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Appendix K
Compensatory Mitigation Plan

Compensatory Mitigation Plan

July 2013

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Compensatory Mitigation Plan

EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers (Corps) has developed this Compensatory Mitigation Plan (CMP) to address environmental impacts associated with Alternative 3 for the Feasibility Report/Environmental Impact Statement (FR/EIS) for the proposed reallocation of storage at Chatfield Reservoir. The CMP, as presented in this report, is considered an integral part of the recommended plan, and as such, its implementation must be carried out concurrently as part of the overall project. 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 resources to be impacted. The CMP describes the proposed mitigation activities with sufficient specificity for reviewers of the FR/EIS to determine the mitigation proposed and provide comments on the adequacy of the proposed compensatory mitigation. The draft FR/EIS identified Preble's meadow jumping mouse (Preble's) 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 designed to offset the adverse impacts to the target environmental resources associated with Alternative 3, should Alternative 3 be approved as proposed in the FR/EIS.

The CMP concludes that:

- There are adequate opportunities within the Chatfield Reservoir watershed to mitigate for adverse impacts to the target environmental resources;
- The proposed compensatory mitigation measures have a high likelihood of being successfully implemented; and
- The estimated costs for implementing, managing, and monitoring the proposed mitigation are within the range of feasibility for the Chatfield Water Providers.

The CMP is informed by and complies with applicable regulations, policies and guidelines including:

- Department of the Army Planning Guidance Notebook – ER 1105-2-100 (April 22, 2000) six-step planning process;
- Water Resources Development Act of 2007 (WRDA 07) – Mitigation for Fish and Wildlife and Wetlands Losses (August 31, 2009) (P.L. 110-114), Section 2036, Mitigation for Fish and Wildlife and Wetlands Losses; and
- Memorandum addressing Implementation Guidance for Section 2036(a) of the Water Resources Development Act of 2007.

The CMP has been developed with substantial input from the U.S. Fish and Wildlife Service (Service), Environmental Protection Agency (EPA), Colorado Division of Wildlife (CDOW), Colorado State Parks, Denver Chapter of the Audubon Society, Sierra Club, South Suburban Parks and Recreation District, and the Chatfield Basin Conservation Network and other involved entities.

The CMP is based on the following conservative assumptions:

- All of the existing target environmental resources will be lost below 5,444 feet in elevation (Alternative 3);
- None of the target environmental resources will reestablish below 5,444 feet in elevation (Alternative 3);
- 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 protection.

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. The EFUs capture the ecological functions provided by the individual target environmental resources as well as their overlap. To ensure a diversity and balance of mitigation activities, minimum levels of mitigation activities were established for Preble's, birds, and wetlands that will contribute to meeting the overall goal to replace lost ecological functions and values of Preble's habitat, bird habitat, and wetlands associated with adverse impacts of reallocation. Although the CMP focuses its mitigation activities on the target environmental resources, it is structured to provide a diversity of ecological functions that will benefit a broad range of wildlife including insects, amphibians, reptiles, and mammals.

The CMP establishes quantifiable objectives and maximizes, to the degree practicable, the amount of mitigation that will occur on Corps lands in the vicinity of Chatfield Reservoir (on-site). The CMP provides requirements for monitoring, reporting, and adaptive management. The CMP specifies:

- The location of the mitigation activities;
- The activities that will occur;
- When the activities will occur;
- The approximate scope of the activities;
- The estimated range of EFUs to be gained; and
- The criteria for determining success of the mitigation activity.

To ensure the CMP is successfully implemented, it establishes an escrow fund to fully fund mitigation up front and milestones for implementing mitigation activities and meeting success criteria as a precondition to use of proportionate amounts of reallocated storage. The mitigation milestones are linked to use of the reallocated storage by the Chatfield Water Providers, thus assuring that the mitigation will be accomplished as a prerequisite to proportionate use of the storage reallocation.

The CMP has been developed at a feasibility level and provides a process to proceed from the feasibility level to the detailed level needed to implement the mitigation activity. The CMP will benefit from refinements and will mature over time. The process for refinement of the CMP and adaptive management measures are specified.

The Department of the Army and the Colorado Department of Natural Resources (CDNR) will enter into a Water Storage Agreement (WSA) setting out their respective obligations for reallocating the designated water supply storage and implementing the CMP. The CDNR will then execute subagreements, identical in their terms and conditions, with each of the Chatfield Water Providers. The subagreements will set out the responsibilities of the Chatfield Water Providers to the CDNR for undertaking the CDNR's obligations to the U.S. Government under the WSA for implementing the CMP. However, the Corps continues to have discussions with the State and the Chatfield Water Providers to further refine the legal relationship between the entities.

After execution of the WSA, the Chatfield Water Providers will place the funds then judged necessary to satisfy all of the nonfederal obligations under the WSA, including implementation of the CMP, into an escrow account. The Chatfield Water Providers will also create a new nonprofit corporation called the Chatfield Reservoir Mitigation Company as a vehicle for facilitating the coordinated management of the process for implementing the CMP.

In accordance with the terms of the WSA, senior management oversight of the implementation of the Plans will reside in the Project Coordination Team, consisting of senior management representation from the Corps, the CDNR, and the Chatfield Water Providers. The Project Coordination Team shall consult on the progress of the nonfederal work being undertaken pursuant to the Plans, with a view toward anticipating and offering solutions to potential problems to the Plans' scheduled completion and make recommendations to the Omaha District Commander. The Corps has the final authority on acceptance or rejection of the Project Coordination Team's recommendations.

The EIS describes the target resources present at Chatfield Reservoir in Section 3.9.1 (Preble's and birds) and Section 3.7.1 (wetlands) and depicts Preble's habitat in Figure 3-12 and bird habitat in Figure 3-10. The EIS summarizes impacts to the target resources in Table 4-16 (Preble's), Table 4-13 (birds), and Table 4-11 (wetlands). About 789 acres and 1,180 EFUs of the target environmental resources are estimated to be impacted by Alternative 3, by inundation and permanent and temporary impacts associated with the relocation of recreation facilities. This maximum impact estimate is conservative because the estimate assumes that all of the target environmental resources below 5,444 feet in elevation will be lost. Some of the maximum estimated impacts are unlikely to occur. The estimated maximum impacts will be reviewed and verified through monitoring and the estimated EFUs will be documented. Use of the term "up to" in describing the CMP objectives refers to the impact and associated mitigation as estimated maximum values. The Project Coordination Team will be responsible for determining when the defined CMP objectives have been met and impacts to the target environmental resources have been fully mitigated. The Project Coordination Team 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 CMP proposes to mitigate environmental impacts through maximizing on-site mitigation (469 EFUs) in combination with additional off-site mitigation along tributary corridors upstream from Chatfield Reservoir (711 EFUs). Of the 469 EFUs of on-site mitigation, 384 EFUs are estimated to be temporary impacts that would occur in disturbed areas during the construction of modifications to utilities, roads, and recreation facilities and will be mitigated in place following construction. Of the 384 EFUs, about 118 EFUs would be mitigated above 5,444 feet and reclaimed to upland grasslands, and about 266 EFUs would be restored in place below 5,444 feet prior to inundation from the reallocation. Following restoration of these areas, compensatory mitigation would be required for the remaining maximum of 796 EFUs (1,180 EFUs minus the 118 EFUs and 266 EFUs mitigated in place). The total of 796 EFUs is the target for compensatory mitigation used throughout the CMP (85 EFUs on-site plus 711 EFUs off-site) (Table ES-1). The CMP includes the on-site creation of up to 85 EFUs of combined wetland and riparian habitat that will benefit Preble's and birds. The total estimated cost for on-site mitigation for impacts to the target environmental resources is $18,862,165, which equates to an average of about $113,970 per acre or $221,908 per EFU.

The mitigation for the remaining EFUs (up to 711) will occur off-site. The majority of the off-site mitigation will occur on private lands in the Plum Creek watershed through the permanent protection, enhancement, and management of riparian habitats and adjoining uplands to benefit the target environmental resources. Section 6.4 includes several tables that summarize impacts, on-site mitigation, and off-site mitigation in greater detail. These tables provide both acreages and EFUs.

Table ES-1. Mitigation in EFUs.

Resource/Activity	EFUs
On-Site	
Restoration (recreation facilities and borrow areas below 5,444 ft msl)	266
Restoration (recreation facilities, borrow areas, and utilities above 5,444 ft msl)	118
Preble's Noncritical Habitat	43
Preble's Critical Habitat – Plum Creek CHU	3
Birds	9
Wetlands	30
Total On-Site Mitigation	469
Off-Site	
Habitat Protection, Enhancement, Restoration, and Management	711
Total On-Site and Off-Site Mitigation	1,180

Off-site mitigation for impacts to Preble's critical habitat in the South Platte River arm of Chatfield Reservoir will involve implementation of the Sugar Creek Sediment Mitigation Project and other habitat enhancement measures in the Pike National Forest. The designated critical habitat on Sugar Creek encompasses about 380 acres and 4.5 stream miles, which is more than four times the acres and about three and a half times the length of stream miles of critical habitat lost to reallocation. Stream miles and acres instead of EFUs are used because the EFUs were developed for the plains environment and this off-site critical habitat mitigation will occur in a montane environment. The sediment impacts to Sugar Creek and its riparian habitats are pervasive and implementation of the Sugar Creek Sediment Mitigation Project will benefit 4.5 miles of Preble's critical habitat by returning Sugar Creek to a functioning aquatic and riparian ecosystem. Off-site mitigation for impacts to Preble's critical habitat in the Plum Creek arm of Chatfield Reservoir will involve the permanent protection and, where needed, enhancement of Preble's habitat within the West Plum Creek critical habitat unit (CHU) that includes lands designated for a large Preble's recovery population.

Subsequent to release of the draft FR/EIS and draft Biological Assessment (BA), the Corps and Service held discussions regarding crediting of off-site mitigation measures. In addition to providing additional detail to the CMP regarding mitigation, monitoring, adaptive management, and reporting, sections of the draft CMP were revised as to how weighting factors are applied to EFU calculations for the long-term protection, enhancement, and management of Preble's

habitat. While the EFUs are calculated solely on the basis of target habitat within a particular area, weighting factors form the basis of benefit that comes from the ecological effects of the landscape context in which the off-site mitigation habitats are situated. Revisions to the weighting factors increased the amount of off-site mitigation needed and the associated costs of that mitigation and are addressed in this revised version of the CMP.

It is estimated that it will take 6 years to implement the CMP at an estimated present value cost of about $77.8 million for on- and off-site mitigation activities, including monitoring and maintenance.

1.0 INTRODUCTION

The Corps has developed this Compensatory Mitigation Plan to address the remaining unavoidable impacts associated with the reallocation of storage under Alternative 3 and the recreation facilities modification following impact avoidance and minimization. The CMP, as presented in this report, is considered an integral part of the recommended plan, and as such, its implementation must be carried out concurrently as part of the overall project. The CMP has been developed at a feasibility level, and considers the ecological resources that will be adversely affected at a sufficient scope and detail to enable a reasonable judgment that the recommended compensatory mitigation will be implementable and adequate to compensate for the functions and values of resources to be impacted. The CMP has been developed with substantial input from stakeholders including the Service, EPA, CDOW, Colorado State Parks, Denver Chapter of the Audubon Society, Sierra Club, South Suburban Parks and Recreation District, and the Chatfield Basin Conservation Network (Appendix A). The CMP is informed by and conforms to applicable regulations, policies, and guidelines including the Water Resource Development Act (WRDA) and Department of the Army Planning Guidance Notebook ER 1105-2-100 (Appendix B).

The CMP focuses on providing mitigation for impacts to:

- Preble's meadow jumping mouse (Preble's) habitat, including designated critical habitat;
- Migratory bird habitat; and
- Wetlands.

The draft FR/EIS identified Preble's 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. Although the CMP focuses on the target environmental resources, it is structured to provide a diversity of ecological functions that will benefit a broad range of wildlife including insects, amphibians, reptiles, and mammals. Mitigation for other types of impacts is addressed in the FR/EIS.

The CMP is designed to offset the adverse impacts to the target environmental resources associated with the reallocation of storage space and effects of inundation under Alternative 3, should Alternative 3 be approved as proposed in the FR/EIS. The CMP also includes actions to offset adverse impacts associated with the relocation of recreation facilities and use of borrow areas, the impacts of which have been separately identified. This CMP is designed to replace the lost ecological functions and values of the target resources from both types of actions. The impacts and corresponding mitigation requirements for each of these actions are identified in Section 6.0. Section 6.3.2.5 includes several tables that summarize impacts, on-site mitigation, and off-site mitigation. For ease of reference, they are collectively referred to as the "adverse impacts of reallocation to be mitigated" or "reallocation." The adverse impacts estimated for the target environmental resources in Chapter 4 of the FR/EIS are a conservative maximum estimate of the impacts. The impact estimate assumes that all of the target environmental resources below the maximum pool elevation of 5,444 feet would be lost. As a practical matter, this may not be the case, and can be addressed through monitoring and adaptive management (Section 7.0). Implementation of the CMP is expected to produce quantitative and qualitative benefits for the target environmental resources. The quantitative benefits will be measured by the ecological functional units (EFUs) gained.

The CMP establishes quantifiable objectives and maximizes, to the degree practicable, the amount of mitigation that will occur on Corps land in the vicinity of Chatfield Reservoir (on-site) (Section 5.0). The CMP provides requirements for monitoring, reporting, and adaptive management (Sections 7.4 and 7.5). Monitoring will occur at least annually until the entire CMP is fully implemented. Each individual mitigation activity will be monitored at least annually for a minimum of 5 years or until success criteria are met. An adaptive management plan for the target environmental resources and other resources is presented in Appendix GG of the EIS. The

"currency" of the CMP is EFUs. This ecological functions approach was taken because of the substantial geographic overlap in the target environmental resources (Appendix B). The EFUs capture the ecological functions provided by the individual target environmental resources as well as their overlap. To ensure diverse and balanced mitigation activities, minimum levels of mitigation activities were established for Preble's, birds, and wetlands that will contribute to meeting the overall goal to replace lost ecological functions and values of Preble's habitat, bird habitat, and wetlands associated with adverse impacts of reallocation to be mitigated (Section 5.0). The modeling developed to determine the EFUs has received approval through appropriate review as coordinated with the Corps of Engineers Ecosystem Center of Expertise. EFUs were not used for the off-site mitigation of impacts to designated Preble's critical habitat in the Upper South Platte CHU. The off-site critical habitat mitigation for impacts to the Upper South Platte CHU focuses on stream miles rather than EFUs because the EFUs were developed for a plains environment and this off-site critical habitat mitigation will occur in a montane environment on the Pike National Forest. Stream miles are an appropriate unit to measure impacts and mitigation for Preble's critical habitat in this montane environment because Preble's is a riparian species and this off-site mitigation will be applied to a riparian system. EFUs will be applied to off-site critical habitat mitigation in the West Plum Creek CHU because this mitigation will occur in a plains environment near Chatfield Reservoir.

The CMP describes the proposed mitigation activities with sufficient specificity for reviewers of the FR/EIS to determine the mitigation proposed and provide comments on the adequacy of the CMP. The CMP specifies: 1) the location of the mitigation activity, 2) what activity will occur, 3) when the activity will occur, 4) the approximate scope of the activity, 5) the estimated range of EFUs to be gained from the activity, and 6) the criteria for determining success of the mitigation activity. Upon approval of the Federally Recommended Plan, preliminary plans will be prepared and submitted for Corps' approval prior to the development of final design documents. The plans and specifications for the mitigation activities respond to and are informed by comments received on the draft FR/EIS and the CMP (Section 7.1).

1.1 Report Organization

The CMP is organized into nine sections and nine appendices as follows:

- Section 1: *Introduction* – Provides background for the CMP.
- Section 2: *Corps Planning Policy and Guidance* – Discusses how the CMP complies with key Corps Civil Works Guidance documents pertaining to compensatory environmental mitigation for water projects.
- Section 3: *Guiding Principles* – Discusses the principles that guided development of the CMP.
- Section 4: *Mitigation Approach* – Combines the Corps regulation, policy, and guidance on mitigation with the guiding principles; stakeholder and agency expectations; and ecological priorities to develop an approach to the CMP that focuses on ecological functions.
- Section 5: *Objectives* – Presents the overarching goal of replacing lost ecological functions of Preble's habitat, bird habitat and wetlands and establishes quantifiable and measurable objectives to meet this goal.
- Section 6: *Proposed Mitigation Activities* – Provides descriptions and locations of the specific on- and off-site compensatory mitigation activities proposed to mitigate for impacts to the target environmental resources. At the end of Section 6 is a summary of the proposed mitigation and tables that summarize the impacts and mitigation in several ways.
- Section 7: *Implementation* – Describes the process for refining the CMP, establishes milestones for implementing the CMP, assigns responsibilities and oversight, establishes monitoring and reporting requirements and provides a framework for adaptive management and describes operation scenarios that could minimize environmental impacts.
- Section 8: *Costs* – Summarizes the estimated costs for implementing the Compensatory Mitigation Plan and presents the cost effectiveness/incremental cost analysis.
- Section 9: *References* – Provides references cited in Sections 1.0 through 8.0. Separate references are provided at the end of each appendix for references cited in the appendix.

- Appendix A: *Stakeholder Involvement* – Lists the various stakeholders involved in development of the CMP and meetings held with stakeholders where the CMP was discussed.
- Appendix B: *Compliance with Policy and Guidance on Compensatory Mitigation* – Steps through the various applicable Corps regulations and guidance on environmental mitigation and how and where the CMP complies with the regulations and guidance. Appendix B provides the supportive detail for Section 2.0.
- Appendix C: *Ecological Functions Approach* – Presents detailed information on development of the ecological functions approach for determining impacts and mitigation credits for the target environmental resources and provides

support for Sections 4.0 and 6.0. Appendix C also provides information on the feasibility and adequacy of the proposed mitigation.

- Appendix D: *Regional Conservation Planning* – Presents information on regional conservation plans that the CMP draws from and integrates with.
- Appendix E: *Challenge Cost Share Agreement* – Establishes responsibilities for each of the signatories regarding off-site Preble's critical habitat mitigation at Sugar Creek on the Pike National Forest. The Agreement specifies mitigation activities, costs, and a schedule.
- Appendix F: *Guidelines for the Restoration and Revegetation of Temporarily Disturbed Upland Areas at Chatfield State Park* – Provides specification for soil preparation, seeding, mulching, monitoring and maintenance for temporarily disturbed upland areas, including best management practices to minimize the spread of noxious weeds.
- Appendix G: *Assumptions and Calculations for On-Site Mitigation Gains in EFUs and Costs* – Provides a table showing how costs were developed for each on-site mitigation area.
- Appendix H: *Review of Designated Critical Habitat in the Pike National Forest* – Memorandum to the U.S. Fish and Wildlife Service discussing a review of the Upper South Platte Critical Habitat Unit on the Pike National Forest and mitigation opportunities and constraints.
- Appendix I: *Ecological Functions Approach, Model Review Report, Chatfield Reallocation Study* – Report from the U.S. Army Corps of Engineers, Omaha District, reviewing the ecological functions approach for determining impacts and mitigation credits for the target environmental resources.

2.0 CORPS PLANNING POLICY AND GUIDANCE

The Corps Civil Works planning process for water and related land resources planning is guided by the Water Resources Planning Act, as amended (WRPA) (42 U.S.C. 1962a-2) and the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321-4347). This CMP complies with key Corps Civil Works guidance documents pertaining to compensatory environmental mitigation for water and related land resources projects that integrate the requirements of WRPA and NEPA. These documents are:

- Department of the Army Planning Guidance Notebook – ER 1105-2-100 (April 22, 2000) six-step planning process and Appendix C Environmental Evaluation and Compliance;
- Water Resources Development Act of 2007 (WRDA 07) – Mitigation for Fish and Wildlife and Wetlands Losses (August 31, 2009) (P.L. 110-114), Section 2036, Mitigation for Fish and Wildlife and Wetlands Losses; and

- Memorandum addressing Implementation Guidance for Section 2036(a) of the Water Resources Development Act of 2007.

The Corps Planning Guidance Notebook is grounded in the economic and environmental principles and guidelines (P&G) originally established in 1983 by the U.S. Water Resources Council. These P&G guide the formulation and evaluation studies for major federal water resource development agencies.

Additionally, the compensatory mitigation of impacts to designated critical habitat for Preble's is in accordance with Service guidance. The Service considers only mitigation actions within the same CHU when determining whether an action will result in destruction or adverse modification of critical habitat (Service 2004). See Appendix B for further discussion on how the CMP complies with this guidance on compensatory mitigation.

3.0 GUIDING PRINCIPLES

Several principles guided the development of the CMP and are listed in Table 1.

Table 1. Guiding Principles for Compensatory Mitigation.

Principle	Explanation
Prioritize mitigation	In order of priority: on-site, Preble's critical habitat, off-site.
Consider the context of mitigation activities	Mitigation measures must be appropriate on a landscape scale for the target environmental resources.
Account for habitat overlap	The non–aquatic habitat at Chatfield Reservoir provides shared ecological functions for Preble's, birds, and wetlands.
Replace lost ecological functions	Mitigation aims to adequately compensate for ecological functions degraded or lost as a result of implementing an alternative.

3.1 Prioritize Mitigation

Having compensatory mitigation as close as possible to the location of impacts, preferably in Chatfield State Park, was identified as an important issue during scoping. Keeping mitigation close to impacts is also often desirable as a means to maintain the ecological integrity of impacted ecosystems. Proposed on-site compensatory mitigation has been maximized to the degree practicable for the following reasons:

- On-site mitigation provides the least amount of risk regarding the ability to acquire lands and ensure mitigation is fully implemented.

- The Service considers only mitigation actions within the same CHU when determining whether an action will result in destruction or adverse modification of critical habitat (Service 2004). There are two separate CHUs within Chatfield State Park.
- Ecological resources are an important part of the overall makeup and feel of Chatfield State Park. Maximizing on-site mitigation to compensate for adverse impacts to these ecological resources helps restore the overall integrity of Chatfield State Park by providing comparable resources to the extent practicable following reallocation.
- Agencies that manage resources within Chatfield State Park have been involved in development of the principles that guide the CMP. The Colorado Division of Parks and Wildlife manages the site for recreation, fisheries, and wildlife and the Service oversees compliance with the ESA and has designated the South Platte River and Plum Creek arms of Chatfield Reservoir as critical habitat for Preble's.
- Local environmental groups that use Chatfield State Park (e.g., Audubon Society) were invited by the Corps to participate as special technical advisors for the FR/EIS process because of their expertise and knowledge of ecological resources in Chatfield State Park. These organizations and the agencies above have provided valuable input for developing and prioritizing mitigation strategies.
- On-site compensatory mitigation is considered a priority by the Corps and EPA when it is practicable (EPA and Department of the Army 1990).
- The cost of on-site compensatory mitigation is estimated to be more expensive than the cost of off-site compensatory mitigation; however, compensatory mitigation will be entirely funded by the Chatfield Water Providers. No federal funds will be used to implement the proposed compensatory mitigation.

On-site compensatory mitigation primarily will be accomplished by expanding or enhancing existing habitats that are not impacted by reallocation in order to offset impacts from reallocation. The CMP includes descriptions of on-site mitigation activities that would be undertaken to maximize on-site compensatory mitigation (Section 6.1).

The second priority, compensatory mitigation for impacts to designated critical habitat for Preble's, is required to occur within the CHU in which the impacts occur (Section 6.3), a portion of which occur in Chatfield State Park. To the degree practicable, the on-site compensatory mitigation for impacts to critical habitat has been maximized (Section 6.3.1). The remainder of the compensatory mitigation for impacts to designated critical habitat for Preble's will occur within the West Plum Creek CHU and the Upper South Platte CHU within the Pike National Forest (Section 6.3.2).

The remainder of the compensatory mitigation will occur in off-site locations, with incentives to provide buffers and habitat connectivity (Appendix C, Section 4.3). Incentives for protecting multistructure bird habitat near Chatfield State Park also are included because this

type of bird habitat that will be lost at Chatfield State Park is restricted to a relatively small geographic area near Chatfield State Park that is defined by urban development to the east and north, by foothills and canyons to the west, and by a distinct change in riparian communities south of Sedalia.

3.2 Context

The compensatory mitigation will occur in a watershed context. The majority of the compensatory mitigation will occur within the Chatfield Reservoir watershed and all mitigation will occur in the Upper South Platte River watershed. The target environmental resources were considered when developing the mitigation activities and selecting mitigation sites. Potential Preble's mitigation sites are most restricted as compared to bird habitat or wetland mitigation sites. Preble's is not found downstream of Chatfield Dam; therefore, sites for Preble's mitigation are limited to areas above the reservoir (above the proposed inundated areas) along the South Platte River and Plum Creek and their tributaries. Site selection for bird habitat mitigation and wetland mitigation is much less restrictive. Sites can be targeted along Deer Creek, Massey Draw, Marcy Gulch, and downstream reaches of the South Platte River (below Chatfield Reservoir), as well as upstream reaches of the South Platte River and Plum Creek. All of these sites are important for maintaining and improving the ecological functions of the watershed. Additionally, the CMP considers regional conservation plans and opportunities for off-site compensatory mitigation (Appendix D).

3.3 Habitat Overlap

The non–aquatic habitat at Chatfield Reservoir provides shared ecological functions for the target environmental resources identified during the FR/EIS process. This habitat also supports other types of wildlife such as insects, amphibians, reptiles, and other mammals. It is important to account for and incorporate this overlap in the development of the CMP so that mitigation activities provide the maximum combined ecological benefit rather than focusing on resource-specific activities (Section 4.0).

3.4 Replace Lost Ecological Functions

Chatfield State Park provides habitat for multiple species; however, the same location does not necessarily provide similar ecological values for each of the species. For instance, a willow-dominated wetland is of high value to Preble's for foraging and cover, but is of lower value to

ground-nesting birds that spend most of their time in upland grasslands, even though the birds may occasionally forage in the wetland. In another instance, a grove of mature cottonwoods with a sparse understory is of high value to tree-nesting birds but of only moderate value to Preble's.

As part of the development of the CMP, the functional value that a particular habitat type provides for Preble's and birds has been calculated by developing a system that quantitatively rates how various attributes of the habitat contribute to the overall survival of the resource. The variations in ecological values provided to the different target environmental resources by the same habitat are captured by summing the separate functional values. This provides the overall functional value or functional index of the habitat. This means that a habitat type that provides high value to all three of the target environmental resources will have a higher ecological index rating than a habitat type that does not (Appendix C). This approach ensures that no one type of habitat is over-represented and accounts for the benefits of mitigation involving multiple resources.

3.5 Selection of Locations for Compensatory Mitigation

In addition to the guiding principles, the selection of the locations for mitigation activities was based on the following criteria:

- To the degree feasible, maximize the amount of compensatory mitigation that will occur on–site;[1]
- Target mitigation activities to occur within the Chatfield Reservoir Watershed;
- To the degree feasible, 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;
- Select locations for mitigation activities that provide a high likelihood for successful mitigation; and
- To the degree practicable, consider the use of approved mitigation banks.

[1] For the purposes of the CMP, "on-site" is defined as property owned by the United States and managed by the Corps in the vicinity of Chatfield State Park.

4.0 MITIGATION APPROACH

The CMP approach is based on using ecological function as a "common currency" for determining impacts and compensatory mitigation. The approach to developing the CMP was informed by Corps and Service regulations, policy, and guidance on mitigation (Section 2.0), regional conservation plans (Appendix D), and the guiding principles for compensatory mitigation (Section 3.0). These policies, plans, and principles focus on the need for compensatory environmental mitigation to replace lost ecological functions. ER 1105-2-100, paragraph C-3(e) and Policy Guidance on Certification of Ecosystem Output Models (August 13, 2008) require the use of a habitat-based method, supplemented with other appropriate information to describe and evaluate impacts and mitigation (Colorado Department of Transportation's Functional Assessment of Colorado Wetlands Method by Johnson et al. 2009).

The terrestrial habitat at Chatfield Reservoir provides shared ecological functions for the target environmental resources (Section 3.3). An ecological functions approach (EFA) was used to assess these overlapping resources during development of the CMP. Several existing models that evaluate habitat functions were assessed for their applicability to the draft FR/EIS. Assessed models included Habitat Equivalency Analysis (HEA), and Habitat Evaluation Procedures (HEP) and its associated Habitat Suitability Indices (HSI). No existing model is capable of accurately representing the site-specific characteristics of Preble's and bird resources addressed in the FR/EIS (Appendix C, Section 2.0); therefore, a site-specific approach was developed for the draft FR/EIS (ERO 2010). In accordance with Corps guidance (EC 1105-2-407: Planning Models Improvement Program: Model Certification (CECW-CP, May 31, 2005), the model developed to determine EFUs was reviewed and approved in close coordination with the National Ecosystem Planning Center of Expertise (Appendix I).

To provide an ecologically meaningful assessment of impacts to the overlapping habitats of the target environmental resources, an ecological functioning index (EFI) was developed for each habitat type. The EFI is a unitless measure that rates habitat components for the target environmental resources on a scale of zero to one. The EFIs for the target environmental resource habitat components were multiplied by acres of impacts to determine the number of impacted EFUs for each target environmental resource. For example, if a habitat type has an EFI of 0.5 for Preble's and 12 acres of the habitat are lost, six Preble's EFUs would be lost. The total

number of EFUs impacted is the sum of EFUs provided in the impact area for each target environmental resource.

Scientific and technical literature and the professional opinions of local experts were relied on to evaluate the terrestrial ecological functions that would be impacted by reallocation. This information was used to develop an EFA model to calculate the number of baseline EFUs being impacted for each target resource and the reduction in total EFUs that may occur with reallocation (ERO 2010). The model also will be used to identify how many EFUs might be generated from mitigation activities (Appendix C).

Development of the CMP integrated the following ecological priorities and stakeholder expectations, some of which overlap (Table 2).

Table 2. Ecological Priorities and Stakeholder Expectations for Environmental Mitigation.

Stakeholder and Agency Expectations	Ecological Priorities
Provide mitigation close to the impact. The target environmental resources in Chatfield State Park provide a valuable resource to the Park.	Provide as much mitigation as practicable close to the impact to maintain local habitat and ecological functions within the watershed.
Provide as much mitigation as practicable prior to the impact occurring.	Provide as much mitigation as practicable prior to the impact occurring or as soon as practicable following the impact.
Develop mitigation for wetlands using a watershed approach (Corps and EPA compensatory mitigation rule)	Locate mitigation within the Chatfield Reservoir watershed to help offset resources lost at Chatfield Reservoir and benefit the watershed.
Base mitigation success criteria on ecological functions (WRDA Section 2036, 2007)	Focus on ecological functions as the currency for impact assessment and mitigation. Provide off-site mitigation as close to Chatfield State Park as possible (weighting for proximity). Protect lands in perpetuity for off-site mitigation from development (use conservation easements and buffers). Protect lands that can provide a network of connected protected lands (weighting for connectivity).

Stakeholder and Agency Expectations	Ecological Priorities
Provide full mitigation for adverse modifications to Preble's designated critical habitat within the Upper South Platte and West Plum Creek CHUs (U.S. Fish and Wildlife Service guidelines)	Mitigate within the Upper South Platte and West Plum Creek CHUs – onsite to the extent possible, then offsite where Preble's critical habitat is severely degraded and otherwise would likely further deteriorate in the future in the Upper South Platte CHU, and protect, manage and enhance habitats targeted for a large recovery population in the West Plum Creek CHU.

These ecological priorities and stakeholder expectations, the guiding principles previously discussed (Section 3.0), and the ecological functions approach discussed below provided the framework for the CMP. The CMP is composed of three primary components:

- On-site mitigation – the restoration of temporarily disturbed areas and the conversion of upland areas to wetland, riparian and Preble's habitat within Chatfield State Park
- Off-site 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 CHU designated to support a large recovery population of Preble's
- 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.

The first priority is to maximize on-site mitigation. Providing the maximum amount of on-site mitigation will provide as much mitigation as possible as close as possible to the impact location and will meet stakeholder expectations of replacing lost resources within Chatfield State Park. On-site mitigation also provides mitigation within the Chatfield Reservoir watershed. The reasons for considering on-site mitigation as the first priority are discussed in Section 3.1.

The second priority is to provide off-site compensatory mitigation for the loss of designated Preble's critical habitat not mitigated on-site. Per Service guidelines, the Service considers only mitigation actions within the same CHU when determining whether an action will result in destruction or adverse modification of critical habitat. For the Upper South Platte CHU, the remainder of the Upper South Platte CHU outside Chatfield State Park occurs in the Pike National Forest. Sugar Creek has the greatest potential for restoration and enhancement of Preble's habitat in the Upper South Platte CHU. Providing the off-site critical habitat mitigation along Sugar Creek meets the Service's expectations and provides the most favorable ecological gains for Preble's within the Upper South Platte CHU. In the absence of compensatory

mitigation activities along Sugar Creek, the U.S. Forest Service indicates that the agency's projected funding levels would not be adequate to restore this severely degraded Preble's critical habitat. Impacts to the West Plum Creek CHU will occur within the West Plum CHU upstream of Chatfield Reservoir in habitats designated for a large Preble's recovery population. The permanent protection of private lands within the West Plum Creek CHU will advance the recovery of Preble's, because the protection of habitat on private lands will occur in areas designated for a large recovery population and the critical habitat designation affords no protection for nonfederal actions on nonfederal lands.

The third priority is to provide the remainder of the needed compensatory mitigation for the target environmental resources. The protection of private lands within the Plum Creek/West Plum Creek watershed upstream of Chatfield Reservoir was targeted as the most favorable means to benefit the target environmental resources while aligning with stakeholder and agency expectations and ecological priorities (Table 2). This watershed affords numerous opportunities for ecological benefits through protection because:

- The Plum Creek/West Plum Creek watershed flows into Chatfield State Park.
- Private lands on Plum Creek are adjacent and near the park.
- The Plum Creek/West Plum Creek watershed has been proposed as the location for a large Preble's recovery population (Appendix D).
- Much of the Plum Creek/West Plum Creek watershed has been designated as critical habitat for Preble's (75 Fed. Reg. 78430 (December 15, 2010)).
- West Plum Creek has been determined to be one of the most biologically diverse areas in Douglas County (Pague et al. 1995).
- The upper portions of the watershed are located in the Pike National Forest, and scattered areas of protected lands within the watershed provide a matrix of protected lands to build upon and with which to connect.
- Plum Creek and lower portions of West Plum Creek support existing mature cottonwood habitat near Chatfield State Park that provides a habitat complex that supports a variety of bird species including several uncommon and sensitive species (Appendix C, Section 4.3.1).

The Plum Creek/West Plum Creek watershed has extensive riparian areas that support woodlands of plains cottonwoods and peachleaf willows. West Plum Creek is a transitional stream that flows south to north, forming a divide between the foothills to the west and the plains to the east. Its western tributaries link West Plum Creek to montane environments and, in some instances the Pike National Forest. The eastern tributaries add plains influences to West Plum

Creek. The combination of montane, foothills, and plains influences; favorable historical land management; and a relatively natural hydrologic regime help to form and maintain a large intact riparian area that supports a high biological diversity. The Colorado Natural Heritage Program designated West Plum Creek as a conservation "macrosite" and considers it to be perhaps the best remaining transition zone stream system in Colorado (Pague et al. 1995). West Plum Creek contains a number of rare or imperiled species, demonstrating that this macrosite represents a significant proportion of Douglas County's biological diversity. High-quality Preble's habitat occurs throughout the drainage. The riparian habitats are of the highest quality of any in Douglas County (Douglas County et al. 2006). The protection of private lands with habitat that benefits the target environmental resources in the Plum Creek/West Plum Creek watershed for off-site mitigation will be credited at a level of 15 percent (0.15) of the existing EFUs of the protected property.

The development of the CMP also considered incentives to accomplish the identified ecological priorities and meet stakeholder and agency expectations. The use of incentives focused on off-site mitigation because off-site mitigation potentially had the greatest diversity of lands that could be involved. The target habitat for off-site mitigation is composed of about 6,075 acres of private lands (Appendix C, Section 4.0).

The CMP provides incentives in the form of weighting factors for protected properties as discussed in detail in Appendix C, Section 4.3. Subsequent to release of the draft FR/EIS and draft BA, the Corps and Service held discussions regarding crediting of off-site mitigation measures. Based on these discussions, the CMP was revised as to how weighting factors are applied to EFU calculations for the long-term protection, enhancement, and management of Preble's habitat. While the EFUs are calculated solely on the basis of target habitat within a particular area, weighting factors form the basis of benefit that comes from the ecological effects of the landscape context in which the off-site mitigation habitats are situated. Weighting factors increase the credited EFUs for protected habitats when buffers from potential development and connections to other protected lands are established. These weighting factors encourage an expanded network of connected protected lands buffered from development that will benefit the target environmental resources. Weighting factors for proximity to Chatfield State Park are also applied to lands protected within areas specified near Chatfield State Park that provide a multi-

structure habitat of mature cottonwood and a diverse shrub community with a herbaceous understory (Appendix C, Section 4.3.1).

The EFU approach and weighting factors were developed with considerable input from a variety of experts. The overall approach to developing the ecological functions model was to convene an Ecological Functions Technical Committee of locally recognized experts with expertise in the three target environmental resources (Appendix A). The ecological functions approach model was reviewed and approved per the Corps' Policy Guidance on Certification of Ecosystem Output Models (Corps 2007). The Service and Corps worked through several iterations of the weighting factors to ensure the factors were consistent with recognized conservation planning principles and would provide an incentive to provide high-quality mitigation.

These weighting factors were not applied to on-site mitigation because the land within Chatfield State Park is already protected from future development (no weighting factor needed for buffers from development, connectivity to protected lands, or proximity relative to Chatfield State Park).

The off-site mitigation weighting factors provide incentives to accomplish the ecological priorities for mitigation. An acre of land protected for off-site mitigation will be credited with more EFUs if it is buffered, provides a connection to other protected lands, and occurs within specified areas near Chatfield State Park that provide the mature cottonwood habitat complex. Assuming similar land protection costs, the cost per EFU credited will be lower with protected lands that are buffered from development, connected to other protected lands, and close to Chatfield State Park.

Based on discussions between the Corps and Service, the weighting factors presented in Appendix C have been revised as follows for buffers:

- Minimum buffer width of 100 feet = EFUs multiplied by 1.3;
- Average buffer width 200+ feet with no portion of the buffer <100 feet = EFUs multiplied by 1.5; and
- Average buffer width 300+ feet with no portion of the buffer <150 feet = EFUs multiplied by 1.6.

Targeted properties will have riparian habitats and the potential exists for one side of the property to be buffered while the other side of the property is not. The goal is to have the protected property fully buffered. Reduced credit will be received for partially buffered properties. For partially buffered areas, the EFUs bordering the buffered area will receive 25 percent of the buffer credit applied to the EFUs between the buffer and the stream. If a portion of the protected property had a buffer prior to protection and the remainder of the property is buffered as part of protection, then crediting will be received for the appropriate buffer width applied to the EFUs between the buffer and the creek.

The weighting factor for connectivity has been revised as follows:

Connectivity between protected off-site mitigation properties in the West Plum and Plum Creek watershed upstream of Chatfield Reservoir will receive a weighting of 1.25 times the baseline EFUs and enhancement EFUs of the protected property. Crediting for increasing the connectivity will be received when the protected property adds to the connection of an existing protected property. The crediting for connectivity can occur at the time of protection or could occur in the future as the protection of other adjoining properties builds a series of connected properties.

The weighting factors for proximity are applied only to properties near Chatfield State Park that could provide bird habitat as described below and have been revised as follows:

The type and structure of bird habitat impacted by the Chatfield Reservoir reallocation is limited by both space and structure to areas close to Chatfield Reservoir. Much of the bird habitat impacted by reallocation consists of a multistory, multistructure habitat of mature cottonwood, diverse shrub community, and herbaceous understory. Because mitigating Preble's and wetland habitats close to impacts is not as ecologically beneficial as for bird habitat, a weighting factor for proximity will only be applied to bird habitat EFUs at off-site mitigation sites. The weighting factor for bird habitat is a three-tiered weighting based on the proximity of the three zones below to Chatfield State Park:

Zone 1 – Chatfield State Park boundary to upstream to Sedalia, has multistoried cottonwoods and this zone generally provides the functions needed to sustain a cottonwood forest. Crediting is 1.25 X baseline bird habitat EFUs.

Zone 2 – Sedalia to U.S. 86 (Wolfensberger Road). Crediting is 1.0 X baseline bird habitat EFUs.

Zone 3 – All areas farther away from Chatfield State Park than Zone 2. Crediting is 0.75 X baseline bird habitat EFUs. After applying each of the weighting factors as described above, the weighted EFUs are totaled to calculate the total EFU for the protected off-site mitigation property. The revised weighting and adding the weighted EFUs instead of multiplying the weighted EFUs resulted in an increased amount of EFUs needed to be provided by off-site mitigation and is addressed in Section 6.2.2.

5.0 OBJECTIVES

The following objectives for the CMP were developed based on the estimated maximum impacts to the target environmental resources associated with Alternative 3 and the relocation of recreation facilities. This maximum impact estimate is conservative because the estimate assumes that all of the target environmental resources below 5,444 feet in elevation will be lost. Some of the maximum estimated impacts are unlikely to occur. The maximum impact assessment conservatively assumes that any of the target environmental resources that will be inundated (i.e., occur below an elevation of 5,444 feet) will be lost. As a practicable matter, some of these maximum estimated impacts are unlikely to occur for the following reasons:

- The reallocation storage will not be completely full every year;
- The reallocation storage will not remain full in the years it does fill; and
- Some vegetation, particularly between 5,442 feet and 5,444 feet in elevation, will likely tolerate infrequent and/or short-term flooding and will not be lost.

The Tree Management Plan (Appendix Z of the FR/EIS) proposes the removal of trees up to 5,439 feet in elevation, assuming that all trees below 5,439 feet in elevation will be lost to inundation. For areas between 5,439 and 5,444 feet in elevation, an adaptive management approach would be used that entails 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 visitor and dam safety.

This estimate of maximum impacts will be reviewed and verified through monitoring and the estimated EFUs will be documented as discussed in Section 7.1.4. Use of the term “up to” in describing the CMP objectives refers to the impact and associated mitigation as estimated

maximum values. The Project Coordination Team will be responsible for determining when the defined CMP objectives have been met and impacts to the target environmental resources have been fully mitigated (Section 7.2.2).

These objectives are used to guide compensatory mitigation planning and establish success criteria that then inform mitigation monitoring, corrective actions, and adaptive management. The overarching goal is to replace lost ecological functions of Preble's habitat, bird habitat, and wetlands associated with adverse impacts of reallocation at Chatfield Reservoir.

The following objectives will be met to reach the overarching goal of the CMP:

1. **Provide the total compensatory mitigation needed.** The combination of all compensatory mitigation activities in noncritical habitat will provide a total of up to 796 EFUs to replace the estimated maximum loss of 796 EFUs that will remain to be mitigated after restoration of the borrow and fill areas.
2. **Include a diversity and balance of resources and the following important resource considerations when providing up to 796 EFUs of compensatory mitigation:**
    - Ensure a diversity and balance of mitigation activities by implementing compensatory mitigation activities that will provide up to the maximum estimated number of EFUs permanently impacted for each target environmental resource – 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; and
    - Compensate for the loss of up to 42.5 acres of mature cottonwood bird habitat by protecting up to 22.5 acres of mature cottonwood woodlands within a defined off-site bird habitat complex and creating up to 13 acres of specifically designated cottonwood recruitment areas on-site and up to 10 acres off-site that will contribute toward the total compensatory mitigation goal of up to 796 EFUs.
3. **Mitigate impacts to critical habitat.** To mitigate for impacts to 80 acres and 1.3 stream miles of critical habitat inundated in the South Platte River arm that is within the Upper South Platte CHU, enhance up to 17 acres of Preble's habitat on-site in the CHU, and implement measures to benefit 4.5 stream miles of Preble's habitat off-site within the Upper South Platte CHU. To mitigate for impacts to the 75 acres, 2.8 stream miles, and 65 Preble's EFUs of critical habitat inundated in the Plum Creek arm of Chatfield Reservoir, enhance up to 6 acres of riparian and wetland Preble's habitat on-site and implement measures to permanently protect, manage and enhance private lands in the West Plum Creek CHU that will provide up to 65 Preble's EFUs. To the degree feasible, maximize the amount of compensatory mitigation that occurs within the CHUs within Chatfield State Park. Based on existing information and conservative assumptions, the mitigation within the CHUs within Chatfield State Park will result in an estimated 3 EFUs and 23 acres of enhanced Preble's critical habitat.

The Chatfield Water Providers will pursue implementation of these objectives. These objectives are designed to provide a diversity and balance of mitigation activities. However, situations may occur that would not allow full implementation of all of these objectives. As discussed in Section 7.4.1, the Project Coordination Team and the Chatfield Water Providers have the flexibility in certain circumstances to adjust the CMP. Any adjustments to the CMP must meet the following core objectives:

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 through habitat creation, restoration, enhancement, or preservation within the Upper South Platte CHU. This objective is not tied to providing a target amount of EFUs because most of the mitigation for impacts to critical habitat in the Upper South Platte CHU will occur within the montane environment of the Pike National Forest and the model for EFUs was developed for the plains environment.
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.

6.0 PROPOSED MITIGATION ACTIVITIES

Of the three target environmental resources, the mitigation of impacts to Preble's habitat tends to drive mitigation for impacts to the other target environmental resources. This is 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 CHU.

Because of this substantial functional and geographic overlap, compensatory mitigation actions for Preble's will benefit birds and wetlands and provide the majority of the compensatory mitigation needed for impacts to the target environmental resources. This approach will provide mitigation cost efficiencies by accounting for the functional and geographic overlap of impacts to the target environmental resources and focusing mitigation first on mitigation for Preble's habitat. On-site mitigation activities will enhance bird habitat and create wetlands and off-site compensatory mitigation actions will permanently protect and enhance bird and wetland habitat through long-term management of riparian areas and associated wetlands and adjacent uplands that provide substantial habitat for a variety of birds. Additionally, because Preble's habitat has a diversity of components (wooded riparian, riparian wetlands, and adjoining uplands), Preble's habitat supports a broad diversity of wildlife other than birds, including large and small mammals, reptiles, amphibians, and insects. Therefore, other wildlife will benefit from mitigating impacts to Preble's habitat.

Although birds will also benefit from Preble's mitigation activities, there are certain activities specifically intended to compensate for impacts of up to 42.5 acres of mature cottonwood bird habitat that will be adversely affected. Because mature cottonwood habitat has been specifically identified as an important habitat type in Chatfield State Park, mitigation for this resource will include not only compensating for lost EFUs, but also compensating for lost acres. Proposed activities include designating up to 13 acres of on-site mitigation for recruitment of new cottonwood growth (Section 6.1.1.3), protecting up to 22.5 acres of existing mature cottonwood habitat in off-site compensatory mitigation areas, and designating up to 10 acres of off-site mitigation areas for recruitment of new cottonwood growth (Section 6.1.1.4). Areas designated for new recruitment will contribute to the long–term persistence of multi-aged patches of cottonwoods, including future stands of mature cottonwoods.

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.

The remainder of this section describes various proven techniques that will be used to restore, enhance, create, and conserve habitat for compensatory mitigation. Some activities, such

as conservation, will only occur on private lands off-site; others will occur on- and off-site depending on site-specific opportunities and constraints.

Mitigation activities are described in three categories:

- On-site mitigation;
- Off-site mitigation; and
- Preble's critical habitat mitigation (on-site and off-site).

Anticipated EFUs and acreages are provided for on-site mitigation activities and acreages and critical habitat mitigation in the West Plum Creek CHU. Acreages and stream miles are provided for critical habitat mitigation activities in the Upper South Platte CHU.

The proposed approach to compensatory mitigation for Preble's and its designated critical habitat, including the ecological functions approach, has been coordinated with the Service. The compensatory mitigation for Preble's and its designated critical habitat proposed in this CMP also will be included in the Biological Assessment prepared by the Corps as part of the FR/EIS (Appendix V of FR/EIS). In its Biological Opinion, the Service will include conservation measures (mitigation) that address adverse impacts to Preble's and its designated critical habitat. The CMP, as it is presented within this report, is considered an integral part of the recommended plan, and as such, its implementation must be carried out concurrently as part of the overall project.

6.1 On-Site Mitigation

On-site mitigation is mitigation that will occur on property owned by the United States and managed by the Corps in the vicinity of Chatfield Reservoir. On-site mitigation will include two categories of activities: 1) activities associated with compensatory mitigation for assumed permanent impacts to targeted environmental resources, and 2) activities associated with restoring nonpermanent impacts. Permanent impacts are assumed for all targeted environmental resources below 5,444 feet in elevation and within the permanent footprint of relocated recreation facilities, including buildings, parking lots, trails, and permanent roads. Additionally, on-site mitigation will include restoring areas disturbed by recreation relocation activities, but not within the permanent footprint of relocated facilities. These areas include borrow areas, temporary haul roads, and filled areas not permanently impacted by relocated facilities. In these

areas, mitigation will consist of restoring disturbed areas to conditions similar to those present prior to disturbance.

The amount of on-site mitigation will be maximized to the degree practicable. The following describes the on-site mitigation actions for impacts to Preble's habitat. These mitigation actions will also provide EFUs that will benefit birds and wetlands. Upon approval of the Federally Recommended Plan, preliminary plans will be prepared and submitted for Corps' approval prior to the development of final design documents. This process is described in Sections 6.1.1.1 and 7.1.1.

6.1.1 Compensatory Mitigation

Several types of on-site mitigation activities are proposed to convert habitat from one type to another and also to enhance existing habitat. Examples of habitat conversion include changing upland grasslands to shrublands or wetlands, and changing upland shrublands to wetland shrublands. Two examples of enhancing existing habitat are increasing shrub cover in existing wetland shrublands by planting more shrubs and performing weed control in any habitat type to increase cover of native species. 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. A total of 158 acres of wetlands are targeted for creation by compensatory mitigation, which is equal to the maximum acres of wetlands that would be lost.

Most on-site mitigation areas targeted for habitat conversion are currently upland grasslands. Wetland areas typically have saturated soils within 12 inches of the surface for a significant portion of the growing season. As a result, habitat conversion will primarily be accomplished by manipulating ground surface elevations and surface and ground water to provide hydrology adequate to support mesic riparian vegetation and wetlands. Most habitat conversion activities will require heavy equipment and earthwork. Three primary habitat conversion activities are proposed for on-site mitigation areas:

- Install sheet pile cutoff structures to raise the ground water table closer to the surface (Figure 1);
- Create new secondary channels, ditches, or backwaters to bring surface water to mitigation areas (Figure 2); and

- Modify surface topography to lower the ground surface closer to ground water or to better retain surface water (Figure 1).

These conversion activities have been successfully applied in numerous locations with similar conditions along the Colorado Front Range, including in a Preble's habitat enhancement project on East Plum Creek in Castle Rock (Figure 3). Other successful projects in Preble's habitat on Cherry Creek include those at 17-Mile House (Figure 4), Stroh Ranch (Figure 5), and Apache Plume Outfall (Figure 6).

In many cases, a combination of the three activities will likely be necessary to create successful mitigation conditions. The exception is the two borrow areas below 5,444 feet in elevation. Because they will have been excavated as borrow areas and because they will be in close proximity to ground water, sheet piles will not be used, surface water will not be diverted, and only a small amount of grading will be necessary to create suitable mitigation areas.

Installing sheet pile cutoff structures will entail driving interlocking sheets of 20-foot-tall, 25-inch-wide, 0.5-inch-thick steel sheets into the ground. In most locations, the sheets will be driven flush with the existing surface elevation. Where the sheet pile crosses a stream, it may extend 1 to several feet above the channel bottom, creating a grade-control structure that effectively raises the elevation of the channel behind it. Structures with a vertical face of taller than 1 foot are designed to minimize barriers to movement of fish and other aquatic organisms, per guidance from the Corps Denver Regulatory Office. The sheets will extend for some distance across the floodplain, perpendicular to the flow line of the stream. The concept behind installing sheet pile is to intercept ground water as it moves below the surface of the floodplains of Plum Creek and the South Platte River. As the ground water encounters the sheet pile, it will back up behind it, and flow in all directions until it reaches the edges of the structure and can pass beyond it. As the ground water backs up behind the structure, it gets closer to the surface and is eventually close enough to the existing or excavated surface to support wetland and riparian vegetation. Extending the sheet pile across the floodplain allows the channel to move in response to sediment movement along the stream. The conceptual design takes into account the dynamic nature of Plum Creek. The sheet pile cutoffs would be wide enough across the floodplain to accommodate channel migration. This technique has been used successfully on Plum Creek, Cherry Creek, Piney Creek, and Sand Creek.

Figure 1. Habitat Conversion Techniques

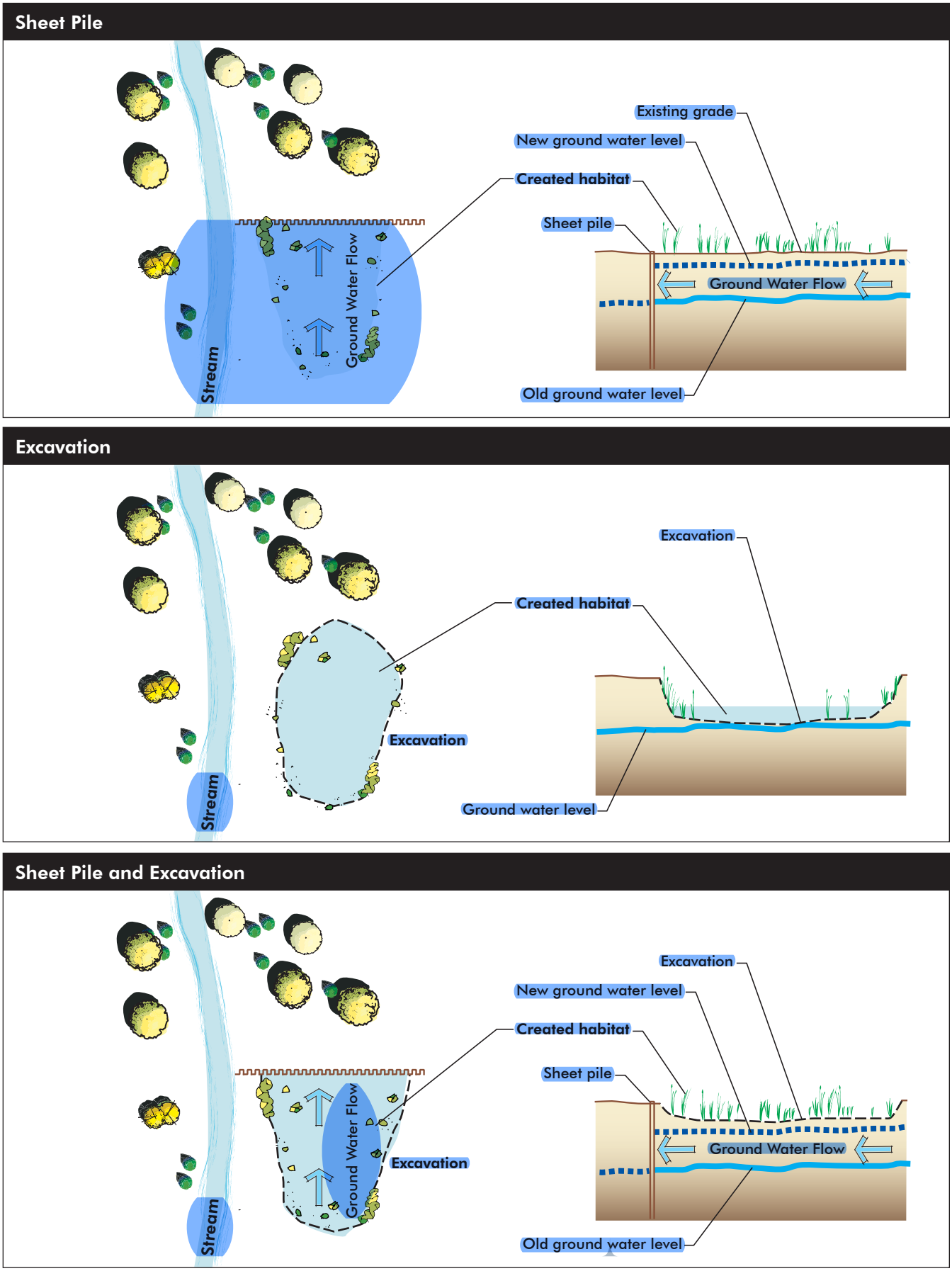


Figure 2. Habitat Conversion Techniques, Cont.

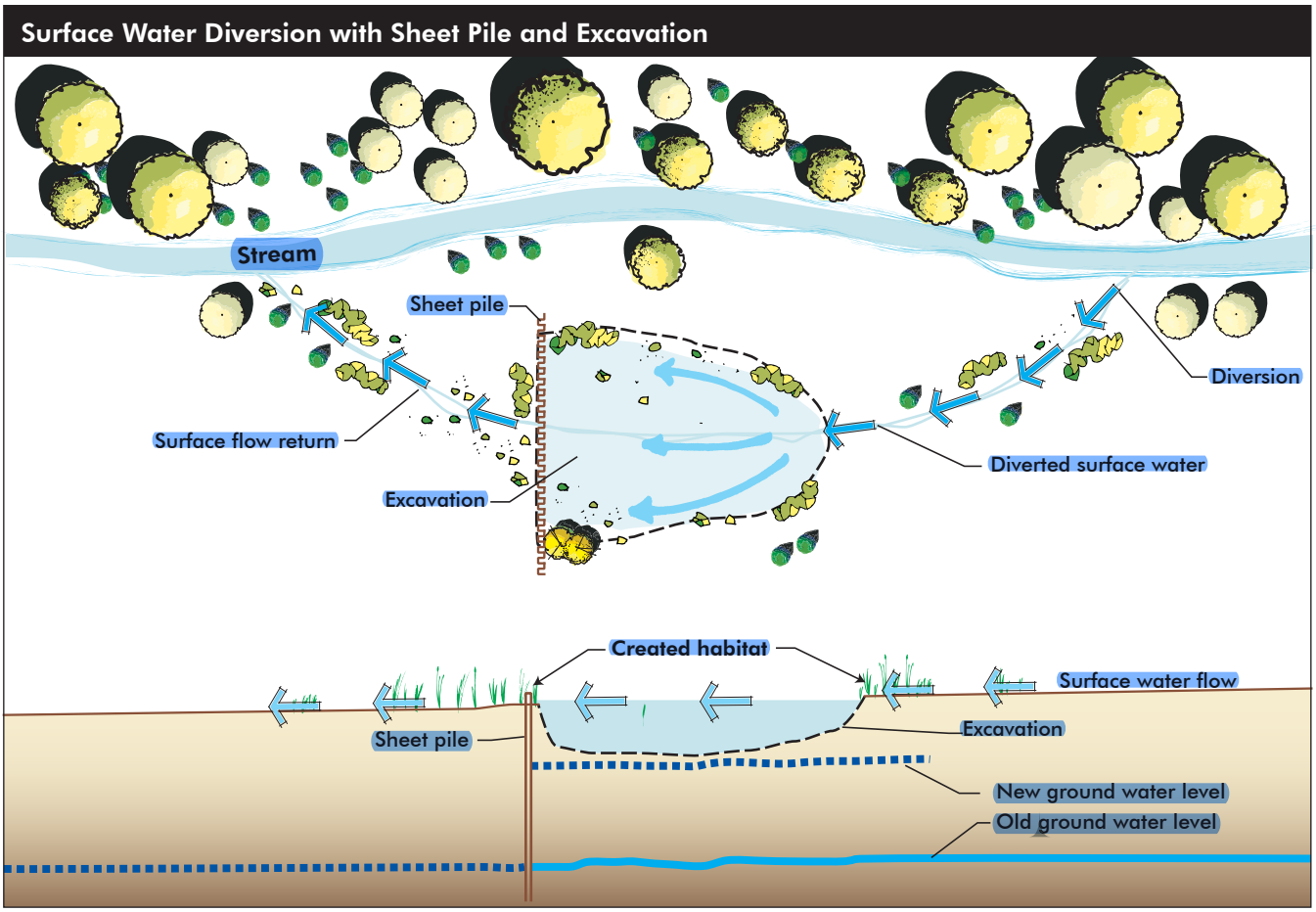


Figure 3 - Example of sheet pile cutoff drop structure on East Plum Creek in Castle Rock, Colorado used to enhance Preble's habitat.

Figure 4 - Aerial photo of Cherry Creek at 17-Mile House stream restoration project. The project included the creation of a new secondary channel to distribute surface water. (Photo courtesy of Muller Engineering Company).

Figure 5 - Cherry Creek at Stroh Ranch stream restoration project. Looking upstream at small riffle structure. Wetlands have expanded upstream of the structure.

Figure 6 - Cherry Creek at Apache Plume Outfall. Looking downstream at expanded Preble's habitat behind low sheet pile cutoff wall. Cutoff wall is visible at about the middle of the photo, just before the stream bends out of sight.

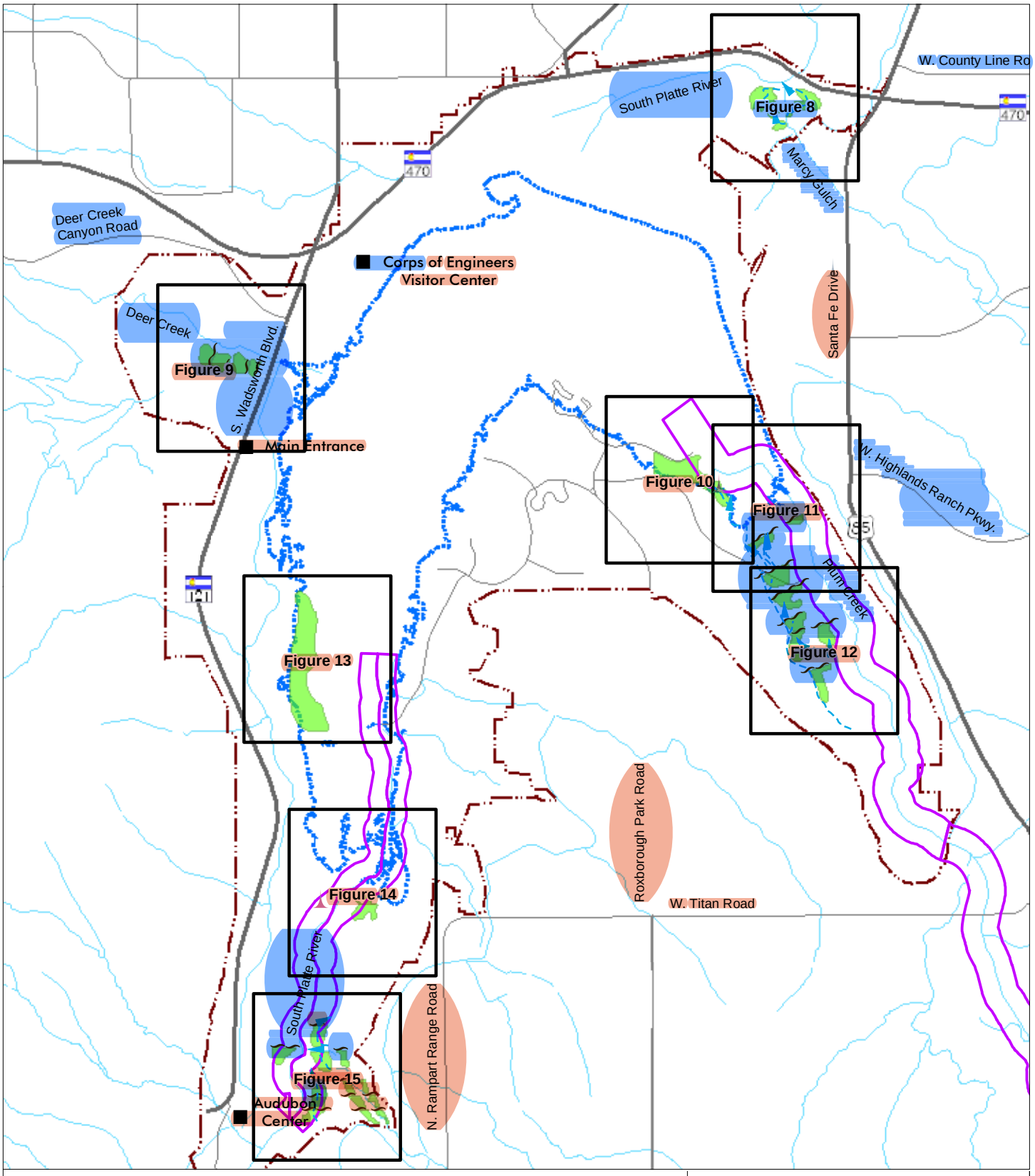
Constructing secondary channels, ditches, and backwaters is a means to convey and spread surface water to areas and to increase water available to support vegetation. If enough water is made available within the root zone, habitat will convert from one type to another. This approach often makes use of existing abandoned channels or oxbows to minimize earthwork.

Excavation lowers the ground surface to near the ground water. Topsoil is typically salvaged and stored for reuse following removal of subsoil. The depth of excavation depends on how far the ground water is below the ground surface. Depending on site conditions, up to several feet of material could be removed.

Based on data gathered on existing conditions in proposed on-site mitigation areas subsequent to publication of the draft FR/EIS, it is likely that most of the mitigation areas will be created by distributing surface water by means of channels and ditches. Ground water in most areas is too deep below the surface to use as a reliable source of water to support successful mitigation conditions. Sheet pile will still be used in some locations to protect against erosion and to aid in saturating the soil with surface water behind the sheet pile. Upon approval of the Federally Recommended Plan, preliminary plans will be prepared and submitted for Corps' approval prior to the development of final design documents. Those plans will be based on information gathered from ground water monitoring wells that have been established in the proposed mitigation areas and on the detailed topographic survey that has been conducted for each mitigation area. The plans will adhere to relevant Corps' and State Parks' standard practices and guidelines for plantings and revegetation, including the Corps' Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams and Appurtenant Structures (Corps 2009a). Once detailed plans and specifications are prepared, on-site mitigation construction will begin. Following construction, mitigation areas will be monitored to document progress toward the number of EFUs anticipated to be gained at each mitigation area.

6.1.1.1 Proposed Activities

Using information available during preparation of the draft FR/EIS, 29 on-site mitigation areas were proposed in the project area – two along Marcy Gulch, four along Deer Creek, 10 along Plum Creek, and 13 along the South Platte River (Figure 7 through Figure 15). The proposed mitigation areas were selected to be close to potential sources of ground and surface



Chatfield Reallocation Study

Pool Elevations: Tetratech

- Potential Mitigation Area
- Preble's Critical Habitat
- Sheet Pile Cutoffs
- Figure Index
- 5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
- Chatfield State Park

0 1,750 3,500 feet

1 inch = 3,500 feet

N

Figure 7
Locations of Potential On-Site Mitigation Areas

File: 4048 Fig 7 locs onsite mit.mxd (WH)
February 2011

ERO Resources Corp.

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

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

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

0 250 500 feet

1 inch = 500 feet

N

Figure 8
Lower Marcy Gulch
Potential On-Site Mitigation Areas

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

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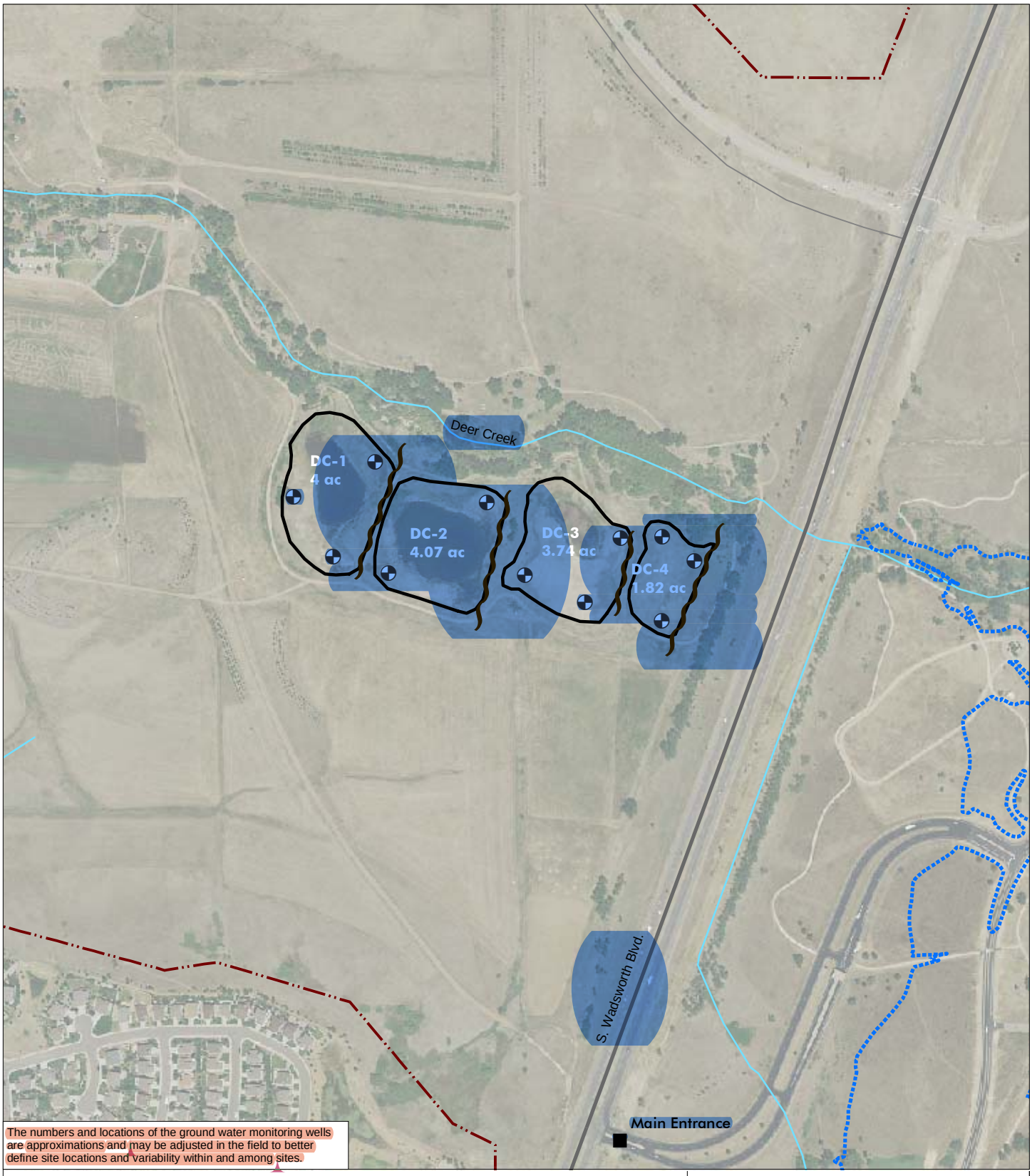

The numbers and locations of the ground water monitoring wells are approximations and may be adjusted in the field to better define site locations and variability within and among sites.

Chatfield Reallocation Study

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

N

Figure 9
Deer Creek
Potential On-Site Mitigation Areas

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

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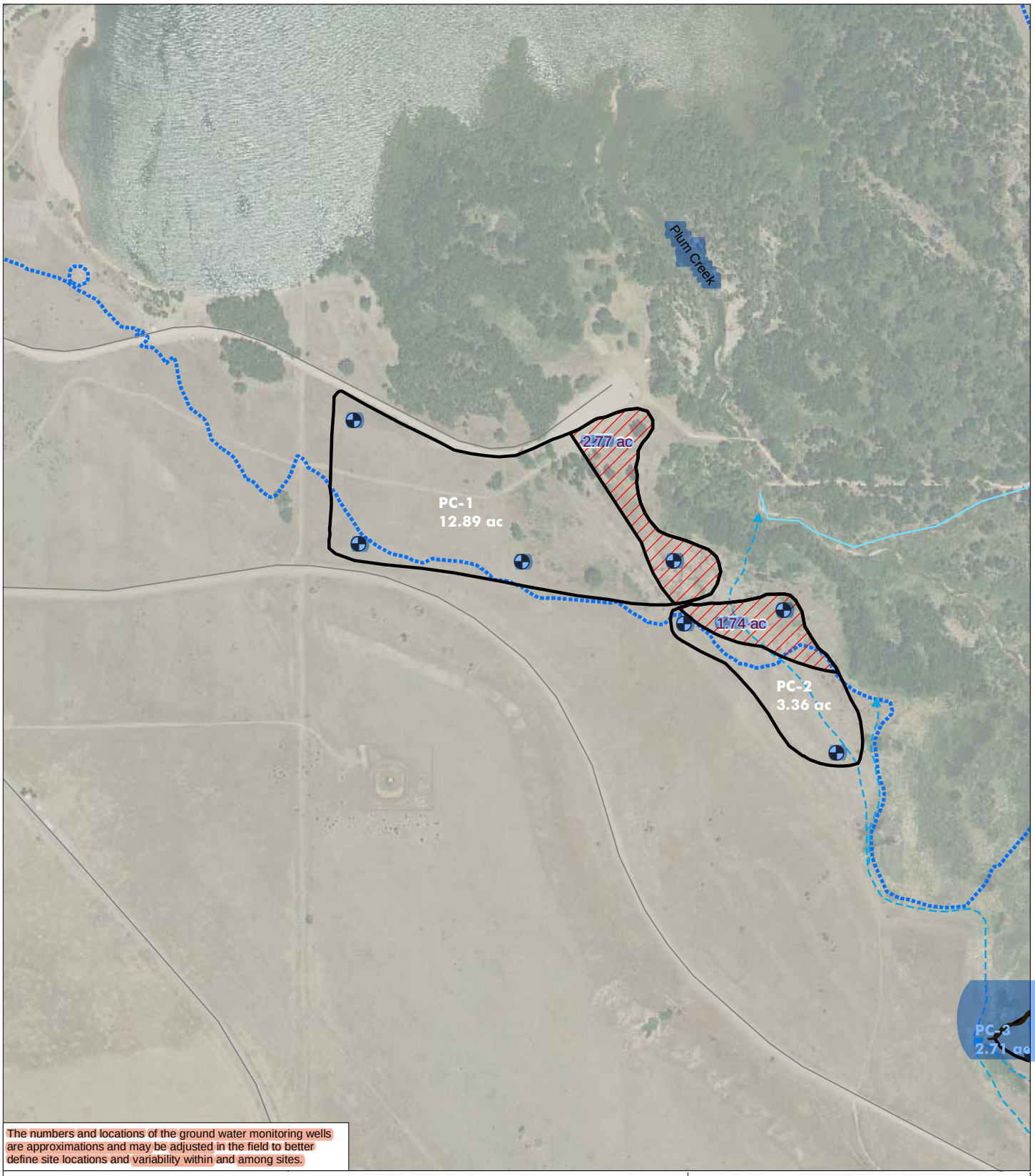

The numbers and locations of the ground water monitoring wells are approximations and may be adjusted in the field to better define site locations and variability within and among sites.

Chatfield Reallocation Study

Potential Mitigation Area

Preble's Critical Habitat Potential Mitigation

Ground Water Monitoring Well

Sheet Pile Cutoffs

Diversion Channel

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

N

Figure 10
Plum Creek
Potential On-Site Mitigation Areas

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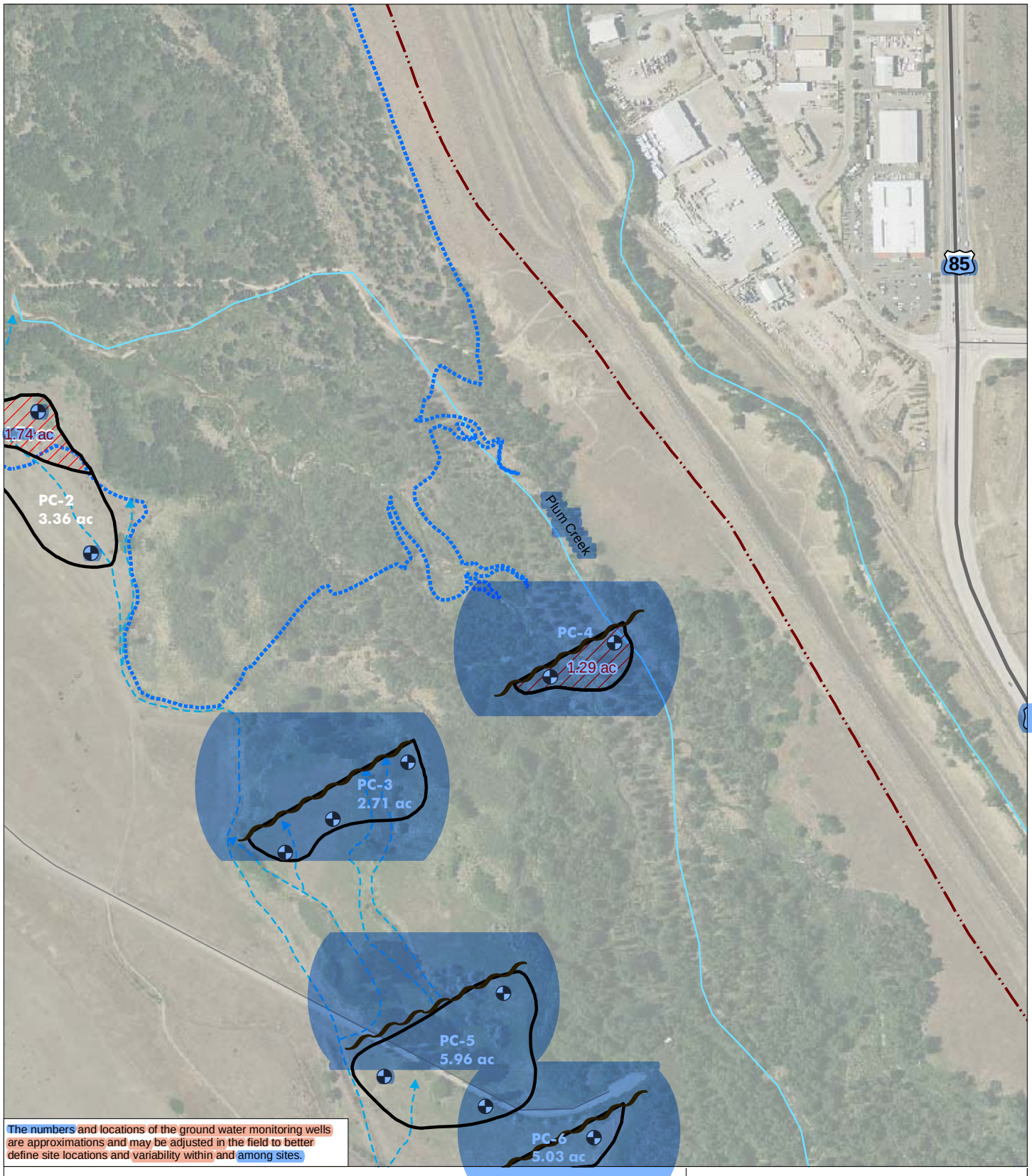

The numbers and locations of the ground water monitoring wells are approximations and may be adjusted in the field to better define site locations and variability within and among sites.

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

Chatfield Reallocation Study

- Potential Mitigation Area
- Preble's Critical Habitat Potential Mitigation
- Ground Water Monitoring Well
- Sheet Pile Cutoffs
- Diversion Channel
- 5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
- Chatfield State Park

0 250 500 feet

1 inch = 500 feet

N

Figure 11
Plum Creek
Potential On-Site Mitigation Areas

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

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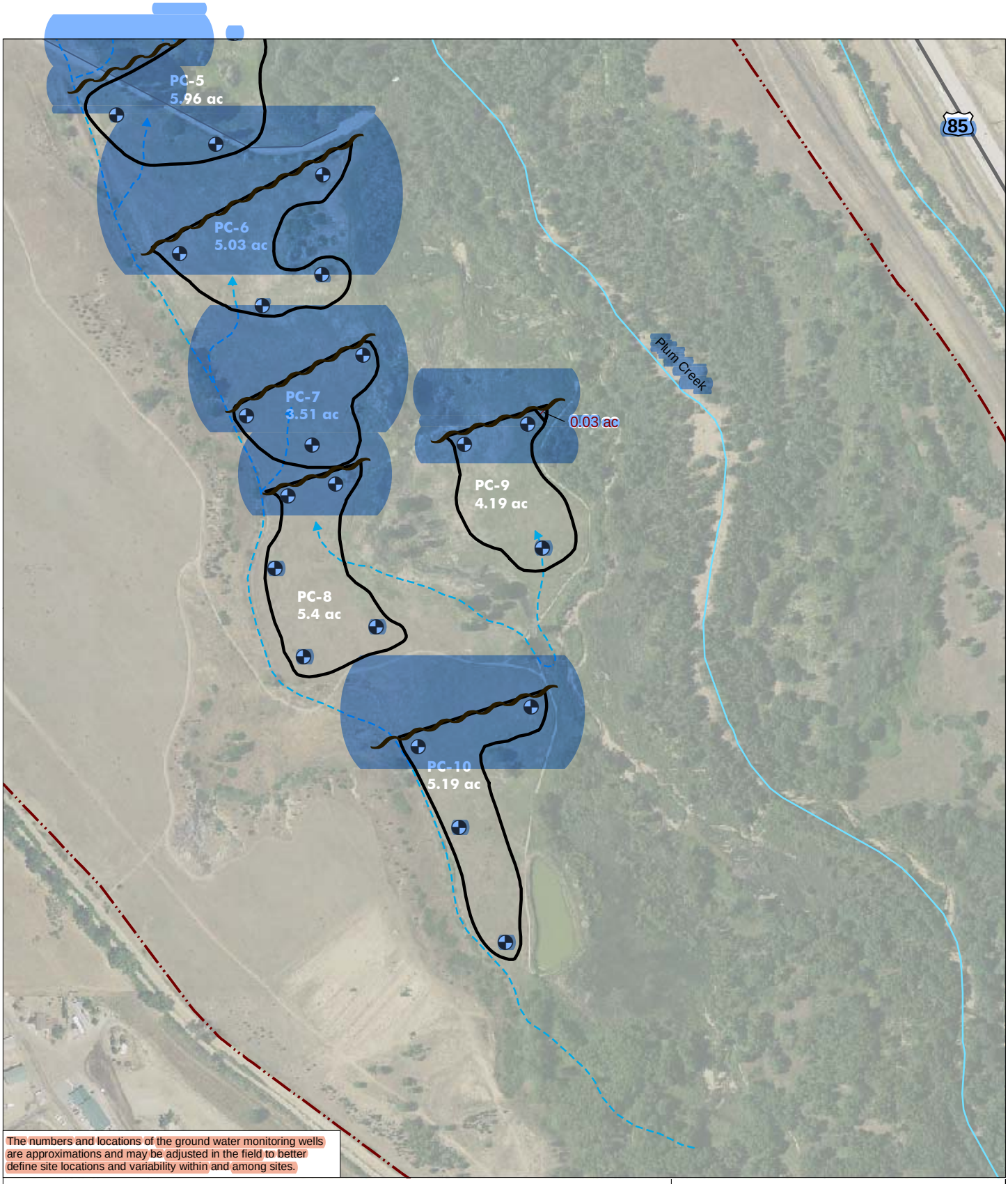

The numbers and locations of the ground water monitoring wells are approximations and may be adjusted in the field to better define site locations and variability within and among sites.

Chatfield Reallocation Study

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

- Potential Mitigation Area
- Preble's Critical Habitat Potential Mitigation
- Ground Water Monitoring Well
- Sheet Pile Cutoffs
- Diversion Channel
- 5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
- Chatfield State Park

0 250 500 feet

1 inch = 500 feet

N

Figure 12
Plum Creek
Potential On-Site Mitigation Areas

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

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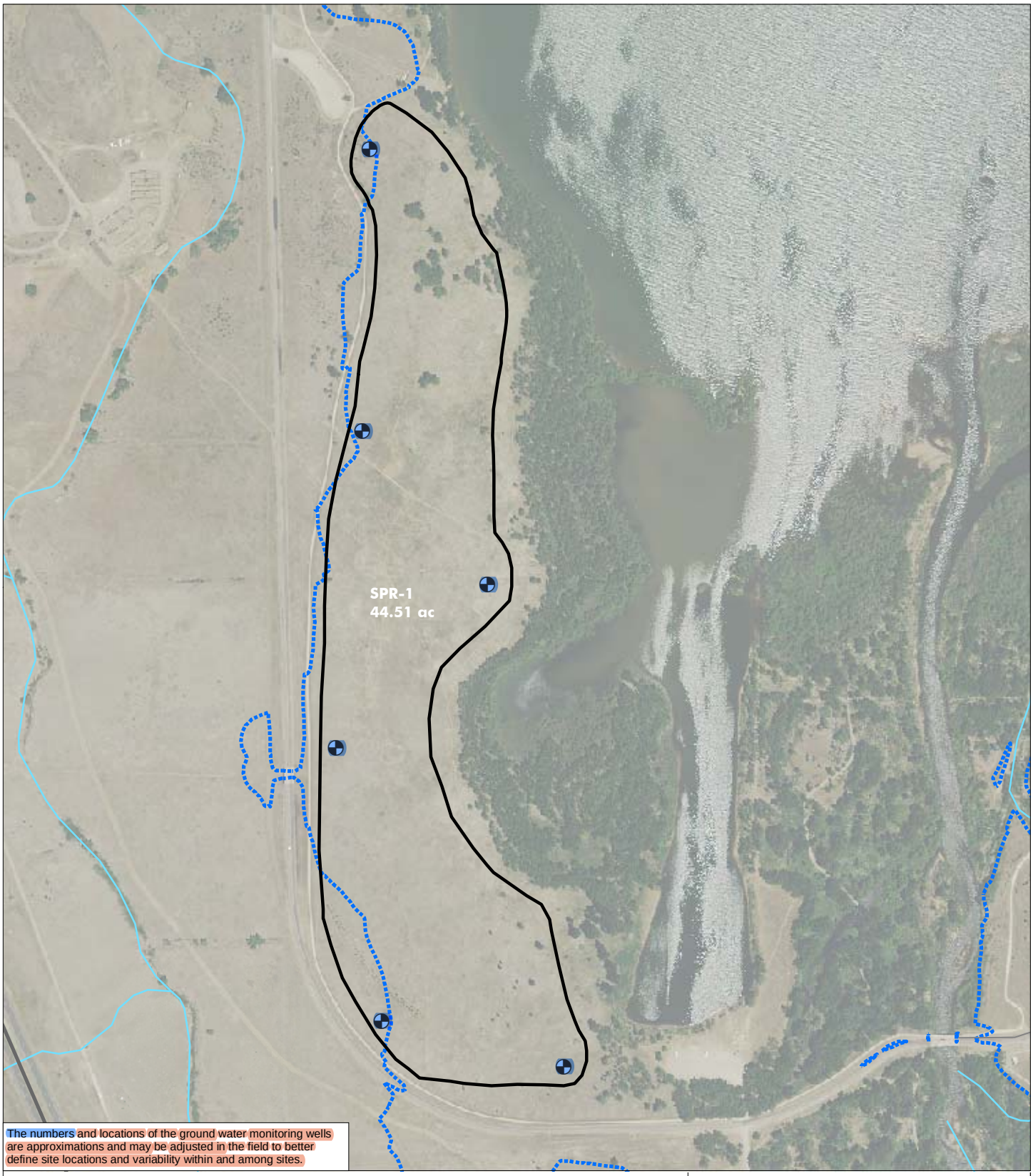

The numbers and locations of the ground water monitoring wells are approximations and may be adjusted in the field to better define site locations and variability within and among sites.

Chatfield Reallocation Study

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

N

Figure 13
South Platte River
Potential On-Site Mitigation Areas

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

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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
- Preble's Critical Habitat Potential Mitigation
- Ground Water Monitoring Well
- Sheet Pile Cutoffs
- Diversion Channel
- 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

N

Figure 14
South Platte River
Potential On-Site Mitigation Areas

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

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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
- Preble's Critical Habitat Potential Mitigation
- Ground Water Monitoring Well
- Sheet Pile Cutoffs
- Diversion Channel
- 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

N

Figure 15
South Platte River
Potential On-Site Mitigation Areas

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

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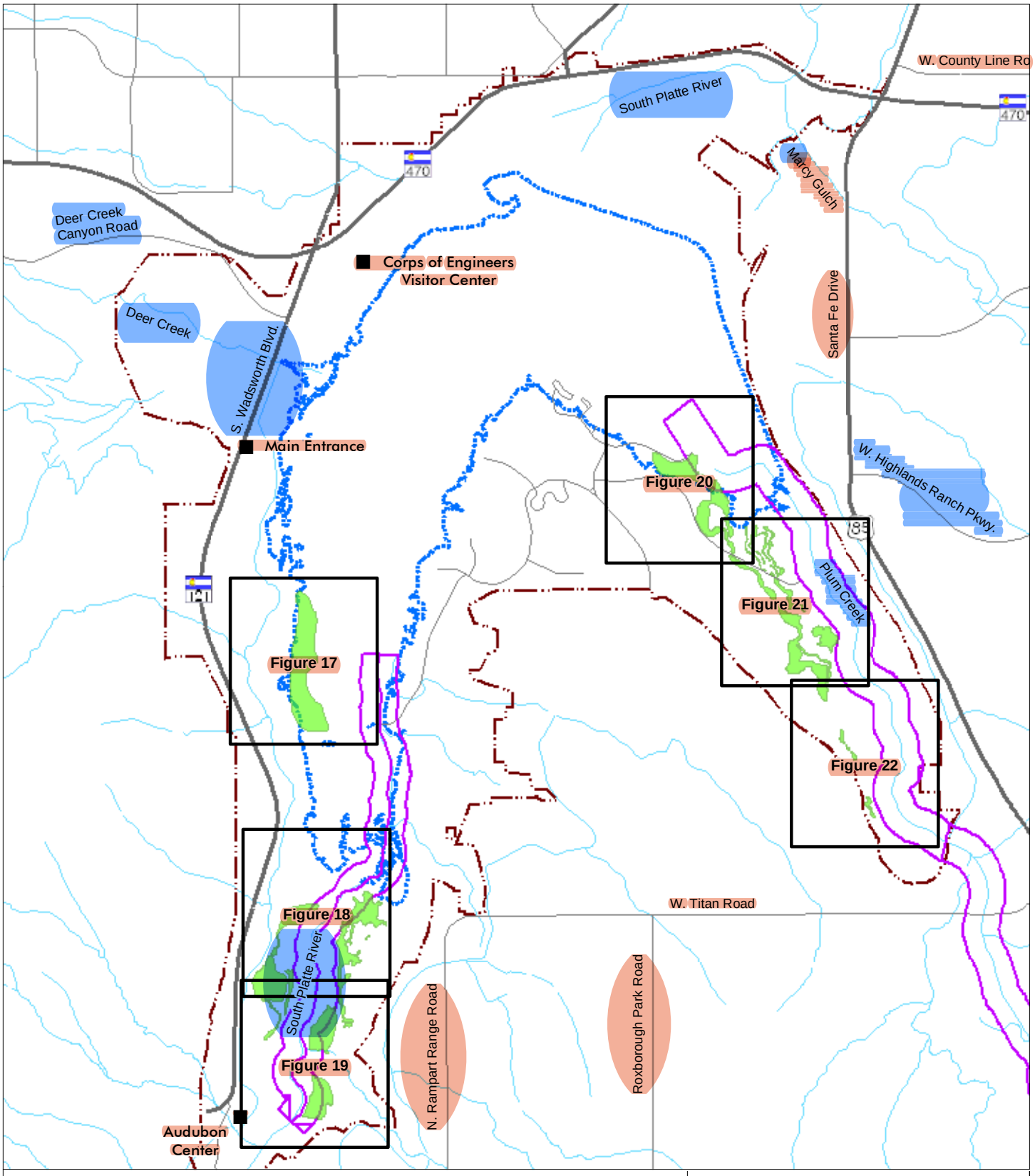
water and to maximize EFU mitigation credits. Two of the mitigation areas will be established in two borrow areas below elevation 5,444 (Figure 10 and Figure 12). The areas will be excavated for material that will be used as part of the recreation facility relocation activities. If not used as mitigation areas, the borrow areas would be restored to upland grasslands. The borrow areas are proposed for use as mitigation areas because they are located below the proposed maximum pool elevation, which means it is likely that ground water will be close to the surface and will be capable of supporting riparian and wetland habitats.

The on-site mitigation areas proposed in the draft CMP were conservative, rough outlines of areas estimated to have the best opportunities to provide mitigation that will result in a significant gain in EFUs. Subsequent to publication of the draft FR/EIS, locations and limits of potential on-site mitigation areas were reevaluated based on data generated by the following activities that have occurred subsequent to publication of the draft FR/EIS:

- Topographic mapping at 1-foot contour intervals;
- Installation and monitoring of ground water monitoring wells in locations indicated on Figure 8 through Figure 15;
- Delineation of any wetlands in proposed mitigation areas;
- Identification of areas of existing desirable vegetation to avoid disturbing them during design and construction;
- Sampling and evaluation of soils for permeability;
- Development of preliminary grading plans; and
- Continued development of the habitat field evaluation to finalize the ecological functions model to eventually determine the number of existing EFUs and EFU impacts based on existing site conditions.

Data analyses determined that surface and ground water conditions in the four mitigation sites proposed along Deer Creek and seven sites along Willow Creek, a tributary to the South Platte River, were unsuitable for successful mitigation efforts. However, other sites along the South Platte River and Plum Creek were expanded or added (Figure 16 through Figure 22). Preliminary estimates of acres of on-site mitigation and EFU mitigation credits for the revised mitigation areas are higher than estimates contained in the draft CMP. Although preliminary estimates of on-site acres and EFUs are higher than those in the draft CMP, preliminary cost estimates for the revised mitigation areas are no higher, and may be lower, than the draft CMP cost estimates. The anticipated reduction in the use of sheet pile reduces construction costs.



Chatfield Reallocation Study

- Potential Mitigation Area
- Preble's Critical Habitat
- Figure Index
- 5444 Pool Elevation (Maximum Pool Elevation of Alternative 3)
- Chatfield State Park

Pool Elevations: Tetratech

0 1,750 3,500 feet

1 inch = 3,500 feet

N

Figure 16
Revised Locations of Potential On-Site Mitigation Areas

File: 4048 Fig 16 revised locs onsite mit.mxd (WH)
January 2013

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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

N

Figure 17
South Platte River
Revised Potential On-Site Mitigation Areas

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

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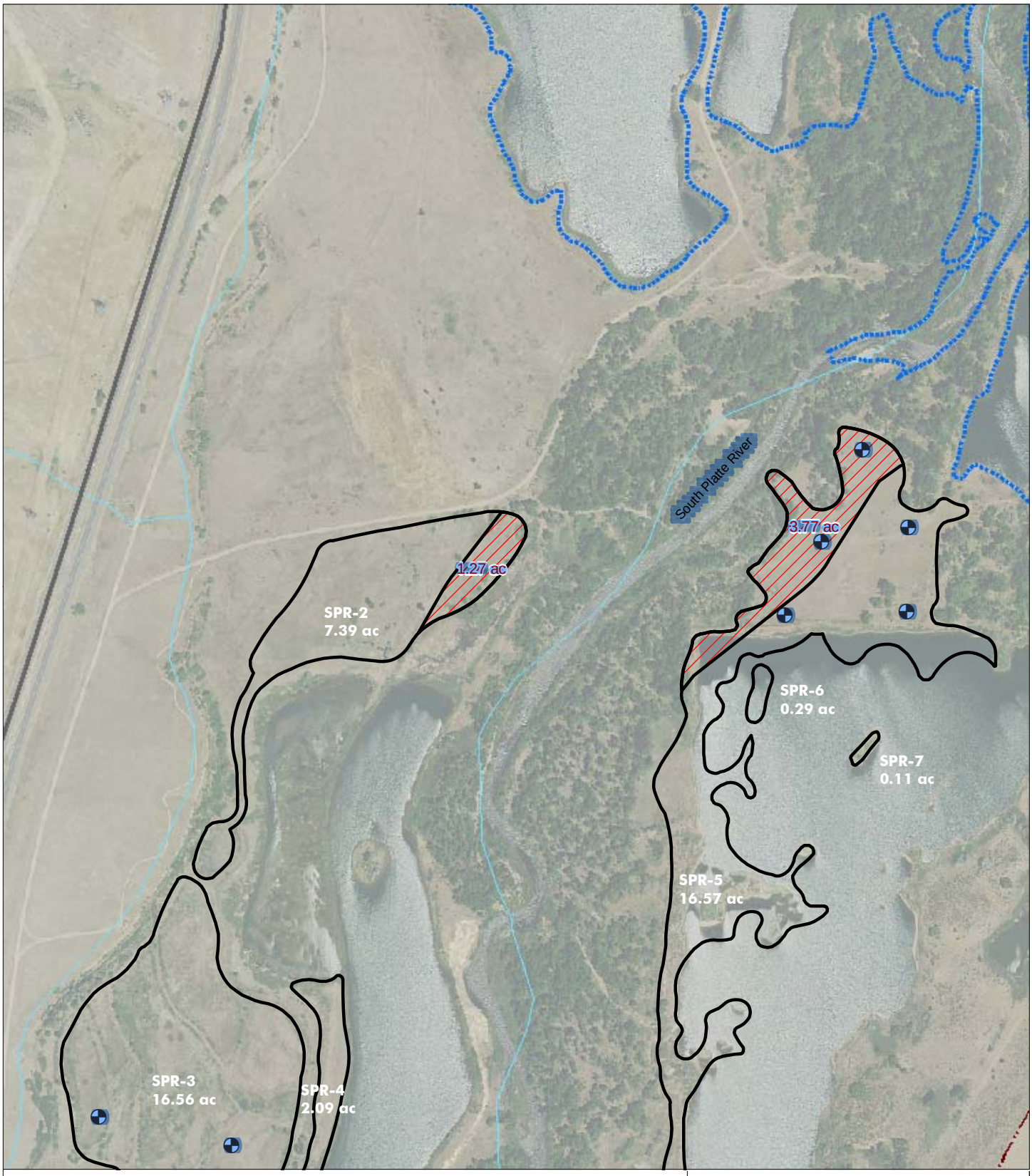

Chatfield Reallocation Study

- 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

0 250 500 feet
1 inch = 500 feet

N

Figure 18
South Platte River
Revised Potential On-Site Mitigation Areas

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

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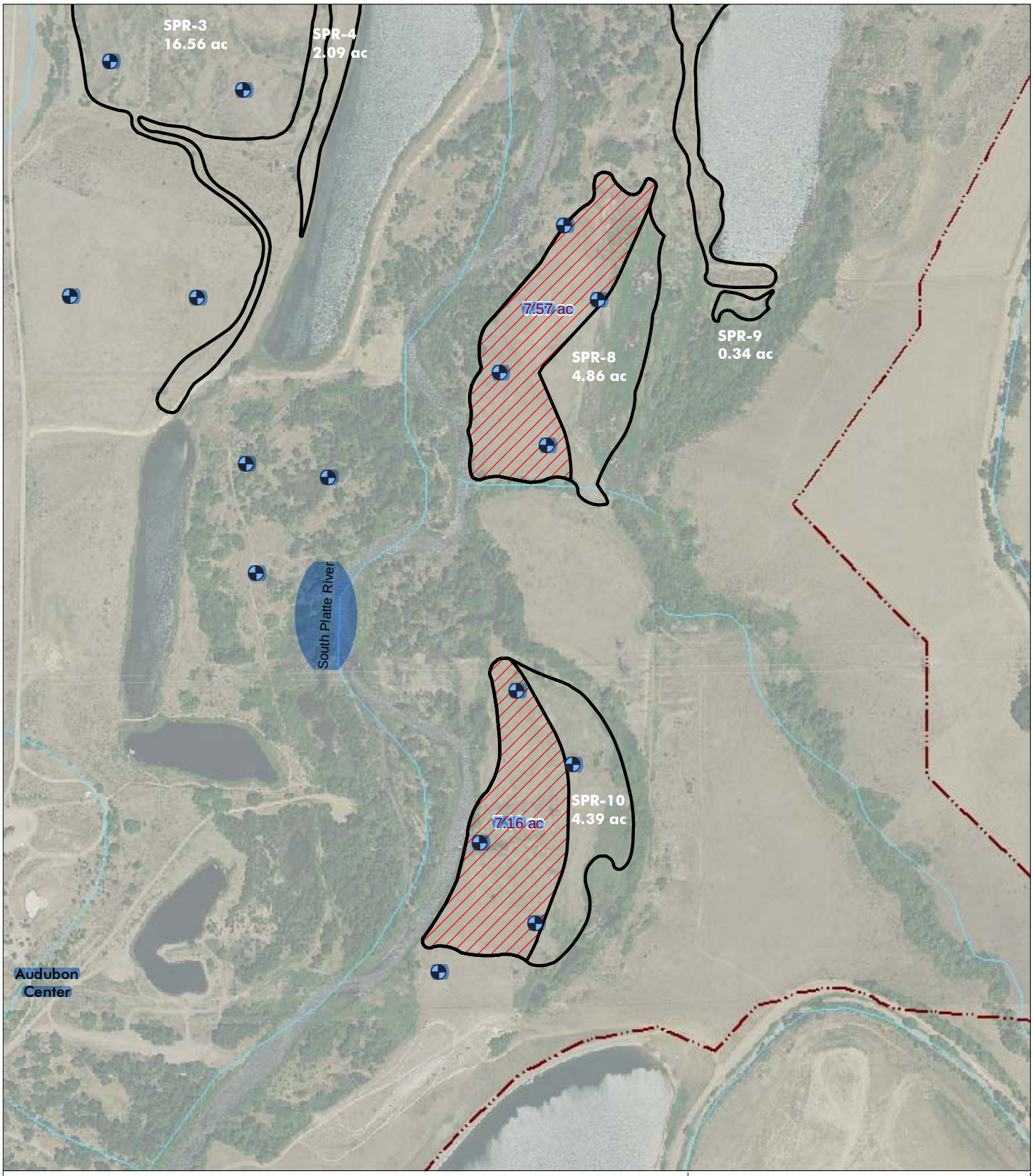

Chatfield Reallocation Study

- 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

0 250 500 feet
1 inch = 500 feet

N

Figure 19
South Platte River
Revised Potential On-Site Mitigation Areas

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

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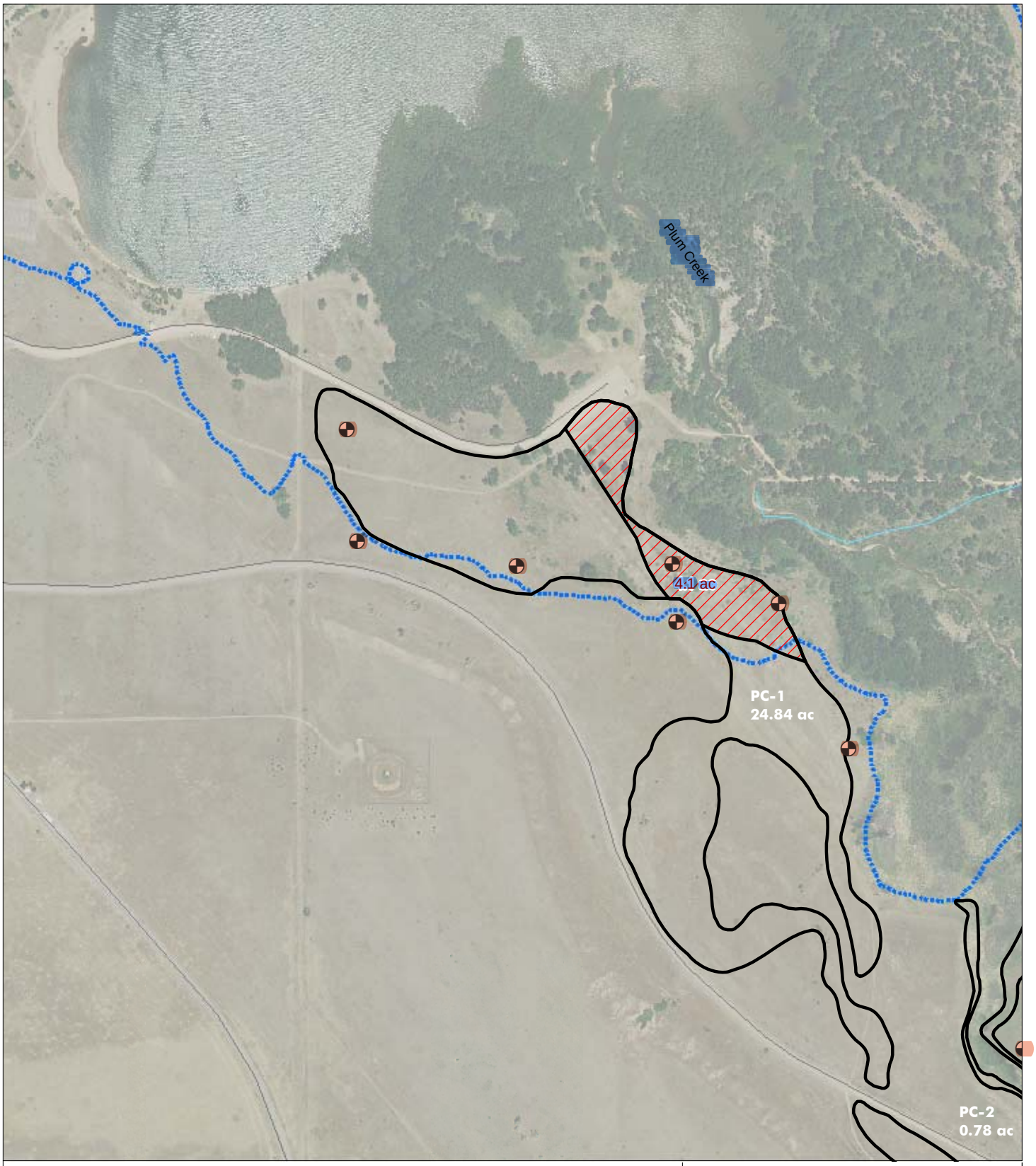

Chatfield Reallocation Study

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

0 250 500 feet

1 inch = 500 feet

N

Figure 20
Plum Creek
Revised Potential On-Site Mitigation Areas

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

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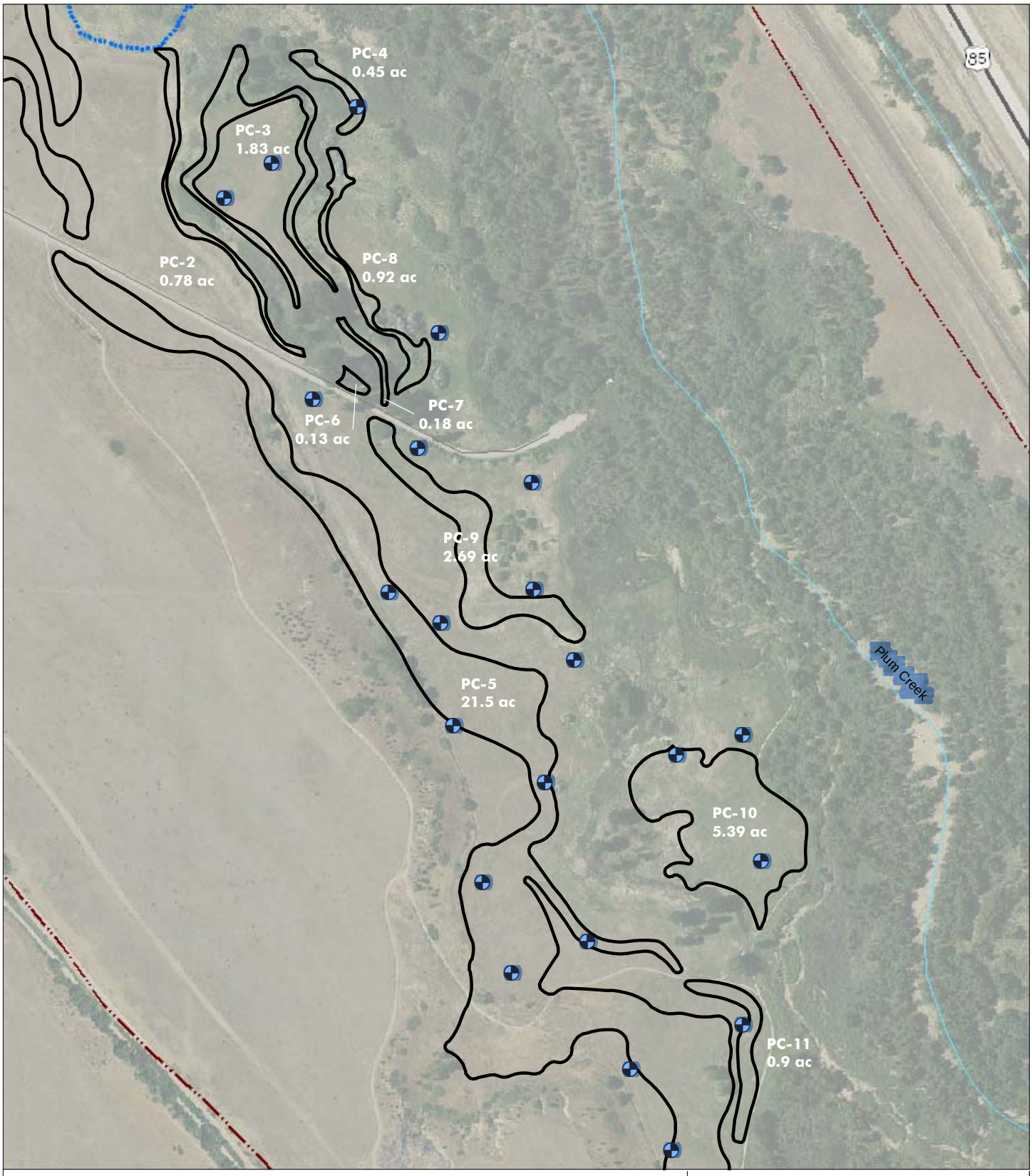

Chatfield Reallocation Study

- 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

N

Figure 21
Plum Creek
Revised Potential On-Site Mitigation Areas

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

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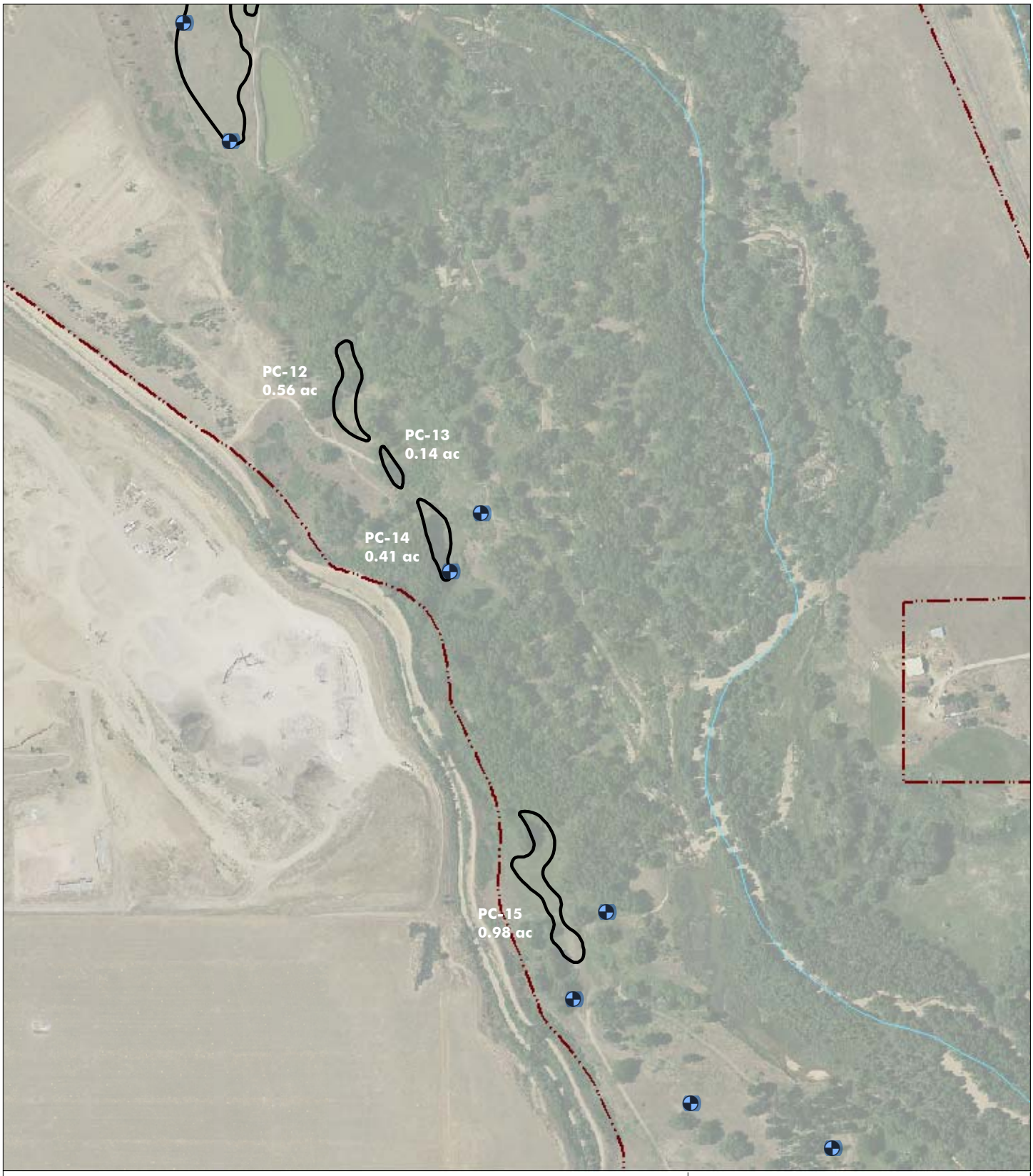

Chatfield Reallocation Study

- 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

N

Figure 22
Plum Creek
Revised Potential On-Site Mitigation Areas

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

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Although different than revised estimates, the draft CMP EFU mitigation credits, acres, and costs are used throughout the remainder of this document because they are more conservative estimates and because estimates will be further refined when site-specific mitigation plans are finalized.

The final extent, location, and number of mitigation areas will change as additional site analyses and designs are completed, but the number of on-site EFU mitigation credits will be maximized and are anticipated to generate at least the minimum number of credits described in Section 6.1.3.

Engineers and wetland ecologists will continue to better define on-site mitigation opportunities and will ultimately produce detailed, site-specific plans to provide the most EFUs in the most cost-efficient manner. These plans will include the following:

- Location map showing where the activity will occur within Chatfield State Park;
- A description of what will occur within the mitigation site, including anticipated acres and noncritical habitat EFUs for planned habitat types;
- CMP view of mitigation site at a scale of 1"=100';
- Cross sections and profiles of mitigation site for those activities involving earthwork that will alter the existing ground surface elevation at a scale of 1"=50';
- A plan for the salvage and use of topsoil for all activities that involve earthwork;
- Water sources, if a supportive hydrologic regime is required (e.g., wetlands);
- Erosion control plan;
- 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;
- Plans requiring an engineered structure will include a review and stamp by a registered engineer;
- Weed control plan; and
- Monitoring plan to determine success (Section 6.1.1.2).

6.1.1.2 Success Criteria

Each compensatory mitigation area will be monitored annually for at least 5 years after completion of the mitigation activities (Section 7.4). The on-site mitigation areas will be designed to support a mixture of wetland palustrine scrub-shrub, forested riparian, and riparian

shrublands. The following criteria relate to these created habitat types. Compensatory mitigation areas will be considered successful when these criteria have been met for at least 3 consecutive years without intervening remedial activities:

- For each planned habitat type, herbaceous cover will be at least 90 percent of the herbaceous cover of the reference area for that habitat type. Habitat type reference areas will be established in nearby areas of undisturbed habitat similar to that planned in the mitigation areas.
- At least 80 percent survival of planted trees and shrubs (including volunteers and vegetative reproduction). Species composition will be representative of species planted.
- State-listed A and B noxious weed species will be managed to comply with current State management guidelines for Jefferson and Douglas counties. State-listed A noxious weed species will be eradicated and in no case will State-listed B species make up more than 10 percent of vegetative cover.
- In areas designed as wetlands:
  - At least 50 percent of the species will consist of species rated as facultative or wetter, and
  - At least one primary or two secondary indicators of wetland hydrology will be present. These indicators of hydrology will be according to the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region* (Corps 2008).
  - For plant establishment, temporary watering past year one of planting will be considered a remedial activity.

6.1.1.3 Cottonwood Regeneration Areas

To compensate for the loss of mature cottonwood habitat, the draft CMP designated 13 acres in on-site mitigation areas SPR-2, SPR-3, and SPR-5 as cottonwood regeneration areas. Based on the revised mitigation areas, at least 13 acres in SPR-5 north of the gravel lake (Figure 18) and SPR-8 (Figure 19) are designated as cottonwood regeneration areas. The final grades and hydrology of these areas will be conducive to the establishment of a combination of cottonwood seedlings and planted trees. Cottonwood seedling areas will consist of gravely and sandy soils saturated during the early portion of the growing season. Surface water will be diverted to seedling areas until the root systems are developed enough to reach the ground water table.

6.1.1.4 Water Supply for Mitigation

The approach for creation of wetlands and cottonwood woodlands is to select and modify mitigation sites as needed to provide a supportive hydrology to sustain the wetland and riparian vegetation. Establishing wetland vegetation and cottonwoods will, in many instances, require a temporary supplemental water supply. The 158 acres of wetlands proposed to be created and the

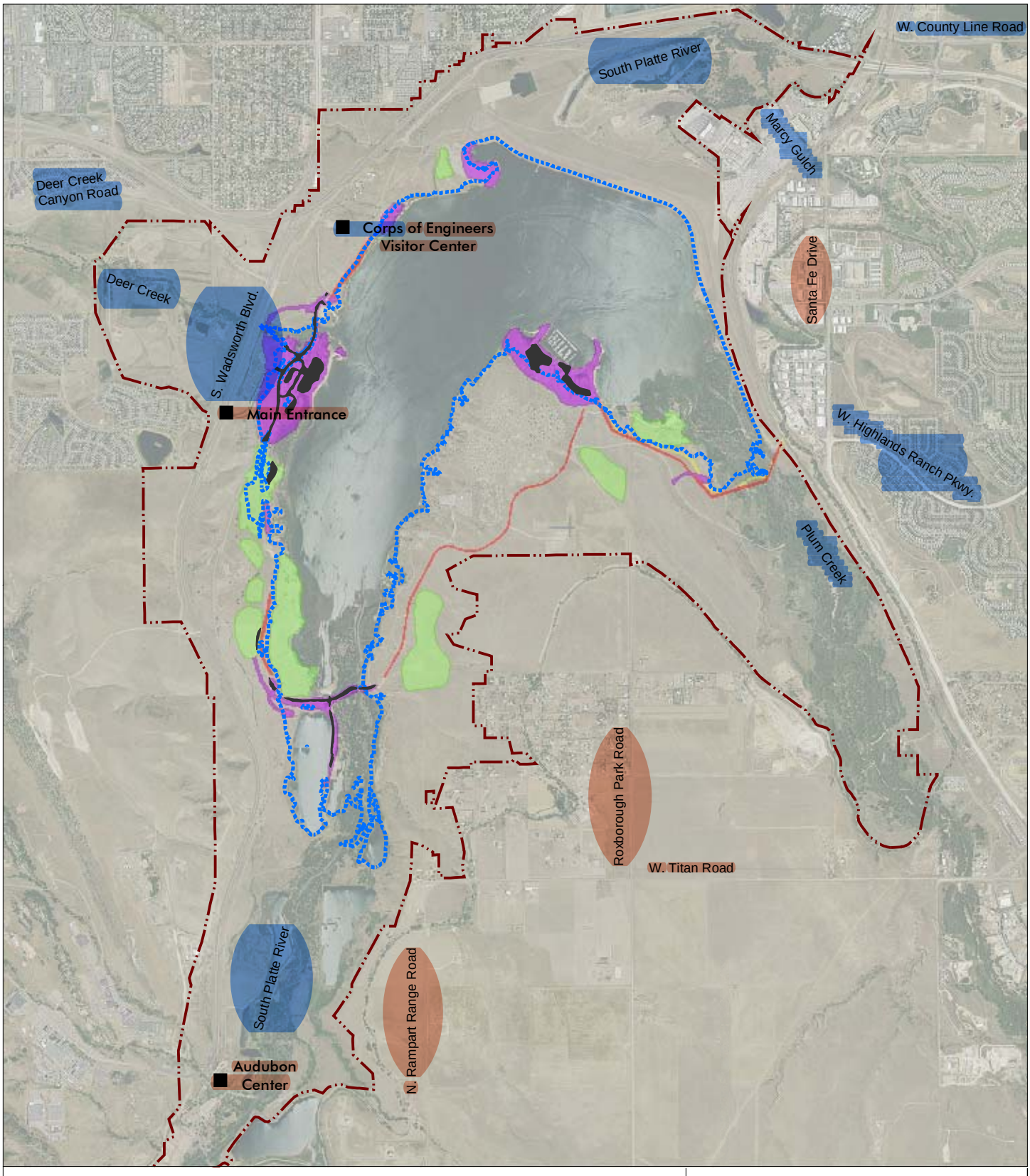
22.5 acres of cottonwood woodlands to be created do not exceed the maximum acres of wetlands and cottonwoods that have been estimated to be inundated by reallocation. Therefore, the transpiration (consumptive use) associated with the proposed creation of wetlands and cottonwood woodlands would not exceed the consumptive use of the wetlands and cottonwood woodlands estimated to be lost with reallocation. It is the policy of the Denver Regulatory Office of the Corps and the Colorado State Engineer's Office not to require water rights for wetland and riparian mitigation that does not exceed the consumptive use of the resources that will be lost. The Chatfield Water Providers will secure the necessary water rights and augmentation supplies if it is determined that a water right or permanent plan of augmentation is required for the mitigation.

6.1.2 Restoration of Borrow and Fill Areas

In addition to on-site compensatory mitigation for permanent impacts associated with inundation and recreation facility relocation, impacts to borrow areas above 5,444 feet in elevation and to fill areas and temporary roads will be mitigated in-place by restoring the areas to conditions similar to those present prior to disturbance (Figure 23). The two borrow areas below 5,444 feet in elevation will be used as compensatory mitigation areas (Section 6.1.1.1). Construction plans for the borrow and fill areas will include plans and specifications that follow restoration and revegetation guidelines developed for use in these areas (Appendix F). The guidelines include sections on soil preparation, seeding, mulching, and monitoring and maintenance. The restored areas will be monitored annually to ensure progress toward specific success criteria (Appendix F). Preliminary construction plans, specifications, and cost estimates for restoration of the borrow and fill areas are included in the recreation facilities relocation plan (EDAW 2009). Upon approval of the Federally Recommended Plan, preliminary plans will be prepared and submitted for Corps' approval prior to the development of final design documents.

6.1.3 Anticipated On-Site Compensatory Mitigation EFUs and Acreages

Once the mitigation areas were selected, the number of acres, potential EFU credits, and estimated costs for each potential on-site compensatory mitigation area were calculated (Table 3). As previously discussed, to be conservative, the estimates and examples are based on the mitigation areas depicted in Figure 7 and not the revised areas depicted in Figure 16. Figure 24 shows an example of how the net gain in EFUs, or EFU credits, were calculated for a habitat



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: Tetratech

0 1,750 3,500 feet

1 inch = 3,500 feet

N

Figure 23
Impacts Associated with Recreation Facility Relocation and Borrow Areas

File: 4048 Figure 23 Rec Facs and Borrow areas.mxd (GS)
February 2013

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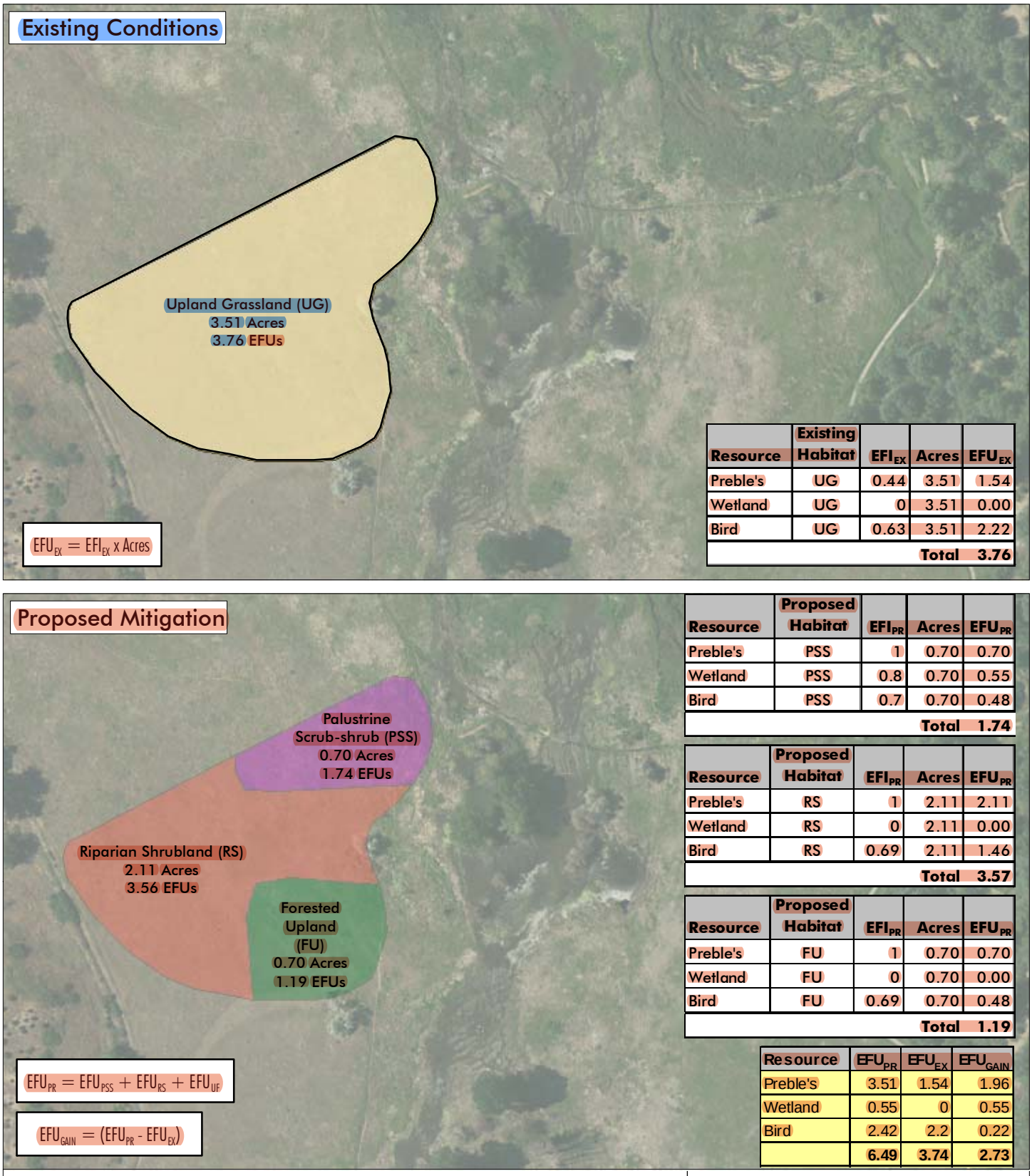

Resource	Existing Habitat	EFI_{EX}	Acres	EFU_{EX}
Preble's	UG	0.44	3.51	1.54
Wetland	UG	0	3.51	0.00
Bird	UG	0.63	3.51	2.22
			Total	3.76

Resource	Proposed Habitat	EFI_{PR}	Acres	EFU_{PR}
Preble's	PSS	1	0.70	0.70
Wetland	PSS	0.8	0.70	0.55
Bird	PSS	0.7	0.70	0.48
			Total	1.74

Resource	Proposed Habitat	EFI_{PR}	Acres	EFU_{PR}
Preble's	RS	1	2.11	2.11
Wetland	RS	0	2.11	0.00
Bird	RS	0.69	2.11	1.46
			Total	3.57

Resource	Proposed Habitat	EFI_{PR}	Acres	EFU_{PR}
Preble's	FU	1	0.70	0.70
Wetland	FU	0	0.70	0.00
Bird	FU	0.69	0.70	0.48
			Total	1.19

Resource	EFU_{PR}	EFU_{EX}	EFU_{GAIN}
Preble's	3.51	1.54	1.96
Wetland	0.55	0	0.55
Bird	2.42	2.2	0.22
	6.49	3.74	2.73

Chatfield Reallocation Study

Potential Mitigation Area

EFI_{EX} = Existing EFI
EFU_{PR} = Proposed EFUs
EFU_{EX} = Existing EFUs
EFU_{GAIN} = Net gain in EFUs

Image Source: Landiscor©, June 2008

This example is based on site PC-7. Subtotals and totals may differ due to rounding.

0 100 200 feet
1 inch = 200 feet
N

Figure 24
Example Calculation of Net Gain in EFUs From Habitat Conversion Activities

File: 4048 Fig 24 EFU Gain Calc Sample.mxd (WH)
February 2013

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conversion activity at mitigation site PC-7. Net gains in EFUs were calculated in a similar manner for all of the on-site compensatory mitigation areas. There would be no net change in EFUs from borrow and fill areas and temporary roads restored in place (Figure 23), so they are not addressed in this section. The following general assumptions were used to provide estimates of EFUs anticipated to result from mitigation activities and estimates of costs for each of the proposed on-site mitigation areas.

Table 3. Acres, EFUs, and Estimated Costs of Proposed On-Site Habitat Compensatory Mitigation Areas (exclusive of the restoration of borrow areas and other temporary disturbances).

Proposed On-site Mitigation Area	Figure Number	Acres		Estimated Gain Preble's EFUs	Estimated Gain Bird EFUs	Estimated Gain Wetland EFUs	Estimated Total Gain in EFUs	Estimated Cost
Lower Marcy Gulch								
LMG-1[1]	Figure 8	10.52		0.00	0.47	7.27	7.82	$ 913,530
LMG-2[1]	Figure 8	6.89		0.00	0.41	5.40	5.81	$ 600,320
Deer Creek								
DC-1	Figure 9	4.00		0.00	1.30	0.45	1.75	$ 639,012
DC-2	Figure 9	4.07		0.00	0.89	0.42	1.31	$ 748,037
DC-3	Figure 9	3.74		0.00	1.78	0.59	2.37	$ 659,194
DC-4	Figure 9	1.82		0.00	0.42	0.29	0.71	$ 468,192
Plum Creek								
PC-1[2]	Figure 10	15.66		7.22	0.77	2.04	10.03	$ 89,347
PC-2[1]	Figure 10	5.10		2.85	0.31	0.81	3.96	$ 581,944
PC-3	Figure 11	2.71		1.05	0.07	0.30	1.41	$ 758,088
PC-4	Figure 11	1.29		0.24	-0.03	0.06	0.27	$ 471,198
PC-5	Figure 11	5.96		3.34	0.36	0.94	4.64	$ 1,159,240
PC-6	Figure 12	5.03		2.82	0.30	0.79	3.91	$ 1,131,533
PC-7	Figure 12	3.51		1.96	0.21	0.55	2.73	$ 783,373
PC-8	Figure 12	5.40		3.02	0.32	0.85	4.20	$ 887,976
PC-9[1]	Figure 12	4.22		2.33	0.25	0.66	3.24	$ 784,530
PC-10	Figure 12	5.19		2.91	0.31	0.82	4.04	$ 1,005,013
South Platte River								
SPR-1[2]	Figure 13	44.51		6.21	-1.34	1.75	6.62	$ 253,244
SPR-2[1]	Figure 14	5.74		1.81	0.34	0.90	3.05	$ 650,408
SPR-3	Figure 15	4.01		0.44	0.24	0.63	1.31	$ 712,626
SPR-4	Figure 15	3.82		0.32	0.12	0.30	0.74	$ 870,405
SPR-5	Figure 15	4.50		2.48	0.26	0.70	3.43	$ 831,480
SPR-6	Figure 15	1.71		0.96	0.10	0.27	1.33	$ 397,381
SPR-7	Figure 15	8.55		0.72	0.49	1.32	2.53	$ 1,682,706
SPR-8	Figure 15	1.47		0.80	0.09	0.23	0.23	$ 336,160
SPR-9	Figure 15	0.95		0.53	0.06	0.15	0.74	$ 232,896
SPR-10	Figure 15	1.74		0.98	0.10	0.28	1.36	$ 401,581
SPR-11	Figure 15	0.92		0.46	0.04	0.13	0.63	$ 218,496
SPR-12	Figure 15	1.44		0.81	0.09	0.23	1.12	$ 337,949
SPR-13	Figure 15	0.97		0.48	0.05	0.13	0.66	$ 256,307
Totals		**165.45**		**46.27**	**8.94**	**29.70**	**84.91**	**$18,862,165**

[1]LMG-1, LMG-2, PC-2, and SPR-2 will be created by excavation only. No sheet pile will be used.
[2]PC-1 and SPR-1 are located in proposed borrow areas that are below the maximum pool elevation of 5,444 feet. Sheet pile will not be used in these areas and earthwork will be done as part of the recreation facility relocation. Potential EFUs for these areas are calculated assuming starting condition of upland grasslands.

Assumptions for calculating anticipated gain in EFUs:

1. Gains in EFUs from mitigation areas within currently mapped habitat are calculated using existing EFUs (Figure 24).
2. Gains in EFUs from mitigation areas beyond currently mapped habitat are estimated using CDOW riparian mapping equivalencies (Appendix C, Section 5.1).
3. Gains in EFUs include EFUs gained from mitigation activities in on-site critical habitat.
4. In most of the mitigation areas, existing upland grassland habitat will be converted on average to about 20 percent wetland palustrine scrub-shrub, 20 percent forested upland, and 60 percent riparian shrublands.
5. As shown in Table C-1 of Appendix C, following mitigation activities, the three habitat types in the mitigation areas will have the following EFIs for target resources:

    a. Palustrine scrub-shrub: Preble's – 1.0 (high value riparian), birds – 0.69 (shrubs (riparian)), and wetlands – 0.79 (palustrine scrub-shrub);
    b. Forested upland: Preble's – 1.0 (high value riparian), birds – 0.69 (trees), and wetlands – 0 (upland); and
    c. Riparian shrublands: Preble's – 1.0 (high value riparian), birds – 0.69 (shrubs (riparian)), and wetlands – 0 (upland).

6. In mitigation areas LMG-1 and LMG-2 (Figure 8), 100 percent of the habitat will be converted to one or more wetland habitat types.
7. Mitigation areas SPR-2, SPR-3, and SPR-5 (Figure 14 and Figure 15) are designated as cottonwood regeneration areas and 100 percent of the habitat will be converted to riparian trees.
8. Mitigation areas on Marcy Gulch and Deer Creek do not include Preble's EFUs because they are outside of known occupied Preble's habitat.

Weed control for the mitigation sites is part of the success criteria and mitigation credit will not be given for weed control in areas disturbed by mitigation activities. Detailed calculations of gains in EFUs are contained in Appendix G.

Assumptions for cost estimates:

1. Cost estimates include compensatory mitigation activities in on-site critical and noncritical habitat.
2. The earthwork, seeding, and mulching costs for PC-1 and SPR-1, which will be in the proposed borrow areas below 5,444 feet in elevation, are included in the recreation facility relocation costs.
3. Sheet pile cutoff structures will be used in 23 of 29 nonborrow area mitigation areas. Sheet pile is not proposed in six sites due to site-specific conditions.
4. Nonborrow areas will require salvage, storage, and reapplication of topsoil and removal of 2 feet of subsoil.
5. Excess excavated material will be disposed of off-site.
6. Sheet piles will extend 20 feet below the ground surface.

7. Mitigation area survey, design, construction administration, and contractor mobilization are 20 percent of estimated project costs (estimate based on professional judgment of Joe Juergensen, P.E., Muller Engineering Company).
8. All mitigation sites will receive the same revegetation treatment of native seeding and tree and shrub planting for each habitat type.
9. Line item cost estimates are based on average unit costs in the Urban Drainage and Flood Control District (District) Bid Tabulation software that compiles information on competitive bids for 35 channel improvement projects with District funding from 2010 to 2012.

More detailed assumptions and calculations are contained in Appendix G. Better defined estimates of on-site mitigation acres and estimated costs will be developed as the site-specific mitigation plans are finalized prior to issuance of the decision documents. Estimates of on-site mitigation EFUs will be revised based on field evaluations and the final site-specific mitigation area plans.

In addition to habitat conversion activities, there are opportunities for habitat enhancement, particularly along Plum Creek and the South Platte River. For example, significant channel degradation along Plum Creek has lowered the water table, adversely affecting adjacent wetland and riparian vegetation. Numerous cottonwood and peachleaf willow trees have died because of the change in hydrology and former wetland areas have transitioned to mesic or upland conditions. Approaches to restoring the degraded channel reach are being studied to determine potential gains in EFUs from restoration and from prevention of additional habitat degradation if the channel instability is not addressed.

Generally, the number of compensatory EFUs gained from enhancement activities, such as weed control, will be lower than those gained from habitat conversion activities such as converting upland grasslands to shrub-scrub wetlands. Because EFUs gained through habitat enhancement such as weed control will be relatively small, they are not included in current calculations of EFUs anticipated to result from on-site mitigation activities. Habitat enhancement activities may be implemented as part of adaptive management (Section 7.5).

Using currently available mapping and estimates of EFUs, 165 acres on-site will be converted to a mosaic of riparian shrublands (89 acres), wetlands (33 acres), and riparian forest (43 acres), and will provide a total of 85 compensatory EFUs. The 85 EFUs will include 3 West

Plum Creek CHU EFUs, 43 noncritical habitat Preble's EFUs, 9 bird EFUs, and 30 wetland EFUs.

6.1.4 Summary of On-Site Noncritical Habitat Mitigation

Based on the best information currently available and using conservative approximations of potential mitigation acreage and EFUs, the following will occur on-site:

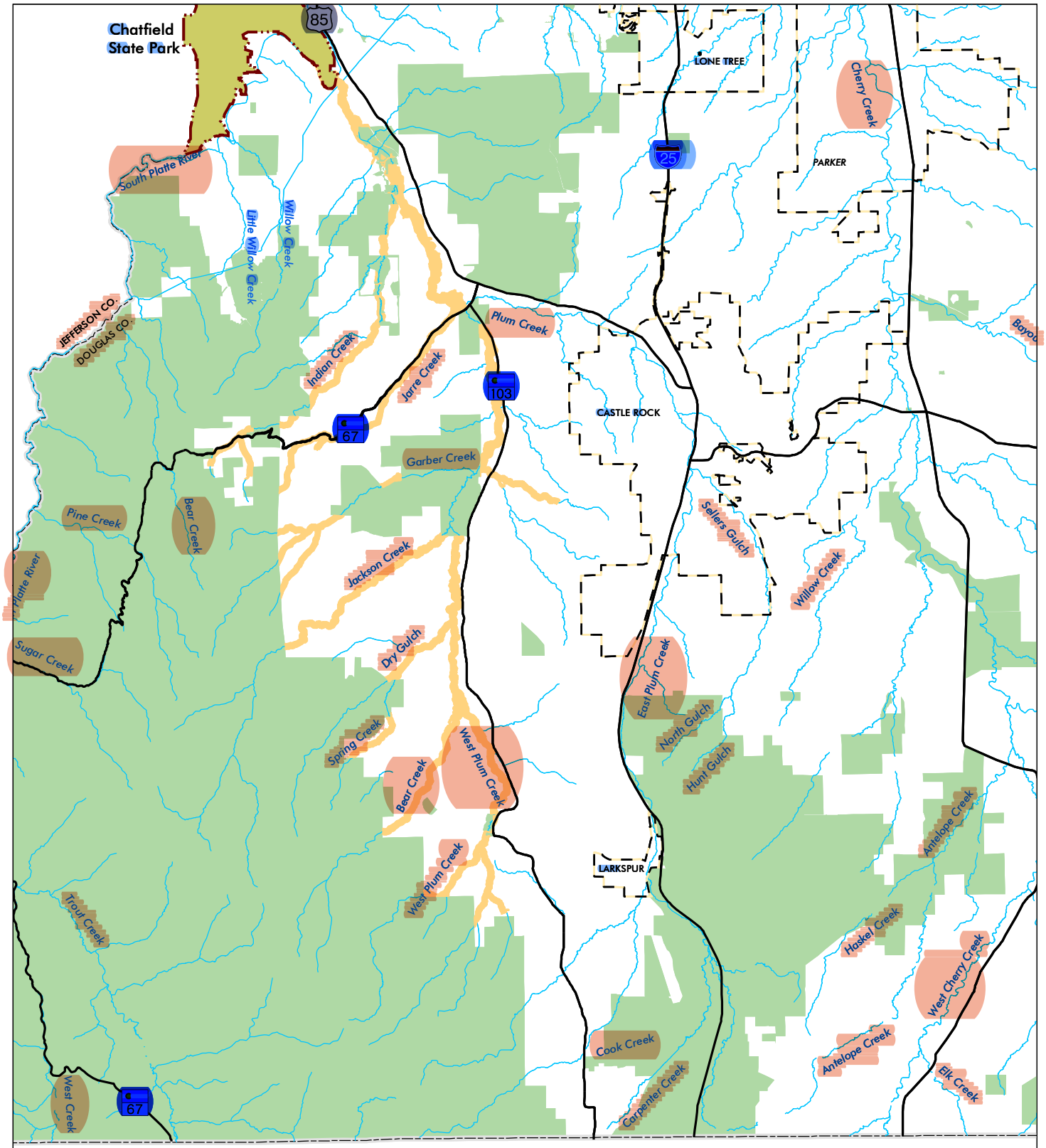
- Conversion of about 134 acres of uplands to Preble's habitat that will enhance 17 acres of Upper South Platte CHU habitat, 6 acres of West Plum Creek CHU habitat, and 111 acres on noncritical habitat, which will provide a net gain of 43 noncritical habitat Preble's EFUs and 3 West Plum Creek CHU EFUs;
- Enhancement of about 165 acres of upland grassland bird habitat to habitat that will provide a net gain of 9 bird EFUs;
- Creation or enhancement of about 47 acres of wetlands that will provide a net gain of 30 wetland EFUs;
- Restoration and revegetation of about 173 acres of borrow and fill areas, and areas disturbed by utility realignment and haul roads to upland grasslands, resulting in no net change in EFUs; and
- Creation of about 13 acres of cottonwood regeneration.

Section 6.3.2.5 includes several tables that summarize impacts, on-site mitigation, and off-site mitigation.

6.2 Off-Site Mitigation

The CMP focuses mitigation efforts first in on-site areas. However, it is recognized that mitigation requirements will exceed what is available within on-site areas. Therefore, additional mitigation sites will be identified off-site, primarily on private lands upstream of Chatfield State Park in the Plum Creek and West Plum Creek watersheds (Figure 25). The final number and extent of off-site mitigation areas will be determined by how many EFU credits are generated from each mitigation area.

For on-site mitigation, calculating EFU credits gained by mitigation activities, such as habitat conversion of upland grassland to a scrub-shrub wetland, is a relatively straightforward process of determining the number of EFUs in the area prior to mitigation activities and the number of EFUs in the area after mitigation activities. The net gain in EFUs will be credited to offset impacts.



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- 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: Tetratech

0 9,000 18,000 Feet

1 inch = 18,000 feet

N

Figure 25
Off-Site Mitigation Target Habitat within Private Douglas County Parcels

File: 4048 - Figure 25 Off-Site Mit Target.mxd (GS)
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Calculating mitigation credits for off-site mitigation is not as straightforward as that for on-site mitigation. Off-site mitigation sites will consist of numerous areas surrounded by various land uses. Unlike on-site mitigation, development may be in close proximity to off-site mitigation areas and there may not be certainty that adjacent land uses will not significantly change over time and adversely affect existing habitat. Also, unlike on-site mitigation areas, most off-site areas will require legal real estate instruments such as conservation easements or deed restrictions to ensure perpetual protection and management of the mitigation areas to benefit the target environmental resources. Finally, conservation and maintenance of existing habitat to benefit Preble's is a mitigation measure available off-site but not possible on-site.

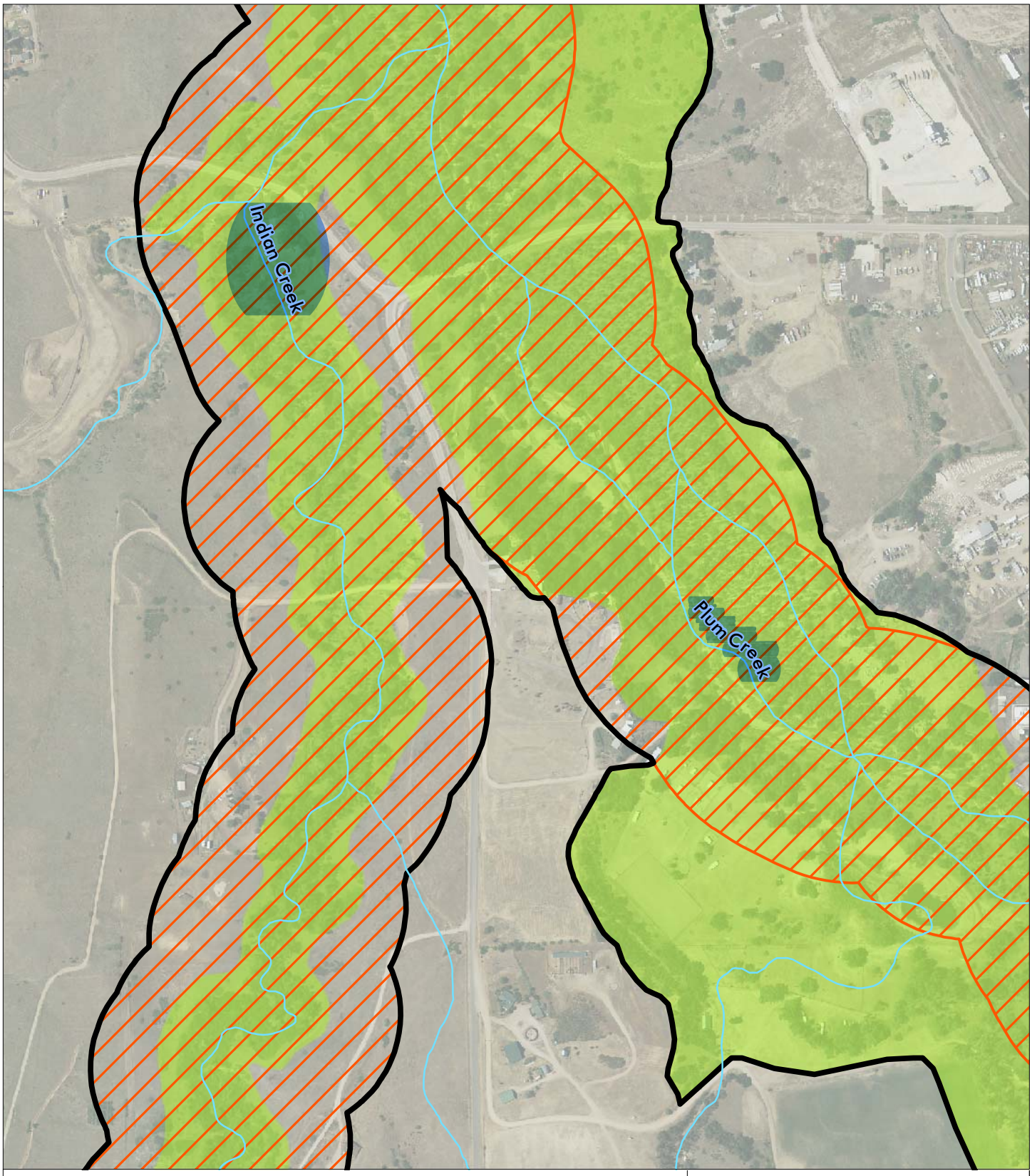
To account for these differences, baseline mitigation credits for preservation and weighting factors related to the ecological effects of landscape context were developed as part of the ecological functions approach. In recognition of the value of protecting existing habitat from loss or degradation by allowable changes in land use in or near the habitat, conservation of existing habitat would generate some amount of baseline mitigation credit. Weighting factors for the proximity of mitigation areas to impacts, the presence of habitat buffers, and the connectivity of off-site mitigation areas to other protected areas have been developed as well. The weighting factors will be applied to existing EFUs present in off-site mitigation areas and to EFUs generated from habitat conversion and enhancement activities as described below. Weighting factors are not applied to on-site mitigation activities because the on-site mitigation activities occur, for the most part, within Chatfield State Park. It was assumed that buffers from potential development, connectivity to other protected habitats, and proximity to Chatfield State Park would have little meaning for on-site mitigation activities.

There also will be off-site mitigation activities to compensate for the mature cottonwood habitat that will be impacted. The mature cottonwood habitat mitigation will contribute to the overall EFUs needed for mitigation. The mature cottonwood habitat mitigation also will be tracked by mitigation acreage to ensure that impacts to mature cottonwoods will be compensated by mitigation activities that involve mature cottonwood habitat. About 13 acres of the mature cottonwood habitat mitigation will take place on-site (Section 6.1.1.3), leaving about 29.5 acres to be compensated for off-site.

6.2.1 Proposed Activities

6.2.1.1 Permanent Protection of Target Habitat

The off-site mitigation for impacts to Preble's noncritical habitat focuses on the West Plum Creek and Plum Creek watersheds upstream of Chatfield State Park (Figure 26). Similar large-scale conservation efforts have been successful in Douglas County (Douglas County et al. 2006). Mitigation areas will be permanently protected by conservation easements put in place on property purchased from willing property owners or through conservation easement agreements with willing property owners. To ensure that mitigation credits are associated with suitable Preble's habitat, only portions of private parcels identified as target habitat would contribute to accrual of mitigation credits (Appendix C, Section 4.1). Target habitat typically includes well-developed riparian habitat and some amount of adjacent upland areas. Douglas County has mapped Preble's habitat as part of the Douglas County Habitat Conservation Plan (DCHCP) (Douglas County et al. 2006). The mapped areas are the Riparian Conservation Zone (RCZ) in the DCHCP. Additionally, in 2009 the Service proposed to designate certain reaches of Plum Creek and its tributaries as critical habitat for Preble's. Off-site target habitat was mapped by overlaying the RCZ and proposed critical habitat and using whichever boundary was wider as the outer boundary of target habitat (Figure 27). The combination of the 2009 proposed critical habitat designation for Preble's and the RCZ mapping provide the maximum target habitat width for off-site mitigation within the target habitat area (Figure 27). Generally, the RCZ is wider than the 2009 proposed critical habitat designation on larger streams (e.g., Plum Creek) and narrower on tributaries to West Plum Creek (e.g., Jarre Creek or Garber Creek). The combination of the RCZ and the 2009 proposed critical habitat designation will facilitate the potential for increased protection of riparian habitats and their adjoining uplands in the off-site mitigation target habitat area.



Chatfield Reallocation Study

Primary Target Habitat
Critical Habitat Proposed in 2009
Riparian Conservation Zone

Imagery Source : Landiscor©, June 2008
Critical Habitat: USFWS, October 2009

0 250 500 feet
1 inch = 500 feet

N

Figure 26
Example Off-Site Mitigation
Target Habitat

File: 4048 Figure 26 Off-Site Mit Target Hab.mxd (GS)
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$EFI_{EX} = BEFI_{EX} + PEFI_{EX} + WEFI_{EX}$

$EFU_{EX} = EFI_{EX} \times Acres$

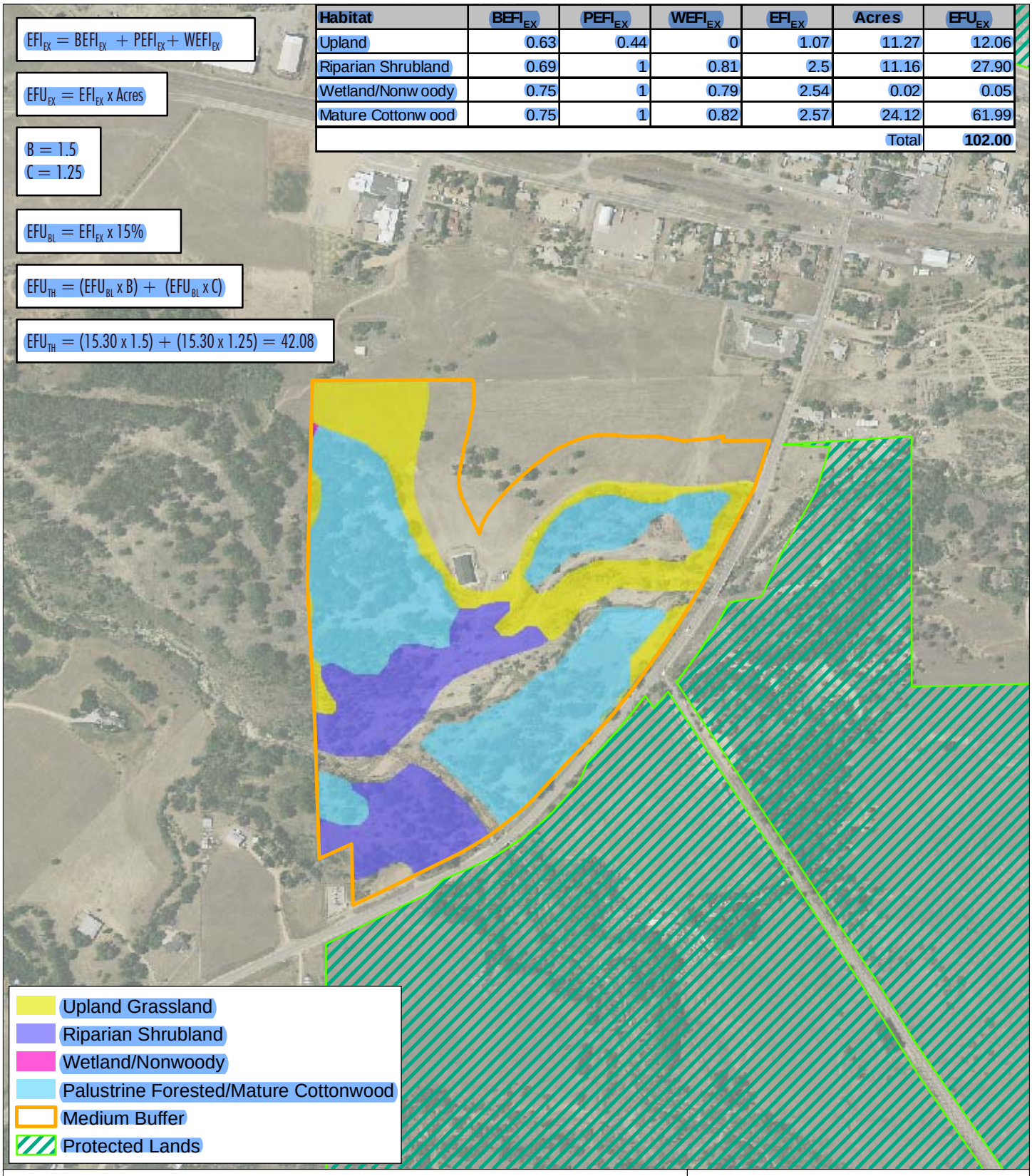
$B = 1.5$
$C = 1.25$

$EFU_{BL} = EFI_{EX} \times 15\%$

$EFU_{TH} = (EFU_{BL} \times B) + (EFU_{BL} \times C)$

$EFU_{TH} = (15.30 \times 1.5) + (15.30 \times 1.25) = 42.08$

Habitat	$BEFI_{EX}$	$PEFI_{EX}$	$WEFI_{EX}$	EFI_{EX}	Acres	EFU_{EX}
Upland	0.63	0.44	0	1.07	11.27	12.06
Riparian Shrubland	0.69	1	0.81	2.5	11.16	27.90
Wetland/Nonw oody	0.75	1	0.79	2.54	0.02	0.05
Mature Cottonw ood	0.75	1	0.82	2.57	24.12	61.99
					Total	**102.00**



Chatfield Reallocation Study

EFI_{EX} = Existing EFI
EFU_{EX} = Existing EFUs
EFU_{BL} = Baseline EFUs
EFU_{TH} = Target Habitat Weighted EFUs
$BEFI_{EX}$ = Existing Bird EFI
$PEFI_{EX}$ = Existing Preble's EFI
$WEFI_{EX}$ = Existing Wetland EFI

Weighting Factors
B = Buffers
C = Connectivity

0 250 500 feet

N

Figure 27
Example Calculation of Off-Site EFUs

File: 4048 Fig 27 Offsite EFU Calc Sample.mxd (WH)
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Image Source: Landiscor©, June 2008

6.2.1.2 Habitat Enhancement

In addition to weighted baseline mitigation credits generated from the permanent protection of habitat on private lands, credits will also accrue from increases in EFUs resulting from habitat conversion and enhancement activities. Off-site habitat conversion activities will generally be the same as those described for on-site habitat conversion (Section 6.1.1). The same method described to calculate the net gain in EFUs, or EFU credits, for on-site habitat conversion activities will be used to calculate EFU credits for off-site habitat conversion activities (Figure 27). There will likely be additional, site-specific opportunities that will be identified and developed as properties become available for preservation.

6.2.1.3 Success Criteria

Each enhanced mitigation area will be monitored annually for at least 5 years after completion of the mitigation activities (Section 7.4). Enhanced areas of off-site mitigation will be designed to support a mixture of wetland palustrine scrub-shrub, forested riparian, and riparian shrublands. The following criteria relate to these created habitat types. Compensatory mitigation areas will be considered successful when these criteria have been met for at least 3 consecutive years without intervening remedial activities:

- For each planned habitat type, herbaceous cover will be at least 90 percent of the herbaceous cover of the reference area for that habitat type. Habitat type reference areas will be established in nearby areas of undisturbed habitat similar to that planned in the mitigation areas.
- There will be at least 80 percent survival of planted trees and shrubs (including volunteers and vegetative reproduction). Species composition will be representative of species planted; and
- State-listed A and B noxious weed species will be managed to comply with current State management guidelines for Douglas County. State-listed A noxious weed species will be eradicated and in no case will State-listed B species make up more than 10 percent of vegetative cover.
- In areas designed as wetlands:
  - At least 50 percent of the species will consist of species rated as facultative or wetter, and
  - At least one primary or two secondary indicators of wetland hydrology will be present. These indicators of hydrology will be according to the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region* (Corps 2008).

6.2.1.4 Cottonwood Regeneration Areas

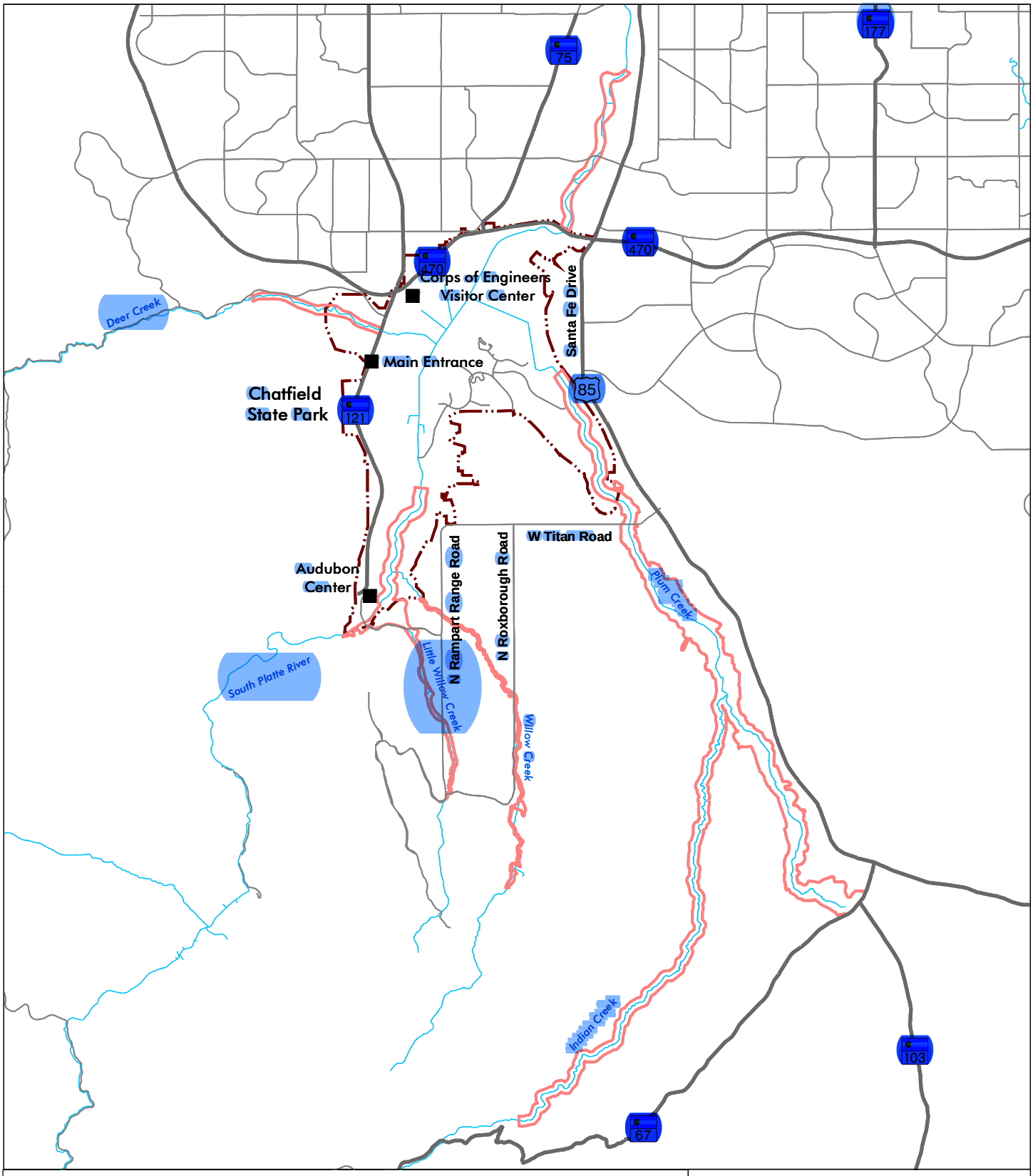
Off-site mitigation activities will also include protecting up to 22.5 acres of existing mature cottonwood habitat and designating up to 10 acres for cottonwood regeneration. Protected areas of existing mature cottonwood habitat will be as large as feasible and not less than 5 acres in size. Cottonwood regeneration areas will be created using the approach described in Section 6.1.1.3.

As with off-site target habitat, areas suitable for cottonwood preservation and regeneration were 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 existing mature cottonwood habitat that will be impacted is part of a larger habitat complex that supports a variety of bird species including several uncommon and sensitive species. This bird habitat complex has been delineated as part of the ecological functions approach (Appendix C, Section 4.3.1) and contains conditions suitable to support large stands of mature cottonwood. Because of the appropriate conditions and adequate amount of existing cottonwood habitat, mitigation activities for mature cottonwood habitat will take place within the boundaries of the mapped bird habitat complex (Figure 28).

6.2.2 Anticipated EFUs and Acreages

Based on current information and assumptions, on-site, noncritical habitat compensatory mitigation activities will generate 85 EFUs (Section 6.1.3) to partially offset the 796 permanently impacted EFUs (exclusive of impacts to Preble's EFUs in critical habitat in the Upper South Platte River CHU). This number will be refined as more information becomes available during detailed design of the on-site mitigation areas, but is not likely to be significantly lower because the size of the proposed on-site mitigation areas is estimated conservatively. The current EFU estimate is likely the minimum number that will be generated on-site because, under adaptive management (Section 7.5), additional EFU credits can be gained as habitat below the 5,444-foot elevation stabilizes over time.

If 85 EFUs is a conservative estimate of the minimum number of anticipated on-site EFUs that will be gained, then a conservative estimate of the maximum number of EFUs required from off-site activities to fully offset the 796 impacted EFUs is 711 EFUs. If more EFU credits are generated on-site, fewer are necessary off-site.



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Bird Habitat Complex Boundary

Chatfield State Park

0 5,000 10,000 Feet

1 inch = 10,000 feet

N

Figure 28
Bird Habitat Complex Targeted for Cottonwood Regeneration and Mature Cottonwood Conservation

File: 4048 - Figure 28 Bird Hab CW Regen Target.mxd (GS)
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The feasibility of generating up to 711 off-site EFUs has been determined as part of the ecological functions approach (Appendix C, Section 4.0). Using conservative assumptions, about 5,917 acres of target habitat is available on private parcels in the Plum Creek and West Plum Creek watersheds in Douglas County. Assuming that EFUs are evenly distributed throughout the 5,917 acres, an estimated 8,035 existing EFUs are potentially available for protection.

Not all private property owners would be willing to sell or enter into conservation easement agreements. Anecdotal information from three large successful mitigation efforts associated with habitat protection for federally listed species suggests that the percentage of potentially suitable habitat that could be protected through transactions with willing land owners could be as low as 15 percent of the potential properties available. An objective for a multiple-species recovery plan on the Platte River calls for the protection of about 29,000 acres of land along the Platte River that contains riparian habitat somewhat similar to that targeted along Plum Creek. Over the last 2 years, the land acquisition effort has assessed 69 parcels of suitable habitat, nine of which, or 13 percent, were purchased (Sackett, pers. comm. 2009). More of the parcels could have been purchased from willing sellers, but because of funding priorities, only the highest quality parcels were acquired. Habitat conservation plans for multiple species along the Salt and Verde rivers in Arizona committed to protecting and managing about 2,000 acres of habitat for off-site mitigation. To date, all but 150 acres have been acquired. In areas targeted for acquisition, from 10 to 50 percent of the available land has been acquired (Sommers, pers. comm. 2009).

Based on this information, for purposes of the CMP, it is assumed that 15 percent of the potential off-site target habitat acreage can be successfully protected. If 15 percent of the existing acreage and EFUs are opportunistically available on properties with owners willing to sell or enter into conservation easement agreements, 888 acres and 1,205 EFUs would be conserved. With a baseline conservation credit of 15 percent, conservation alone of the 888 acres would generate 181 EFU credits. Assuming that all available mitigation areas will have weighting factors applied for connectivity (1.25) and a medium buffer (1.5), applying weighting factors to the baseline credits would increase the mitigation credits to 317 EFUs. Figure 27 shows an example of calculating existing, baseline, and weighted EFUs for a representative parcel on Plum Creek. Finally, if habitat enhancement and conversion activities increase

existing EFUs by 20 percent on average, and if the same weighting factors are applied to the new EFUs, there would be an additional 422 EFUs. With conservation, weighting, and enhancement, off-site mitigation activities would result in an estimated minimum of 739 EFUs.

Section 6.2 and Appendix C provide information on the development and use of weighting factors. Weighting factors are a form of mitigation credits that are applied to off-site protected properties and are used to reflect the added ecological value of providing buffers for the protected property and connectivity to other protected properties. The weighting factors are in agreement with and support the CMP's guiding principles (Table 1) and the ecological priorities and stakeholder expectations for environmental mitigation (Table 2). As shown below, the weighting factors can be applied to the baseline EFUs for protecting a property and to EFUs for enhancing a protected property. When applied to both baseline protection and enhancement of a protected property the products of the weighted baseline protection and weighted enhancement are summed to arrive at the total weighed baseline protection and weighted enhancement EFUs (see below).

The following is a summary of calculations used to estimate the number of off-site EFUs potentially available for mitigation and the number of EFUs that would be gained per acre of potential target habitat (numbers have been rounded to whole numbers). In the calculations below, 15 percent (0.15) is used twice for independent calculations. As described above, it is estimated that 15 percent of the potential off-site target habitat acreage can be successfully protected. The protected habitats will receive a 15-percent conservation credit (i.e., a mitigation credit equal to 0.15 times the existing baseline EFUs):

Total of off-site target habitat ..... 5,917 acres
Total of EFUs in off-site target habitat ..... 8,035 EFUs

- Acres of target habitat and EFUs available assuming 15 percent will be on property of willing owners:

  Available Acres..... 5,917(0.15) = 888 acres
  Available EFUs..... 8,035(0.15) = 1,205 EFUs

- Number of baseline EFUs assuming 15 percent conservation credit:

  Baseline EFUs..... 1,205(0.15) = 181 EFUs

- Number of weighted baseline EFUs using assumed weighting factors of 1.25 for connectivity and 1.5 for medium buffer width:

  Weighted baseline EFUs (181 + (181(0.25)) + (181(0.5)) = 317 EFUs

- Number of weighted EFUs generated by enhancing 20 percent of the total available EFUs:

  Enhancement EFUs.....1,205(0.2) = 241

  Weighted Enhancement EFUs (241 + (241(0.25) + (241(0.5)) = 422 EFUs

- Total estimated weighted baseline and weighted enhancement off-site EFUs:

  Total estimated minimum off-site EFUs.....317 + 422 = 739 EFUs

- The amount of EFUs generated on average per acre of protected target habitat:

$$\frac{\textbf{739 EFUs}}{888 \text{ acres}} = \textbf{0.83 EFUs/acre} \qquad \frac{\textbf{888 acres}}{739 \text{ EFUs}} = \textbf{1.20 acres/EFU}$$

The estimated minimum of 739 EFU credits available off-site exceeds the estimated 711 EFUs off-site mitigation credits needed. Section 6.3.2.5 includes tables that summarize needed off-site mitigation.

The estimated maximum 711 EFUs of needed off-site mitigation include impacts to mature cottonwood woodlands. To ensure that the off-site EFUs include mitigation for impacts to mature cottonwoods, off-site mitigation for impacts to mature cottonwood will include preserving up to 22.5 acres of the existing mature cottonwood habitat and creating up to 10 acres for cottonwood regeneration. More than 200 acres of mature or nearly mature cottonwood habitat occurs in off-site target habitat. The combined 32.5 acres of off-site mitigation, along with the 13 acres of on-site mitigation, will compensate for the 42.5 acres of impacts to mature cottonwood habitat.

6.2.2.1 Uncertainties

As discussed above, the CMP conservatively assumes that at least 15 percent of the potential off-site target habitat acreage can be successfully protected. The CMP also assumes that all available mitigation areas will have weighting factors applied for connectivity (1.25) and an average buffer width of 200+ feet (1.5), and that habitat enhancement and conversion activities will increase existing EFUs by 20 percent on average. There are uncertainties in implementing the off-site mitigation. Not all private property owners targeted for land protection may be

willing to enter into agreements to protect their property or portions of their property at a fair market price. The lands that are protected may not on average provide the needed connectivity, buffers, and habitat enhancement potential that would increase the EFUs beyond the baseline protection credit. As further discussed in Section 7.5 Adaptive Management, these circumstances would require the protection of additional private lands, which might require expanding the geographic scope of private lands considered for protection (Figure 25) and could add to the estimated off-site mitigation costs because additional properties would need to be protected.

6.3 Mitigation for Impacts to Preble's Designated Critical Habitat

Critical habitat has been designated on the South Platte River and Plum Creek arms of Chatfield Reservoir (75 Fed. Reg. 78430 (December 15, 2010)). Up to 80 acres and 1.3 stream miles of Preble's designated critical habitat will be inundated on the South Platte River arm and up to 75.2 acres and 2.8 stream miles of designated critical habitat will be inundated on the Plum Creek arm. 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.

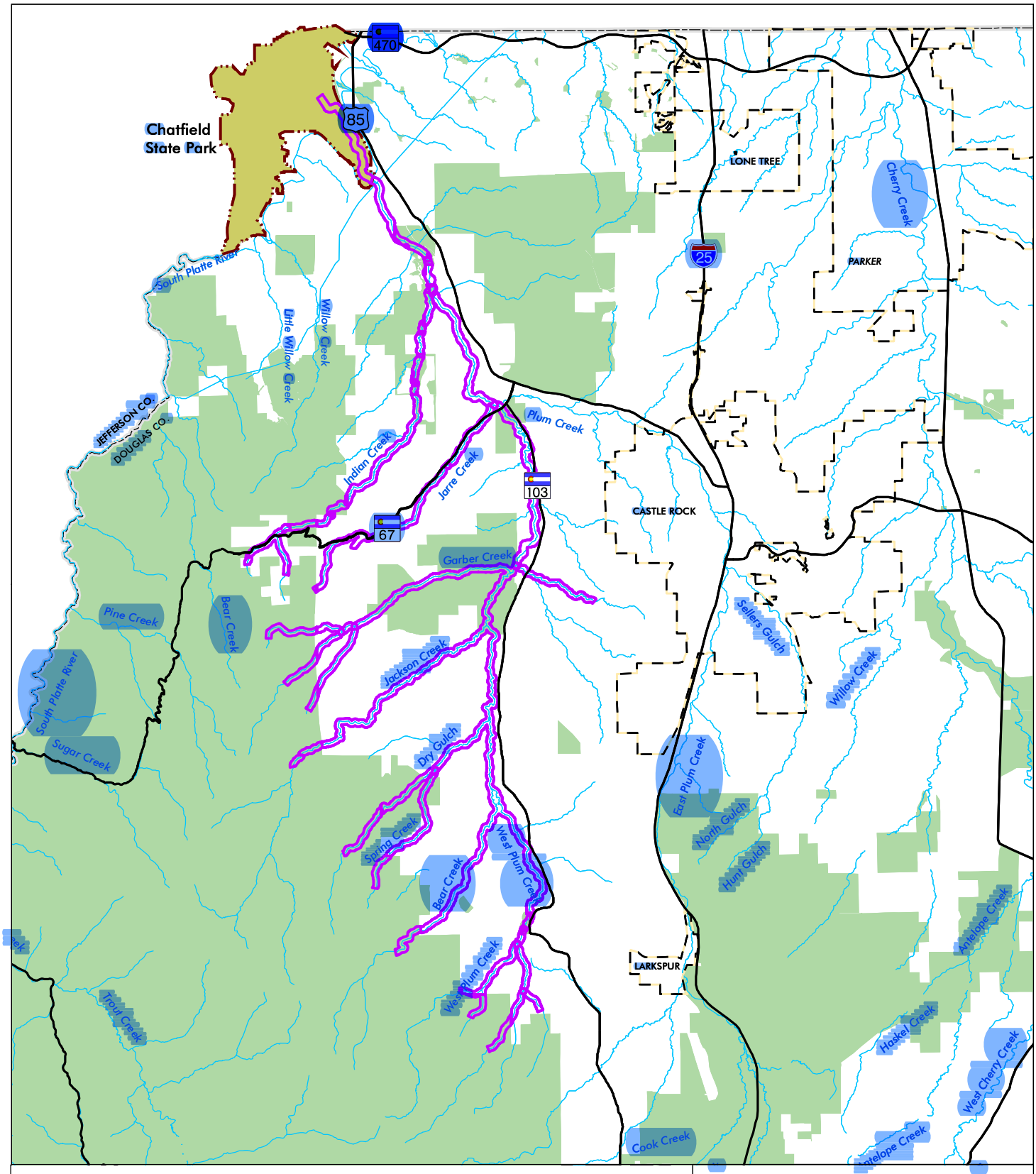
The development of mitigation for impacts to designated critical habitat for Preble's used the following approach:

1. All mitigation for impacts to critical habitat will occur within the same CHU in which the impacts occur (Service 2004).
2. The mitigation must be demonstrated to be cost effective and efficient in producing the needed ecological functions for replacement of the functions lost.
3. Mitigation for impacts to critical habitat will be maximized to the degree practicable within Chatfield State Park before developing off-site mitigation.
4. Once the on-site mitigation has been maximized, off-site alternatives for mitigation will be evaluated and screened to determine the practicable alternatives that have the greatest opportunity to benefit the CHU and provide the greatest ecological benefit for the cost of the measures.
5. Potential mitigation sites were eliminated from further consideration if the effects for which mitigation would be provided were caused by the discrete actions of others and, therefore, are the responsibility of these actors to provide mitigation.
6. The proposed mitigation is acceptable to the agencies and stakeholders.
7. The mitigation will avoid jeopardy to the subspecies and adverse modification of its critical habitat.

With the exception of the South Platte River arm of Chatfield Reservoir, the Upper South Platte CHU occurs on the Pike National Forest (Figure 30). 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. As discussed below, the off-site critical habitat mitigation for impacts to the Upper South Platte CHU 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. Therefore, the ecological functions approach and EFUs are not an appropriate approach to determine impacts and mitigation in the montane environment of the Pike National Forest. Because most of the mitigation for impacts to critical habitat in the Upper South Platte CHU will occur within the montane environment of the Pike National Forest, impacts and mitigation for designated critical habitat in the Upper South Platte CHU will be expressed in stream miles and not in EFUs.

Mitigation of up to 75.2 acres and 65 Preble's EFUs 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 Plum Creek arm of the reservoir. The remainder of the mitigation for impacts to the Plum Creek critical habitat would be compensated through off-site mitigation within the West Plum Creek CHU as described in Section 6.2. The West Plum Creek CHU (Figure 29) covers generally the same area as the area for the primary target off-site mitigation area (Figure 26).

The required mitigation for impacts to Preble's will be determined through the Section 7 consultation process between the Corps and the Service. A Biological Assessment addressing ESA compliance has been prepared by the Corps as part of the FR/EIS (Appendix V of FR/EIS). The Service will prepare its Biological Opinion for the final FR/EIS. The Biological Opinion will include conservation measures (mitigation) that address adverse impacts to Preble's and its designated critical habitat. The following proposed mitigation for impacts to critical habitat has been discussed with the Service and was included in the Biological Assessment submitted to the Service for concurrence.



Chatfield Reallocation Study

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

Unshaded areas are unprotected lands in Douglas County

0 9,000 18,000 Feet

1 inch = 18,000 feet

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Figure 29
West Plum Creek Critical Habitat Unit for Preble's

File: 4048 - Figure 29 West Plum Creek CH.mxd (WH)
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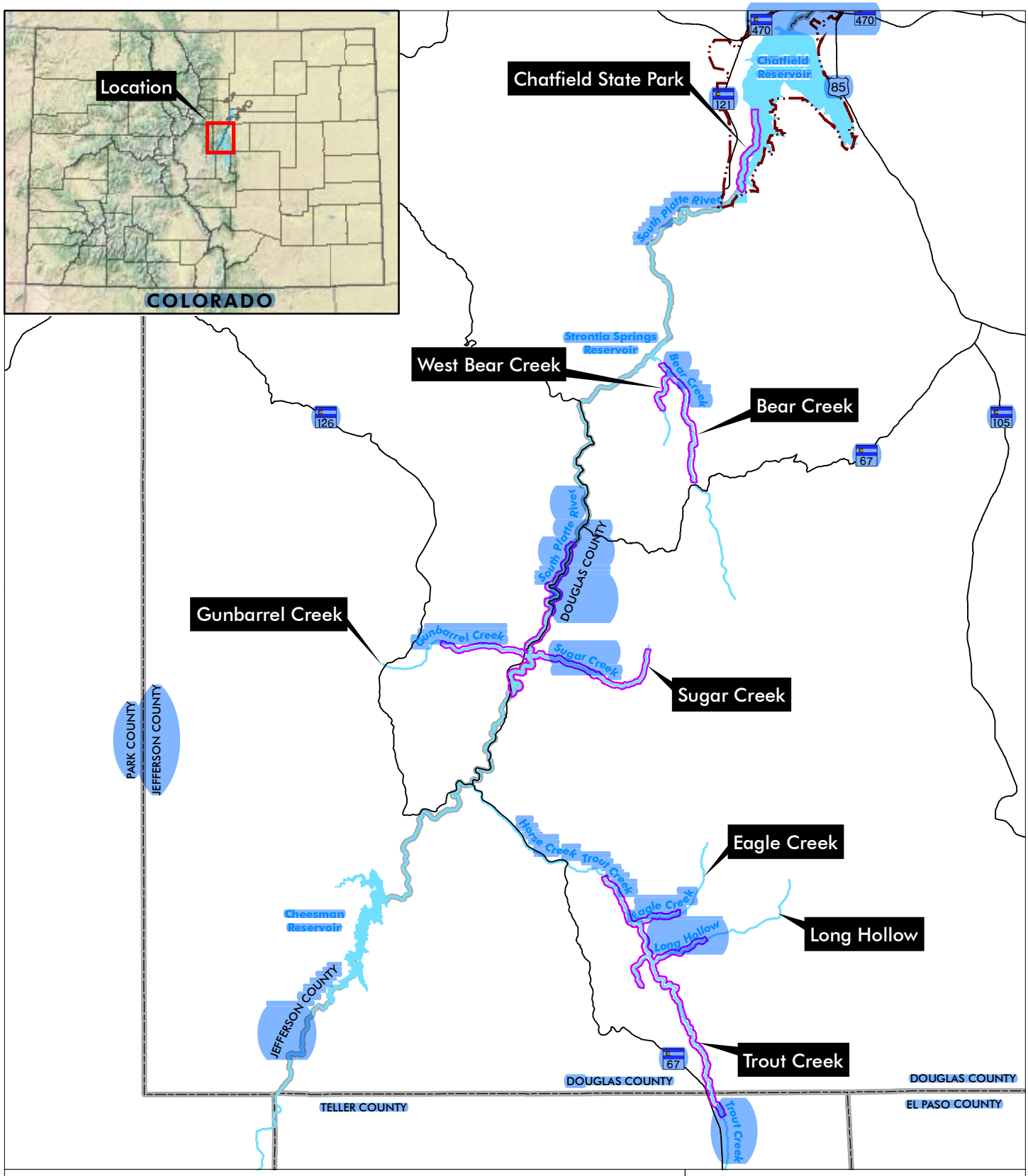

Chatfield Reallocation Study

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

0 10,000 20,000 feet

1 inch = 20,000 feet

N

Figure 30
Upper South Platte River
Critical Habitat Unit for Preble's

File: 4048 - Figure 30 UPSPR CH.mxd (WH)
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6.3.1 On-Site Critical Habitat Mitigation

The amount of mitigation for impacts to designated critical habitat for Preble's will be maximized within the designated critical habitat within Chatfield State Park to the degree practicable within each of the respective CHUs where the impacts occur. The types of on-site mitigation activities proposed for Preble's critical habitat are the same as those described for on-site noncritical habitat (Section 6.1.1).

6.3.1.1 Proposed Activities

Nine on-site compensatory mitigation areas overlap with critical habitat. Mitigation areas SPR-2, SPR-3, SPR-4, SPR-5, and SPR-7 occur within the Upper South Platte CHU (Figure 14 and Figure 15) and mitigation areas PC-1, PC-2, PC-4, and PC-9 occur within the West Plum Creek CHU (Figure 10, Figure 11, and Figure 12). Mitigation activities in these areas would result in about 23 acres of enhanced critical habitat (Table 4).

Table 4. On-Site Critical Habitat Mitigation Areas.

Mitigation Area	Acres
SPR-2	2.50
SPR-3	3.23
SPR-4	2.49
SPR-5	1.77
SPR-7	7.09
PC-1	2.77
PC-2	1.74
PC-4	1.29
PC-9	0.03
TOTAL	22.91

Because they are subareas of on-site mitigation areas for noncritical habitat and would be constructed at the same time, the preconstruction activities and success criteria described for on-site noncritical habitat will be the same for the on-site critical habitat mitigation areas (Section 6.1.1.1). Similarly, the costs for the critical habitat portion of the mitigation areas have not been estimated separately, but are included in the estimated on-site, noncritical habitat mitigation area costs (Table 3).

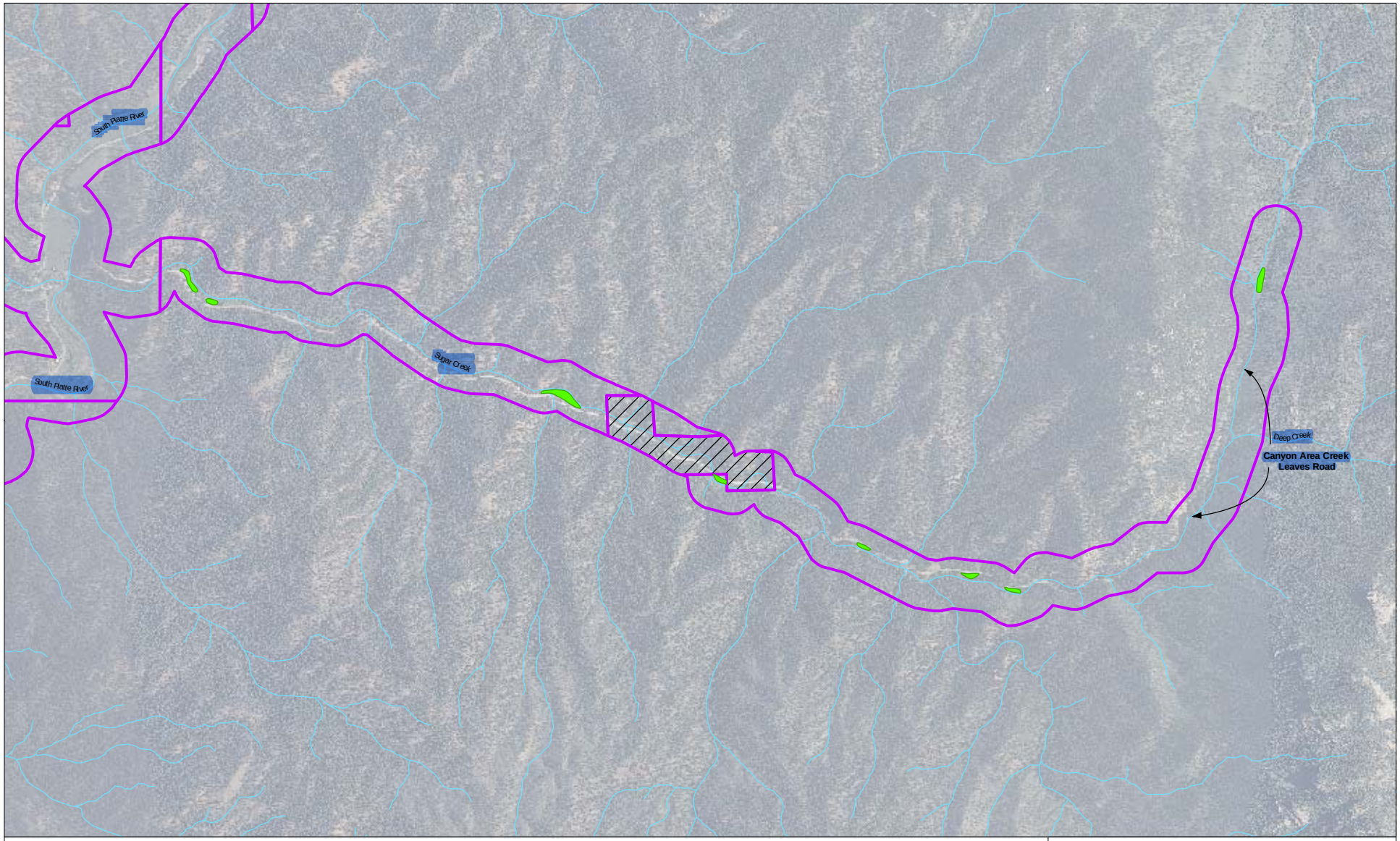
There may be additional opportunities to enhance critical habitat with noxious weed control or shrub plantings. Those opportunities and the amount of mitigation credit they would generate will be further evaluated in consultation with the Service between receipt of comments on the draft FR/EIS and the final decision documents.

6.3.2 Off-Site Critical Habitat Mitigation

The remaining mitigation for impacts to designated critical habitat for Preble's will occur off-site within the Upper South Platte CHU that occurs within the Pike National Forest (Figure 30) and the West Plum Creek CHU upstream of Chatfield Reservoir (Figure 29). The mitigation activities in the Upper South Platte CHU are based on a review of designated critical habitat of Preble's within the Pike National Forest (Appendix H) and have been coordinated with the U.S. Forest Service (USFS) and the Service (ERO, pers. comm. 2009).

6.3.2.1 *Proposed Activities – Upper South Platte CHU*

The Upper South Platte CHU within the Pike National Forest is distributed over eight drainage segments and includes about 3,298 acres and 36.5 stream miles (Figure 30 and Figure 31). The entire CHU was reviewed to determine the potential for enhancing, restoring, or creating habitat for Preble's, and, for the sites potentially suitable for mitigation, the feasibility (relative costs, logistics, and habitat gains) of implementing mitigation was determined (Table 5 and Appendix H). Potential mitigation sites were eliminated from further consideration if the effects for which mitigation would be provided were caused by the discrete actions of others and, therefore, are the responsibility of these actors to provide mitigation. The drainage segments designated as critical habitat were screened to determine which sites had the greatest potential to provide suitable mitigation for impacts to designated critical habitat and where mitigation could be feasibly implemented. Although the designated critical habitat within the Pike National Forest is extensive, opportunities for habitat enhancement, restoration, and creation are limited in most drainages by existing high quality habitat, steep topography, and poor access.



Chatfield Reallocation Study

- Preble's Critical Habitat
- Potential Mitigation Area
- Private Land
- River or Stream

Image Source: USDA NAIP 2009

0 1,000 2,000 feet

1 inch = 2,000 feet

N

Figure 31
Potential Preble's Critical Habitat Mitigation, Sugar Creek, Pike National Forest

File: 4048 Fig 31 Pot CH Mit sugarcreek.mxd (WH)
February 2013

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Table 5. Drainages within the Upper South Platte CHU Evaluated for Mitigation.

Site Evaluated	Opportunities	Constraints	Determination
Trout Creek	Localized areas of erosion associated with past fires and the decomposed granitic soils have fed tributaries which have deposited sediments that encroach into the riparian zone of Trout Creek. These sediments could potentially be removed, allowing a gain in the riparian communities and Preble's habitat. Historically there has been some channel downcutting and erosion in the very upper reach of Trout Creek in Teller County. However, the steep eroded banks and point bars formed from the eroded banks are now well vegetated.	Existing high quality habitat. The one reach with some mitigation potential (above Rainbow Falls Park North) has constructability issues because it lacks suitable access to bring in equipment to remove sediment from the riparian zone. The steep west-facing slopes in this reach would also present challenges to securely storing the removed sediment and ensuring sediments would not be redeposited in the riparian habitat and stream in the future.	No mitigation activities are proposed for Trout Creek due to the lack of feasible opportunities and access.
Long Hollow	Opportunities for mitigation are limited by narrow riparian corridors in a steep canyon, current high quality of the habitat that is present with little potential to expand habitat due to steep narrow canyon.	Limited access, existing high quality of habitat, and steep topography limit the opportunities for mitigation.	No mitigation activities are proposed for Long Hollow or the unnamed tributary due to lack of opportunities and access.
Eagle Creek	Opportunities for mitigation are limited by narrow riparian corridors in a steep canyon, current high quality of the habitat that is present with little potential to expand habitat due to steep narrow canyon.	Limited access, existing high quality of habitat, and steep topography limit the opportunities for conservation.	No activities are proposed for Eagle Creek due to lack of opportunities and access.
Sugar Creek	Sediment from Highway 67 affects most of the critical habitat portions of Sugar Creek. Sediment from Highway 67 fills the channel and buries portions of the riparian zone, which degrades the quality and quantity of Preble's habitat. Historically, pullouts between Highway 67 and Sugar Creek destroyed vegetation and further	Short reaches of Sugar Creek do not occur adjacent to Highway 67 and are narrow and canyon-like, which limit access and opportunities for improvements to stream and riparian habitats. The USFS and Douglas County are currently developing plans to minimize the sediment input into Sugar Creek, but there is no funding to implement	Sugar Creek provides the most feasible site for mitigation within the Upper South Platte CHU and would provide the greatest benefits relative to mitigation cost. The mitigation would need to be integrated with the plans and efforts of the USFS and Douglas County. The Chatfield Water Providers would fund the work that occurs within the

Site Evaluated	Opportunities	Constraints	Determination
	exacerbated erosion. These situations present opportunities to improve and expand the riparian habitats along Sugar Creek. Highway 67 provides the needed access to Sugar Creek to construct the facilities needed to implement the mitigation.	the Plans. Mitigation activities need to be above and beyond activities that would be undertaken by others.	critical habitat reach. This could be done separately by the Chatfield Water Providers or as part of an integrated project with the USFS and Douglas County.
Gunbarrel Creek	Limited mitigation opportunities occur in a couple of short reaches that are less confined by topography where excavation and planting next to the riparian corridor could expand the riparian corridor.	Access is limited to foot or pack animal traffic. It would not be feasible to get earthmoving equipment to potential mitigation sites.	No mitigation activities are proposed for Gunbarrel Creek due to the lack of feasible opportunities and access.
South Platte River	There are a few areas where sediment has accumulated and is elevated to a degree that inhibits the growth of riparian vegetation, primarily coyote willow. These sediments could be excavated to the elevation of adjacent riparian vegetation and planted with coyote willow (plants or stakes).	Areas that could benefit from mitigation activities are limited and most occur on the side of the river away from the road; therefore, earthmoving equipment would need to cross the river. Excavated sediment would need to be hauled away, which could be challenging for sites not adjacent to the road. Because of these constraints, excavation and sediment removal would be expensive. Sediment could accumulate again due to upstream inputs from burn areas.	Activities on the South Platte River could be combined with other mitigation activities in the Upper South Platte CHU, but on their own would not provide enough conservation.
Bear Creek	Some mitigation opportunities occur in upper Bear Creek where the growth and distribution of upland shrubs adjacent to the riparian corridor, particularly Gambel's oak, could potentially be improved by removing or thinning the overstory trees. These opportunities occur in scattered locations from the upper limit of critical habitat to where the steep canyon begins about 1 mile downstream.	Limited opportunities, high quality existing habitat, steep terrain, and limited access greatly limit any mitigation activities on Bear Creek and would make any such activities expensive relative to benefits gained.	No mitigation activities are proposed for Bear Creek due to limited opportunities, high quality existing habitat, steep terrain, and limited access

Site Evaluated	Opportunities	Constraints	Determination
West Bear Creek	Opportunities for mitigation are limited by narrow riparian corridors in a steep canyon, current high quality of the habitat that is present with little potential to expand habitat due to steep narrow canyon.	High quality existing habitat, narrow riparian corridor, steep terrain, and limited access greatly limit any feasible mitigation activities on West Bear Creek and would make any such activities expensive relative to benefits gained.	No mitigation activities are proposed for West Bear Creek due to high quality existing habitat, narrow riparian corridor, steep terrain, and limited access

Based on the review of all of the drainages within the Upper South Platte CHU, two options for mitigation became apparent: 1) provide the mitigation at multiple sites within multiple drainages, or 2) provide all of the mitigation at the Sugar Creek site. Providing the mitigation at multiple sites would have had increased risk and been more expensive than the Sugar Creek option because of limited and challenging access for equipment, scattered small sites suitable for mitigation, and the potential inability to control forces that created the problems on which the mitigation would focus (e.g., erosion in the watershed associated with past large-scale fires). It was determined that the most feasible opportunities for habitat restoration and enhancement occur on Sugar Creek, which encompasses about 381 acres and 4.5 stream miles. Based on live trapping surveys performed by the USFS, Preble's is known to inhabit the critical habitat reach of Sugar Creek. The Service's designation of critical habitat was limited to stream reaches known or believed to be occupied by Preble's (68 Fed. Reg. 37301 (June 23, 2003)).

Sediment from Highway 67, the adjoining decomposed granite slopes, and forest fires in the watershed have overwhelmed the capacity of Sugar Creek to move the sediment through the stream environment. Sediment from Highway 67, which parallels Sugar Creek, affects most of the critical habitat portions of Sugar Creek. This sediment fills the channel and buries portions of the riparian zone, which degrades the quality and quantity of Preble's habitat. Historically, pullouts between Highway 67 and Sugar Creek destroyed vegetation and further exacerbated erosion. Most of these pullouts have now been fenced off by the USFS. These adverse situations present opportunities to improve and expand the riparian habitats along Sugar Creek.

The stream and riparian habitats within the critical habitat reach of Sugar Creek would be improved by:

- Better defining the streamside road edge of Highway 67 to minimize the continued introduction of sediment into the riparian and aquatic habitats;

- Constructing sediment traps to control sediment before it reaches the riparian zone and creek;
- Revising the drainage to maximize the control of stormwater runoff on the off-stream channel side of Highway 67 including properly sized culverts and channels to route stormwater flows; and
- Reshaping the tilt of the Highway 67 roadbed to drain away from Sugar Creek.

Additionally, several opportunities occur in the critical habitat reach to expand the riparian corridor. The riparian corridor can be expanded into the historical pullouts along Sugar Creek previously described. On the downstream end of each of the pullouts, a cutoff or drop structure would be created (see Section 6.1 for a description of cutoff structures). The structure would slow and spread surface and ground water upstream of the structure. As ground water levels rise and spread, a supportive hydrologic regime for an expanded riparian corridor would occur in the fenced-off pullout area. The expansion of the woody riparian vegetation into the pullouts would be assisted by planting shrubs native to the Sugar Creek riparian corridor. Planting would occur once a supportive hydrologic regime was established.

The shallow pools that would form behind the structures help capture sediment that is currently mobile within the Sugar Creek system. As these pools fill with sediment, they will be colonized by riparian vegetation, further expanding the riparian habitat.

Because of the systemic environmental factors discussed above that have led to Sugar Creek and its riparian habitats being overwhelmed with sediment, the USFS and Douglas County have investigated what could be done at Sugar Creek to control sediment inputs to Sugar Creek and improve the aquatic and riparian habitats. A plan was developed to address sediment issues along Sugar Creek (CH2M Hill 2009). The USFS and Douglas County have implemented some minor components of this plan, but there is no funding in place to comprehensively implement the Sugar Creek Sediment Mitigation Project. To mitigate for impacts to critical habitat associated with reallocation, the Chatfield Water Providers would fund implementation of the Sugar Creek Sediment Mitigation Project within the critical habitat reach of Sugar Creek (Station 00+0 to Station 240+50). The Chatfield Water Providers would enter into an agreement with the USFS and Douglas County addressing the measures to be implemented, the schedule for implementation and the funding required to implement the sediment control and reduction measures (Appendix E). The USFS and Douglas County will need to agree that the sediment

reduction and control measures to be implemented are consistent with the Sugar Creek Sediment Mitigation Project and that they are the measures necessary to substantially minimize the sediment inputs to the critical habitat reach of Sugar Creek. In addition to the sediment control measures, the Chatfield Water Providers agree to expand riparian habitat at several locations (Figure 33). The riparian expansion will consist of the following at the historical pullouts:

- Construction of a drop structure that mimics a beaver dam at the lower end of the historical pullouts combined in some instances with excavation of the pullout area;
- Monitoring ground water level rise; and
- Planting native woody riparian vegetation in areas of elevated ground water levels.

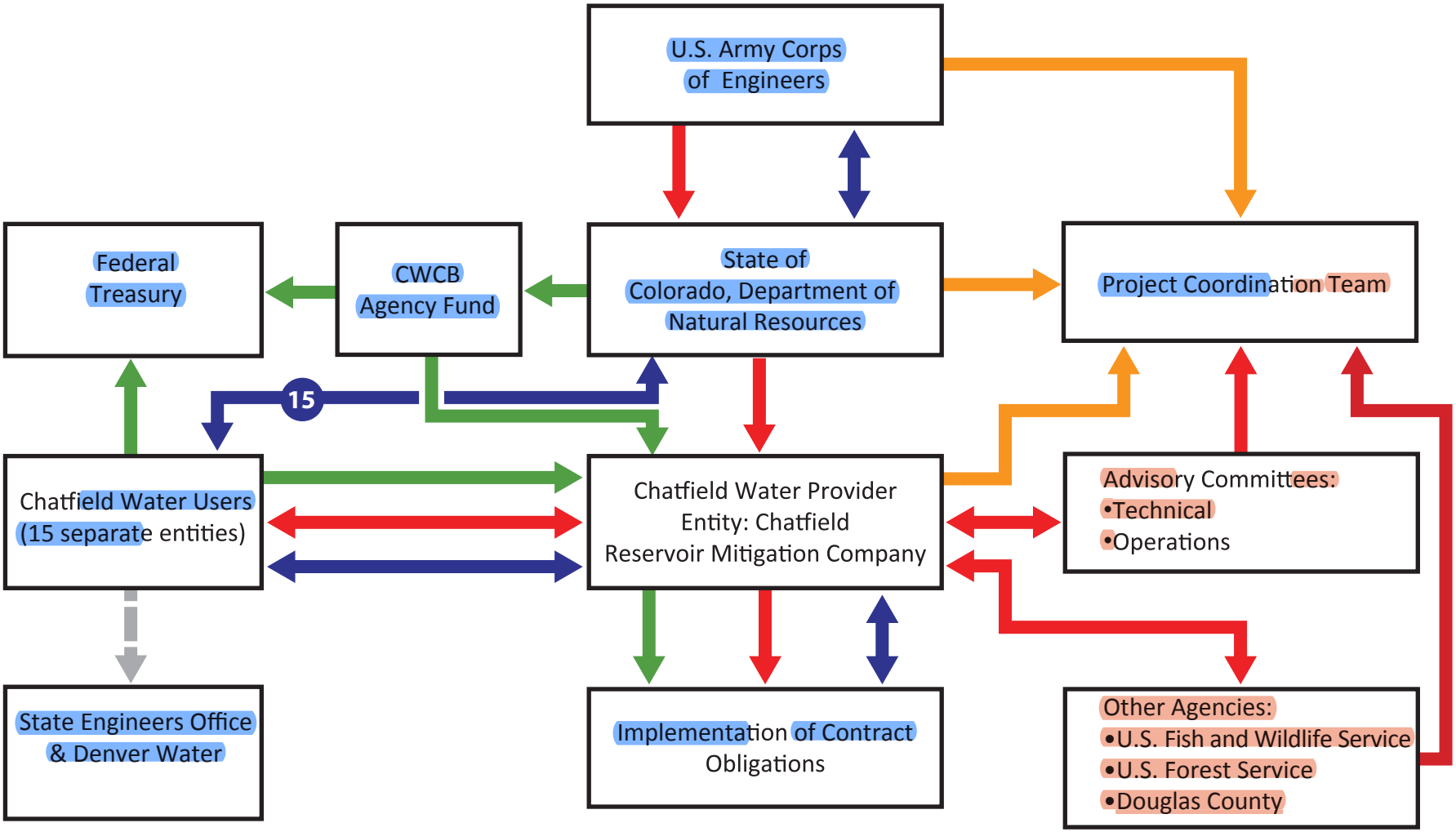
There is agreement among the Chatfield Water Providers, Douglas County, and the USFS on how the mitigation activities will proceed on USFS lands (Appendix E). The mitigation activities in the Upper South Platte CHU are in addition to any Douglas County and/or USFS management responsibilities and/or funded programs (i.e., these activities would not occur without the proposed compensatory mitigation). Upon approval of the Federally Recommended Plan, preliminary plans will be prepared and submitted for Corps' approval prior to the development of final design documents. This process is described in Section 7.1.

6.3.2.2 Anticipated Benefits – Upper South Platte CHU

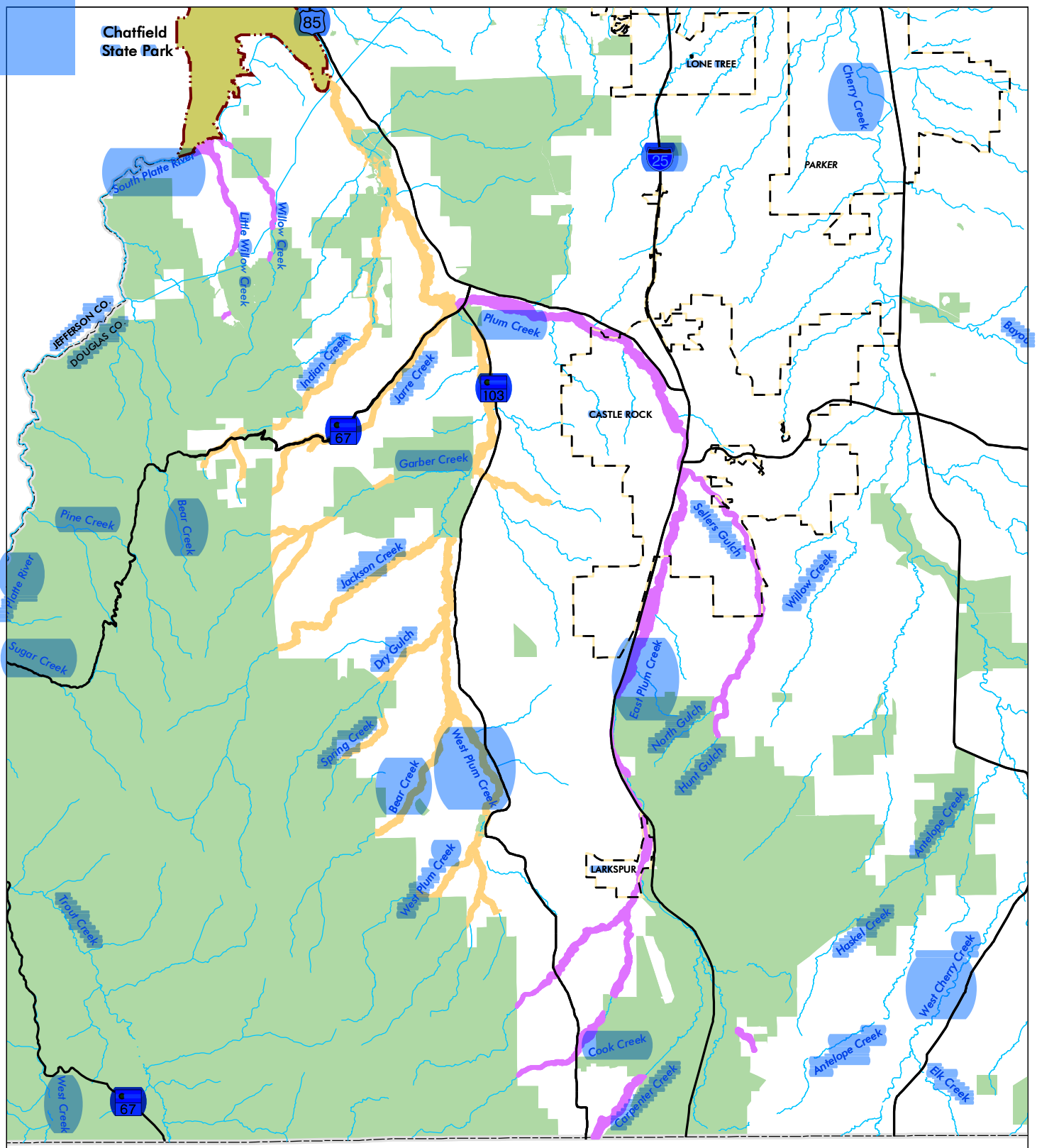
The sediment impacts to Sugar Creek and its riparian habitats are pervasive and implementation of the Sugar Creek Sediment Mitigation Project will benefit the entire 4.5-mile reach of Preble's critical habitat by returning Sugar Creek to a functioning aquatic and riparian ecosystem. The sediment mitigation needs to be implemented systematically throughout the critical habitat reach to minimize the systemic problem of sediment from the road, adjoining cut slopes and watershed. Implementation of sediment control measures on a portion of the creek and road reach would not solve the problem. The Sugar Creek Sediment Mitigation Project directly addresses the maintenance of dynamic geomorphological processes and systems, which is one of the primary constituent elements of the designated critical habitat for Preble's (68 Fed. Reg. 37301 (June 23, 2003)). These processes are described as those that create and maintain river and stream channels, floodplains and floodplain benches, and promote patterns of vegetation favorable to Preble's. Controlling and removing sediment will prevent and reverse the burying of riparian vegetation by sediment and the associated rise of the floodplain above the water table, which will in turn support and promote patterns of vegetation favorable to Preble's.

Figure 32.

Chatfield Reservoir Reallocation Project
Proposed Implementation Organizational Chart *



* The U.S. Army Corps of Engineers continues to have discussions with the State and the Chatfield Water Providers to further refine the legal relationship between the entities



Chatfield Reallocation Study

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

0 9,000 18,000 Feet

1 inch = 18,000 feet

N

Figure 33
Potential Areas of Expanded Off-Site Target Habitat

File: 4048 - Figure 33 Expanded Off-Site Target.mxd (GS)
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The off–site critical habitat mitigation focuses on stream miles rather than EFUs or acres. This is because the EFUs were developed for a plains environment (Appendix C) and the off-site critical habitat mitigation will need to occur in a montane environment (i.e., the remainder of the Upper South Platte CHU occurs outside of Chatfield State Park in a montane environment). Stream miles are an appropriate unit to measure impacts and mitigation for Preble's critical habitat because Preble's is a riparian species and off-site mitigation will be applied to Sugar Creek's riparian system. For example, the working draft of the Recovery Plan for Preble's (Service 2003) describes the required amounts of habitat for recovery in terms of stream miles and not acres. This approach is consistent with Preble's habitat measures described for recovery.

6.3.2.3 Success Criteria

The off-site critical habitat mitigation within the critical habitat along Sugar Creek will be considered successful when the following occur:

- All of the mitigation activities agreed upon (Appendix E) have been fully implemented;
- All funds for operations and maintenance have been provided; and
- All riparian plantings (including volunteers and vegetative reproduction) have at least 80 percent survival.

The Sugar Creek critical habitat mitigation area will be monitored annually for at least 5 years following implementation of the mitigation activities and reported annually (Section 7.4.1).

6.3.2.4 Proposed Activities – West Plum Creek CHU

The West Plum Creek CHU occurs within and upstream of Chatfield Reservoir State Park and consists of about 90 stream miles and 5,518 acres (75 Fed. Reg. 78451 (December 15, 2010)). The proposed off-site mitigation for impacts to designated Preble's critical habitat in the Plum Creek arm will be the same as those described previously in Section 6.2.

6.3.2.5 Anticipated Benefits – West Plum Creek CHU

The off-site mitigation proposed to occur in the target habitat area (Figure 26) will complement the purposes of the proposed critical habitat designation. The location of the West Plum Creek CHU was proposed to address the large recovery population for Preble's identified for this watershed by the working draft of the Preble's Recovery Plan (74 Fed. Reg. 52081 (October 8, 2009)). The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Critical habitat does

receive protection under Section 7(a)(2) of the Endangered Species Act through the prohibition against federal agencies carrying out, funding, or authorizing the destruction or adverse modification of critical habitat (74 Fed. Reg. 52071 (October 8, 2009)). Therefore, unless there is a federal action, the designation of critical habitat affords no habitat protection on private lands. The permanent protection of private lands within the West Plum Creek CHU is consistent with the designation as the protected lands would support the recovery of Preble's and afford protection of critical habitat on private lands not provided by the designation of critical habitat.

6.3.2.6 Success Criteria

The off-site critical habitat mitigation within the West Plum Creek CHU will be determined to be successful when the habitat has been permanently protected and enhanced habitat meets the criteria listed in Section 6.2.1.3.

6.4 Summary

Proposed mitigation activities range from on- and off-site conversion of one habitat type to another, to off-site conservation of target habitat, to sediment and erosion control and habitat improvements in Preble's critical habitat. The proposed activities will compensate for impacts to ecological functions that result from reallocation activities. The activities are based on construction techniques and conservation strategies that have been effectively used for other projects in the region (Sections 6.1.1, 6.2.1, and 6.2.2; Figure 3 through Figure 6).

Impacts and mitigation associated with noncritical habitat and with Preble's West Plum Creek critical habitat are tracked using the number of functional units (EFUs) for each target environmental resource. Impacts and mitigation associated with critical habitat mitigation in the Upper South Platte CHU are tracked using acres and stream miles. A total of 1,180 EFUs are estimated to be impacted by the project consisting of 775 EFUs in permanent impacts from inundation, 21 EFUs in permanent impacts from recreation facility modifications, and 384 EFUs in temporary impacts from activities associated with construction of modifications to utilities, roads, and recreation facilities.

Table 6 through Table 10 summarize impacts and proposed mitigation for comparison. Table 6 organizes by target environmental resource the impacts and proposed mitigation associated with the effects of inundation on critical and noncritical habitat. Table 7 organizes by target environmental resource the impacts and mitigation associated with the effects of relocating

recreation facilities, including borrow and fill activities and permanent facilities above and below 5,444 feet. Relocating the recreation facilities is estimated to permanently impact 21 EFUs. Table 8 provides the total number of EFUs impacted by inundation and recreation facility relocation, and the estimated number of EFUs anticipated to result from on- and off-site mitigation activities. Table 9 summarizes the acres of permanent and temporary impacts anticipated. Table 10 itemizes acres of on-site mitigation for each proposed habitat type in critical and noncritical habitat. The proposed on-site mitigation would focus on replacing upland grasslands with shrub and forested habitat. Of note, quantities in Tables 6 through 10 have been rounded to the nearest whole number, which may result in minor differences from quantities presented elsewhere in the FR/EIS.