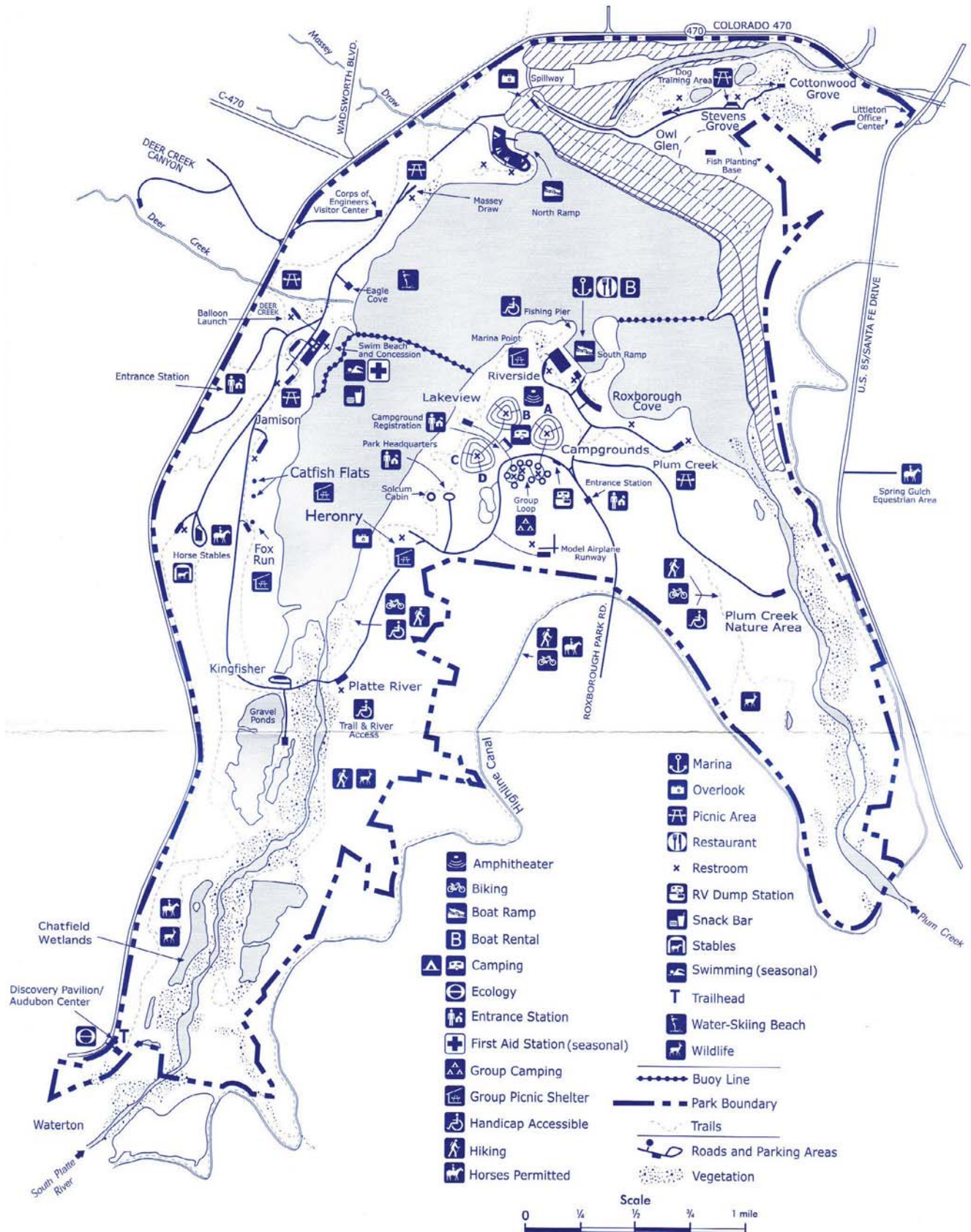


Figure 26 Chatfield Marina Existing Marina Location (5,426' Elevation)

**Chatfield Marina**  
Existing Marina Location

(Water Elevation 5426.0')



Figure 27 Chatfield Marina Existing Marina Location (5,440' Elevation)

**Chatfield Marina**  
Existing Marina Location

(Water Elevation 5440.0')





Figure 28 Chatfield Marina Existing Marina Location (5,444' Elevation)

**Chatfield Marina**  
Existing Marina Location

(Water Elevation 5444.0')



Figure 29 Chatfield Marina Roxborough Cove Location (5,426' Elevation)

### Chatfield Marina

Roxborough Cove Marina Location

(Water Elevation 5426.0')



Figure 30 Chatfield Marina Roxborough Cove Location (5,440' Elevation)

### Chatfield Marina

Roxborough Cove Marina Location

(Water Elevation 5440.0')



Figure 31 Chatfield Marina Roxborough Cove Location (5,444' Elevation)

### Chatfield Marina

Roxborough Cove Marina Location

(Water Elevation 5444.0')

