



Partnering for Progress

US 50 Corridor East



COLORADO
Department of
Transportation

US 50 Corridor East Tier 1 Final Environmental Impact Statement and Record of Decision

Natural Resources Mitigation Strategies Plan

December 2017

Table of Contents

Chapter	Pages
1. Introduction	1
1.1. Project Background	1
1.2. Agency Working Group	2
1.3. Build Alternatives.....	3
1.4. Natural Resource Setting	5
1.5. Natural Resource Impacts.....	7
1.6. Natural Resource Mitigation Goals	8
2. Natural Resource Mitigation Strategies	10
2.1. General Mitigation Strategies	12
2.2. Mitigation Banking Strategies.....	16
2.3. Early Mitigation Strategies	18
2.4. Partnering Opportunities.....	20
3. Implementation.....	22
3.1. Implementation Step 1—Develop mitigation goals for each major habitat type	24
3.2. Implementation Step 2—Pursue broader mitigation goals and partnering opportunities	24
3.3. Implementation Step 3—Update information to ensure appropriate mitigation	24
3.4. Implementation Step 4—Develop criteria for a mitigation bank	24
3.5. Implementation Step 5—Identify and pursue opportunities for cumulative impact mitigation	24
3.6. Implementation Step 6—Conduct adaptive management	25
4. References	26

Tables

Table 1-1. Potential Impacts to Critical Habitat Types in the US 50 Project Area	8
Table 1-2. Special-Status Species with a Higher Likelihood of Being Impacted by the Build Alternatives	8

Figures

Figure 1-1. US 50 from Pueblo, Colorado, to the Kansas State Line	1
Figure 1-2. US 50 Tier 1 EIS Project Area	2
Figure 1-3. Build Alternatives	4
Figure 1-4. Sand Sage Habitat Prowers County	5
Figure 1-5. Impact Calculation Example	7
Figure 1-6. Spatial Scales of Biological Organization	9
Figure 2-1. Hierarchy of US 50 Tier 1 EIS Mitigation Strategies	11
Figure 2-2. Burrowing Owl	13
Figure 3-1. Implementing the Natural Resource Mitigation Goals and Strategies	23

1. Introduction

This document provides goals and strategies for natural resource mitigation of impacts by the US 50 Tier 1 Environmental Impact Statement (EIS) Build Alternatives. After approval, these goals and mitigation strategies will remain in effect until officially revised or rescinded by the US 50 Agency Working Group. While these mitigation strategies are tied to the roadway improvements, they also provide a framework for future, collaborative planning efforts by key stakeholders for natural resource related issues in the Lower Arkansas River Valley. The following sections provide:

- Project background
- A summary of projected natural resource impacts
- Natural resource mitigation goals
- Mitigation strategies to accomplish these goals
- Guidance on how the implementation of mitigation goals and strategies may be accomplished

1.1. Project Background

The US 50 Corridor East Tier 1 EIS (US 50 Tier 1 EIS) was initiated by the Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA). The purpose of the Tier 1 EIS is to provide, within the framework of the National Environmental Policy Act (NEPA), a corridor location decision (not a roadway alignment decision) for U.S. Highway 50 (US 50) from Pueblo to the vicinity of the Colorado-Kansas state line (see Figure 1-1) that CDOT and communities along the US 50 corridor can use to plan and program future improvements, preserve right of way, pursue funding opportunities, and allow for resource planning efforts. The US 50 Tier 1 EIS officially began in January 2006 when the Notice of Intent was published in the *Federal Register*.



Figure 1-1. US 50 from Pueblo, Colorado, to the Kansas State Line

The remainder of this section provides additional background about the US 50 Tier 1 EIS, including the project area, the Agency Working Group, the Build Alternatives, estimated natural resource impacts, and goals for the project's mitigation activities.

1.1.1. US 50 Project Area

The project area for the US 50 Tier 1 EIS has been defined as one to four miles wide surrounding the existing US 50 facility and extending from Pueblo, Colorado, at I-25 to the Colorado-Kansas state line (see Figure 1-2). The project area encompasses the study area limits, which is where the Tier 1 corridor alternatives considered by this project would be located. The study area is 1,000 feet wide centered on the corridor alternatives, beginning on or near the existing US 50 at I-25 in Pueblo, Colorado, and extending to just east of Holly, Colorado, in the vicinity of the Colorado-Kansas state line.

The project area traverses nine municipalities and four counties in southeastern Colorado, including Pueblo County, Otero County, Bent County, Prowers County, the city of Pueblo, the town of Fowler, the town of Manzanola, the city of Rocky Ford, the town of Swink, the city of La Junta, the city of Las Animas, the town of Granada, and the town of Holly. The project area does not include the city of Lamar.

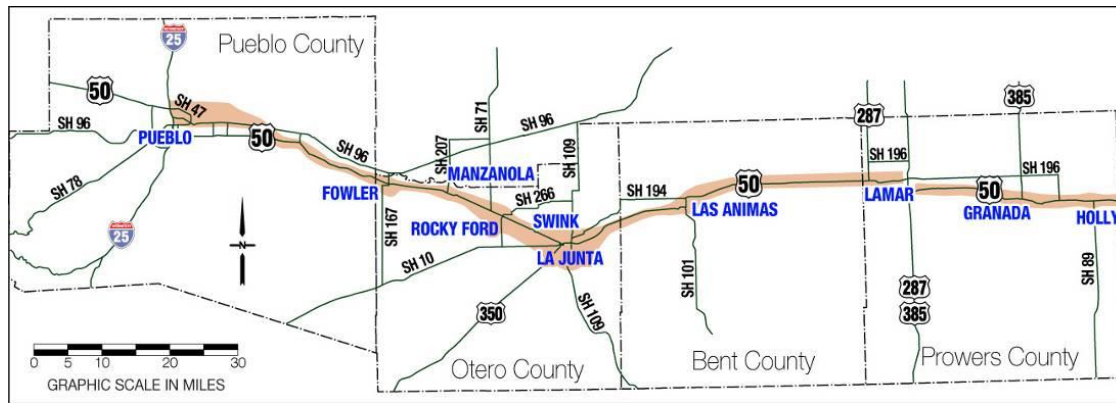


Figure 1-2. US 50 Tier 1 EIS Project Area

A separate Environmental Assessment (EA), the *US 287 at Lamar Reliever Route Environmental Assessment*, includes both US 50 and US 287 in this area, since they share the same alignment. The Finding of No Significant Impact (FONSI) for the project was signed November 10, 2014. The EA/FONSI identified a proposed action that bypasses the city of Lamar to the east. The proposed action of the *US 287 at Lamar Reliever Route Environmental Assessment* begins at the southern end of US 287 near County Road (CR) C-C and extends nine miles to State Highway (SH) 196. Therefore, alternatives at Lamar are not considered in this US 50 Tier 1 EIS.

This project area was approved by the lead agencies and other project stakeholders during US 50 Tier 1 EIS scoping activities.

1.2. Agency Working Group

The Agency Working Group was formed in September 2005 to help coordinate decision making on resources issues and to provide input in the form of technical expertise on resources within each participating agency's legal or regulatory jurisdiction. The goal of this interagency process was to deliver a Tier 1 EIS that meets the purpose and need of the project, includes sound decisions, addresses the concerns of participating agencies, and meets the regulatory requirements of those agencies. Agency representatives signed an Agency Charter Agreement that signified their interest in participating in this interagency process. The agencies that signed the charter became members of the Agency Working Group, and they are listed below.

- Colorado Department of Transportation
- Federal Highway Administration
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- Colorado State Historic Preservation Officer
- U.S. Forest Service
- Natural Resources Conservation Service
- Colorado Parks and Wildlife (formerly Colorado Division of Wildlife and Colorado State Parks)
- Colorado State Land Board
- Bureau of Land Management
- Colorado Department of Local Affairs

The charter details the role of the Agency Working Group in project decision making, identifies their responsibilities, and describes how group members will work together. It also calls on group members to provide input at key project milestone points, and one of those milestone points involves mitigation activities.

1.3. Build Alternatives

Throughout this report, reference is made to the Build Alternatives, which generally are encompassed in a 1,000-foot-wide corridor within which future improvements to US 50 will be made. The ultimate roadway footprint (i.e., alignment) for future improvements is expected to use only 250 feet (approximately 25 percent) of this 1,000-foot width, which will be identified during Tier 2 studies. The Build Alternatives consist of constructing a four-lane expressway on the existing US 50 at I-25 in Pueblo, Colorado, to approximately one mile east of Holly, Colorado. The Build Alternatives would relocate US 50 from its current through-town routes to an around-town route at Fowler, Manzanola, Rocky Ford, Swink, La Junta, Las Animas, Granada, and Holly. Between towns, the highway generally would be improved along its existing route, with the exception of near Fort Reynolds, where there is an alternative to realign the roadway to the south. Figure 1-3 reflects the Build Alternatives as proposed.

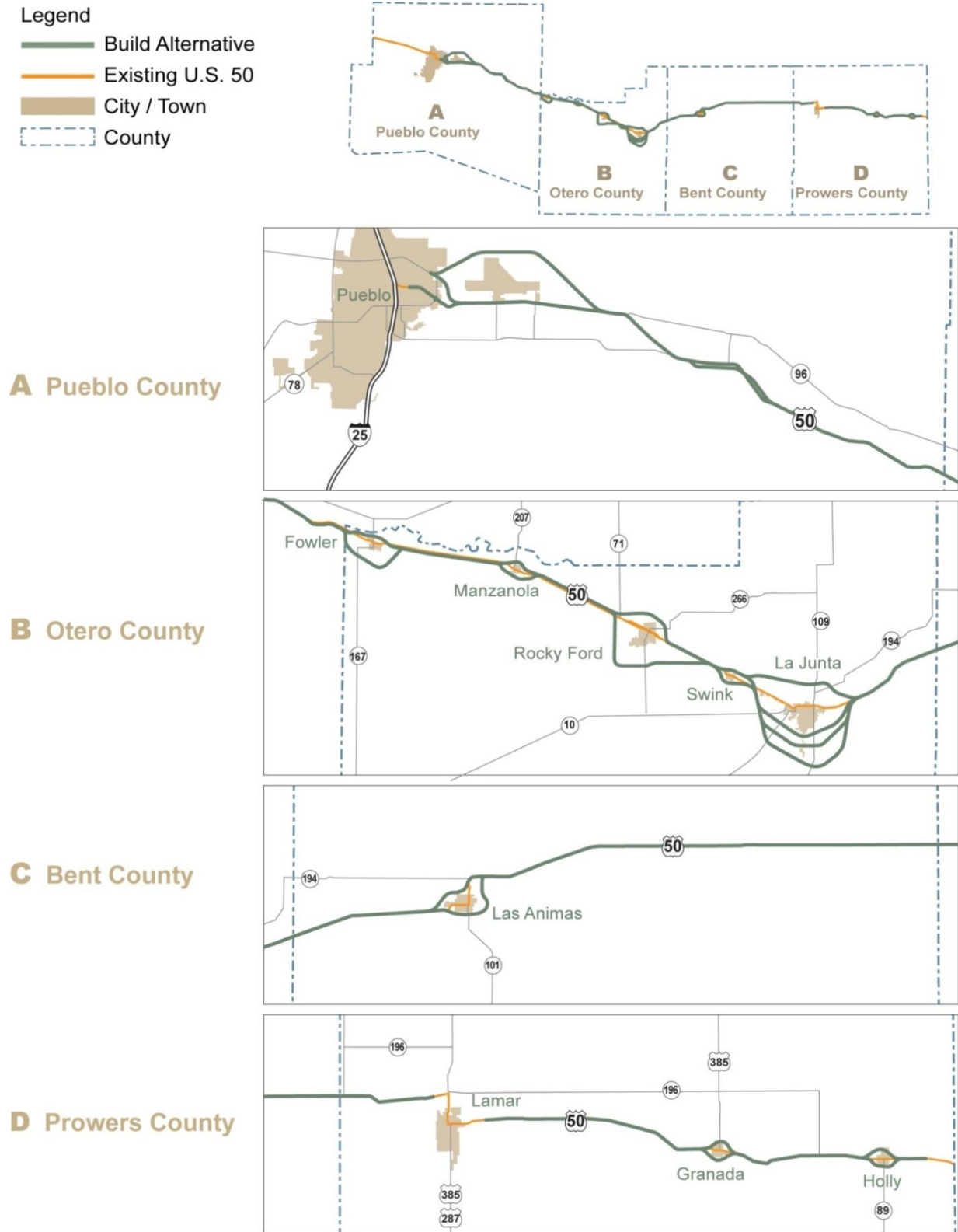


Figure 1-3. Build Alternatives

No around-town general corridor alternatives were developed for Lamar. Lamar has been studied in a separate EA, titled US 287 at Lamar Reliever Route Environmental Assessment, which was signed on August 15, 2013.

1.4. Natural Resource Setting

The following narrative provides a brief overview of the natural resources found in the project area. More information can be found the US 50 Tier 1 EIS Biological Resources Technical Memorandum in Appendix A.

The US 50 project area is characterized by rolling plains and tablelands of moderate relief that gradually slope east from the base of the Rocky Mountains to the central United States. The project area ranges in elevation from 4,446 feet at Pueblo to 3,350 feet at Holly. The plains consist of sediments deposited by rivers that drained and eroded the Rocky Mountains (NRCS 2006). Today, the plains generally are flat with occasional valleys, canyons, lava-capped plateaus, and buttes. In many areas, the rolling shale plain is mantled by loess or windblown sand, alluvium, and outwash (NRCS 2006).

Eastern Colorado lies within the rain shadow east of the Rocky Mountains. The climate of the Great Plains grasslands is a semi-arid regime with characteristic low relative humidity, abundant sunshine, infrequent rains and snow, moderate to high wind movement, and a large seasonal range in temperature (CCC 2007). The moisture and soil temperature regimes are described as ustic or aridic and mesic, respectively (NRCS 2006).

Existing land uses or vegetation cover types within the project area fall into 10 general classifications: agricultural lands, grasslands, riparian or wetlands, shrublands, woodlands, open water, rock outcrops, disturbed, urban, and rural. Woodlands and rock outcrop cover types represent a small fraction of the project area. Therefore, they are not expected to be impacted and are not discussed in this document. Urban and rural community types are inhabited by people. While they do provide some habitat for some generalist wildlife and bird species, they do not provide habitat critical to the survival of plant or animal species in the US 50 project area. Therefore, these land cover types also are not discussed further in this document.

Agricultural lands represent approximately 50 percent of the current land use within the US 50 project area. These lands consist primarily of cultivated crops, as well as rangelands, pasture, and hay production areas—including grasses, alfalfa, or mixtures planted for livestock grazing. Large blocks of agricultural land generally are found west of the Huerfano River, from Fowler to Timpas Creek (west of La Junta) and from Las Animas to Lamar. The land use from Lamar east to Holly is mostly agricultural with large areas of grassland and shrubland scattered between the two towns.

Grassland is a major land cover type in the US 50 project area, representing approximately 22 percent of the total land use. The primary type of grassland is the western Great Plains shortgrass prairie. This grassland occurs primarily on flat to rolling uplands with loamy, ustic soils ranging in texture from sandy to clayey (NRCS 2006). Native, drought-resistant species form the basis of this ecosystem with key species such as blue grama (*Bouteloua gracilis*) dominating (SWReGAP 2006, NSE 2007). Large areas of grasslands occur from Pueblo east to the Pueblo-Otero county line, east of the Timpas River to west of Las Animas, north of John Martin Reservoir, and east of Holly. Grasslands are used primarily for grazing domestic livestock (mostly beef cattle), but also provide forage and cover for wildlife.

Shrublands represent 7 percent of the US 50 project area. In general, these shrublands are similar in terms of vegetation composition to grasslands except for the abundance and visual dominance of woody plants. This type of community also is referred to as a “steppe.” The prominence of shrubs influences the types of birds and mammals likely to use an area. Shrublands in the project area are used primarily for grazing domestic livestock (mostly beef cattle), but also provide important forage and cover for wildlife. The western Great Plains sandhill shrubland, also known as sand sage, represents 69 percent of the total shrubland habitat within the US 50 project area (see Figure 1-4). Sand sage shrublands occur on well-drained, deep sandy soils that often are associated with dune systems or historic floodplains and are



**Figure 1-4. Sand Sage Habitat
Prowers County**

characterized by a sparse to moderately dense woody layer dominated by sand sage (SWReGAP 2006). Large areas of sand sage (*Artemisia filifolia*) are found east of Pueblo between La Junta and Las Animas, and between Lamar and Granada south of US 50.

Wetland and riparian areas represent approximately 14 percent of the total US 50 project area. The density of trees and width of the riparian corridor typically are greatest along the larger perennial streams, such as the Arkansas River, Purgatoire River, Huerfano River, Big Sandy Creek, Apishapa River, and Timpas Creek. Intermittent streams often support a discontinuous riparian community in which trees occur in small clumps and are often replaced by riparian shrubs. Areas of high groundwater frequently support emergent wetlands, some of which have been invaded by salt cedar (*Tamarix ramosissima*). A detailed discussion of wetland/riparian areas found in the US 50 project area can be found in the US 50 Tier 1 EIS Wetland and Riparian Resources Technical Memorandum in Appendix A.

Although wetlands are considered an aquatic habitat, for the purposes of this plan, open water, streams, and rivers comprise aquatic habitats in the US 50 project area. This habitat type also includes the mudflats and beaches that frequently occur adjacent to open water at different times of the year due to drawdown, evaporation, or both. Open or standing water accounts for a small percentage of the land in the project area. It includes a small portion of the John Martin Reservoir, natural and created ponds, lakes, and other reservoirs. Major rivers in the project area include the Arkansas River, which parallels the existing US 50, and the Huerfano River, which crosses it. Other relatively large streams in or near the project area include Granada Creek, Purgatoire River, St. Charles River, Timpas Creek, and the Apishapa River. The majority of the streams within the project corridor support warmwater fisheries. Generally, these prairie streams have broad floodplains, low current velocities, and high turbidity. Their floodplains typically are cultivated almost to the streambanks, with narrow bands of woody species along the active channels.

Approximately 322 different bird species, 12 amphibian species, 40 reptile species, and 74 mammal species could potentially occur in the US 50 project area (NDIS 2007). Many of the bird species that have been observed in the project area only occur during the spring or fall migrations (or both) because the project area is located along a principal route of the central flyway. The central flyway is a key migration route for many bird species between breeding grounds in the north and wintering areas in the south.

A total of 31 special-status species occur, or potentially occur, in the US 50 project area. These include three amphibian species, 11 bird species, five fish species, five mammal species, and seven reptile species. Special-status species include state and federally listed threatened species, endangered species, and candidate plant and animal species, as well as state listed species of concern. No threatened or endangered plant species have been documented in the project area.

Based on their relative value to resident and migratory wildlife and bird species, the most important habitat types that occur in the US 50 project area are grasslands (i.e., shortgrass prairie), shrublands (i.e., sand sage), wetland/riparian areas, aquatic habitats, and agricultural lands. These habitat types are considered essential for the following reasons:

- Temperate grasslands, such as shortgrass prairie communities, have been identified as one of the world's most imperiled ecosystems by The Nature Conservancy (TNC) due to the lack of protection given to them (Neely et al. 2006). In fact, several shortgrass prairie community types in Colorado are considered vulnerable or imperiled (S3 or S2), though their occurrence within the US 50 project area is currently undocumented. Furthermore, numerous state listed and relatively rare animal species depend on shortgrass prairie habitat for all or part of their life cycle (e.g., swift fox, black-tailed prairie dog, etc.).
- Sand sage habitats have a relatively limited distribution and extent in the region and yet support a diverse array of fauna, including the Lesser Prairie Chicken, which is a candidate species for listing under the federal Endangered Species Act. Due to its limited extent, impacts to this habitat type, and associated indirect impacts to the fauna it supports, are magnified when compared to other habitat types. In addition, one sand sage community type (e.g., *Artemisia filifolia/Andropogon hallii*) is considered to be state imperiled (S2) in Colorado (CNHP 2008), and other sand sage community types are considered to be imperiled or threatened in neighboring states (e.g., Kansas, Nebraska). This is somewhat indicative of the importance of sand sage habitat in general. Sand sage itself is considered to

be imperiled in Wyoming, and its status is currently under review in Colorado and several other states (NatureServe 2008).

- Wetland/riparian areas provide important functions to society, such as flood attenuation, wildlife habitat, and water quality improvement. In terms of wildlife habitat, wetland/riparian areas in the US 50 project area provide habitat for numerous common and special-status species, support migrating waterfowl and many neotropical migrants, are important foraging areas for over-wintering Bald Eagles, and provide rookeries for Great Blue Herons. Additionally, many of the projected impacts to wetland/riparian areas will fall under the jurisdiction of Section 404 of the Clean Water Act and so will be regulated by the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA). These jurisdictional impacts will require mitigation that complies with the Compensatory Mitigation Rule of 2008, or current guidance from the USACE, EPA, or both. In addition, projects that receive federal funding or include another form of federal involvement (e.g., Federal Highway Administration), such as the US 50 Tier 1 EIS, also must comply with Executive Order 11990, Protection of Wetlands.
- Aquatic habitats in the US 50 project area either already support, or have the potential to support, several state and federally listed plains minnow species, such as the Arkansas darter, southern redbelly dace, and suckermouth minnow. Aquatic habitats also support migrating waterfowl and are important foraging areas for wading birds and Bald Eagles. Most of these areas also are regulated by the USACE, and any impacts will require a Clean Water Act Section 404 permit in compliance with the Compensatory Mitigation Rule of 2008 (or latest guidance) and Executive Order 11990, Protection of Wetlands.
- Farmland in the Lower Arkansas Valley consists of both irrigated and dry-land farming. These habitat types have intensely altered the natural environment for the benefit of crop production. Even though this habitat type has greatly reduced species diversity, it can be important to local and migratory wildlife during certain times of the year. For example, waste grain, such as wheat and corn, are important food sources for waterfowl and Sand Hill Cranes during fall migration.

1.5. Natural Resource Impacts

The US 50 Tier 1 EIS impact projections for natural resources were completed by assuming a 250-foot roadway footprint would occur within the 1,000-foot-wide Build Alternatives. For example, if within a specific roadway segment, 10 acres of wetland/riparian area were identified, then based on the 250-foot-wide footprint, approximately 25 percent of the wetland/riparian area could be impacted, which is 2.5 acres (see Figure 1-5). Since the roadway footprint (i.e., alignment) will not be determined until Tier 2 studies, it is impossible to identify which specific resources may be impacted. Therefore, actual impacts may be higher or lower than these estimates, and some impacts could be avoided or minimized as design details become available during Tier 2 studies.

Table 1-1 shows estimated direct impacts to various habitat types in the US 50 project area. Indirect impacts of particular concern include habitat fragmentation and the spread and establishment of noxious weeds.

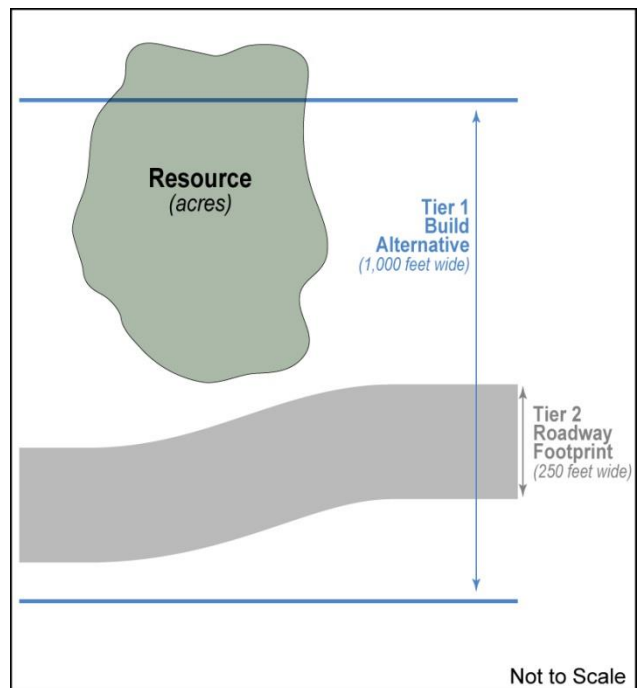


Figure 1-5. Impact Calculation Example

Table 1-1. Potential Impacts to Critical Habitat Types in the US 50 Project Area

Vegetation Cover Type	Potential Impacts
Grasslands (primarily shortgrass prairie)	642 acres to 1,025 acres
Shrublands (primarily sand sage)	173 acres to 294 acres
Wetland/riparian areas	587 acres to 712 acres
Aquatic habitat—perennial streams	0.6 mile to 1.2 miles
Aquatic habitat—all non-wetland channels	12.5 miles to 15.4 miles
Aquatic habitat—standing waterbodies	9.1 acres to 12.5 acres

There are 13 special-status species that are more likely than others to be impacted by the Build Alternatives, and they are listed in Table 1-2, along with their listing status. This list should not be considered a comprehensive or complete list of species that may be impacted, nor should it imply that these species will be impacted, only that they have a higher likelihood to be impacted due to their distribution within the US 50 project area.

Table 1-2. Special-Status Species with a Higher Likelihood of Being Impacted by the Build Alternatives

Special-Status Species	Listing Status
Bird Species	
Burrowing Owl	Listed as threatened by the State of Colorado
Ferruginous Hawk	Species of concern in Colorado
Lesser Prairie Chicken	Federally listed as threatened
Long-Billed Curlew	Species of concern in Colorado
Mountain Plover	Species of concern in Colorado
Fish Species	
Arkansas Darter	Federal candidate for listing, listed as threatened by the State of Colorado
Southern Redbelly Dace	Listed as endangered by the State of Colorado
Suckermouth Minnow	Listed as endangered by the State of Colorado
Herptile Species	
Massasauga Snake	Species of concern in Colorado
Plains Leopard Frog	Species of concern in Colorado
Texas Horned Lizard	Species of concern in Colorado
Mammal Species	
Black-Tailed Prairie Dog	Species of concern in Colorado
Swift Fox	Species of concern in Colorado

1.6. Natural Resource Mitigation Goals

As part of the development of this natural resource mitigation plan, CDOT representatives met with members of the Agency Working Group to discuss the overall concept of the plan and some guiding principles that could be used to develop it. This meeting provided CDOT with the general direction needed to develop broad mitigation goals, formulate general mitigation strategies, and then to identify specific strategies and partnering opportunities. This framework is discussed in detail in Section 2, Natural Resource Mitigation Strategies, of this document. This section (Section 1.6) describes the goals that guided the selection of general mitigation strategies. Section 2, Natural Resource Mitigation Strategies, describes these general mitigation strategies and discusses early mitigation, mitigation banking, and opportunities for mitigation partnerships.

The Lower Arkansas River Valley supports rich and abundant plant and wildlife resources, ranging from rare species of plants and fish to throngs of migrating Snow Geese. In recognition of this abundance, this plan includes several goals for mitigation activities specifically associated with the US 50 Tier 1 EIS and subsequent Tier 2 studies that reflect an overall commitment to maintaining, enhancing, and protecting these resources for future generations. Perhaps unavoidably for a project of this scale, many of these goals and objectives are broader in scope than can be accomplished by any one agency or organization working alone, and so will require the ongoing collaboration and commitment of the Agency Working Group and their partners.

This process, which began with the setting of goals, provides a predictable framework for evaluating what general mitigation strategies support these goals and how mitigation banking, early mitigation strategies, and partnering opportunities would meet the goals and regulatory requirements for impacts to natural resources.

1.6.1. Goal 1—Maintain and enhance biodiversity in the Lower Arkansas River Valley

It is becoming increasingly clear to scientists, researchers, and agencies that—for mitigation to be effective—several different spatial scales must be addressed simultaneously. This goal involves careful consideration of the multiple levels of organization found in natural systems, including landscape, ecosystem, species, and genetic (see Figure 1-6) (Hauffer et al. 2002). This goal corresponds to mitigation strategies 1, 2, 3, 4, 5, 9, 12, 13, and 15 (see Section 2, Natural Resources Mitigation Strategies, of this document).

1.6.2. Goal 2—Improve ecosystem integrity in the Lower Arkansas River Valley

Ecosystem integrity is used in the sense of a natural system being complete, unimpaired, and sound (Hauffer et al 2002). Improving ecosystem integrity will entail the improvement of ecosystem dynamics, processes, and functions. This goal corresponds to mitigation strategies 1, 2, 3, 4, 5, 7, 8, 9, 11, 12, 13, and 15 (see Section 2, Natural Resources Mitigation Strategies, of this document).

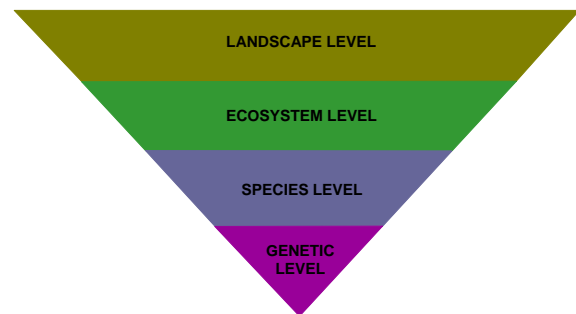


Figure 1-6. Spatial Scales of Biological Organization

1.6.3. Goal 3—Accommodate social and economic objectives when possible

Achieving harmony among the often-competing ecological, social, and economic objectives within the US 50 project area will be critical to the long-term sustainability and viability of natural resource mitigation activities in the Lower Arkansas River Valley. For this reason, the social and economic objectives of local communities, local governments, and local businesses should be considered during the development of natural resource mitigation activities completed for the US 50 Tier 1 EIS and subsequent Tier 2 studies. For example, the 2035 comprehensive plan for the town of Fowler calls for town leaders to “maximize birding trail opportunities” as a way to attract tourists (Town of Fowler 2009). Colorado Parks and Wildlife (CPW) also has planned to install a kiosk in town highlighting a birding trail located nearby. Instances like this one, where social or economic objectives could be met along with natural resource preservation goals, should be considered when mitigation activities are developed. This goal corresponds to mitigation strategies 6, 9, 14, and 15 (see Section 2, Natural Resources Mitigation Strategies, of this document).

2. Natural Resource Mitigation Strategies

The mitigation strategies presented in this document are provided as general guidelines to be followed while conducting mitigation for natural resources impacted by improvements made to US 50 when projects resulting from Tier 2 studies are constructed. It is assumed that any activities pursued under these guidelines will result in mitigation credits for the lead agencies (CDOT and FHWA) for the impacts associated with this project. A mitigation activity that deviates substantially from these mitigation strategies, but remains true to one or more of the mitigation goals stated previously, may be acceptable provided that formal, written approval from the Agency Working Group is obtained prior to initiating the mitigation activity. The general hierarchy of the mitigation strategies is shown in Figure 2-1 (on the next page).

An underlying assumption for all of these mitigation strategies is that avoidance and minimization of impacts will be pursued to the greatest practicable extent during the development of Tier 2 studies, but that the need for some compensatory mitigation for unavoidable impacts will still exist. Tier 2 studies will be developed to avoid and minimize harm to natural resources whenever possible. This document is being developed to guide actions when, after avoidance and minimization efforts, some mitigation is still required.

A second underlying assumption is that one or more legally binding agreements (e.g., memorandum of agreement, banking instrument, etc.) will be created among all participating agencies so that any mitigation activities performed by CDOT for the US 50 Tier 1 EIS are honored by these agencies in the future. The improvements recommended by the US 50 Tier 1 EIS are not currently funded. However, any future improvements related to this project will need at least one comprehensive, legally binding document to bind signatory agencies to the agreements and arrangements provided here so that mitigation requirements are predictable and stable. It is recognized that other regulatory processes will be needed to implement a banking instrument (Section 404 permit, Section 7 consultation, etc.). However, this more inclusive agreement would facilitate the planning and associated budgeting of mitigation actions. Legally binding agreements also will give CDOT and FHWA the assurances they need to actively pursue mitigation opportunities as they arise, as well as provide added assurances to the regulatory agencies with respect to the long-term management of these areas.

A third underlying assumption is that CDOT will implement adaptive management precepts to the natural resource mitigation strategies presented in this document. In other words, CDOT will review and revise impact calculations, regulations/guidance, state and federally listed species, and other information, as needed, so that mitigation strategies can be revised to adequately address relevant issues related to species, habitat, and regulations or guidance. These revisions then will be presented to the Agency Working Group for approval. This is significant because the improvements to US 50 that are recommended by the US 50 Tier 1 EIS are not currently funded, and any of these improvements that could occur in the future are expected to be completed over a long period of time (i.e., decades, not months or years). During this extended time period it is likely that many changes will occur in the regulations, populations of species, and available habitat occurring within the US 50 project area. Without periodic revisions, mitigation strategies developed for the US 50 Tier 1 EIS could become obsolete, unnecessary, or irrelevant.

The mitigation strategies detailed below have been categorized as general mitigation strategies, mitigation banking strategies, early mitigation strategies, and partnering opportunities.

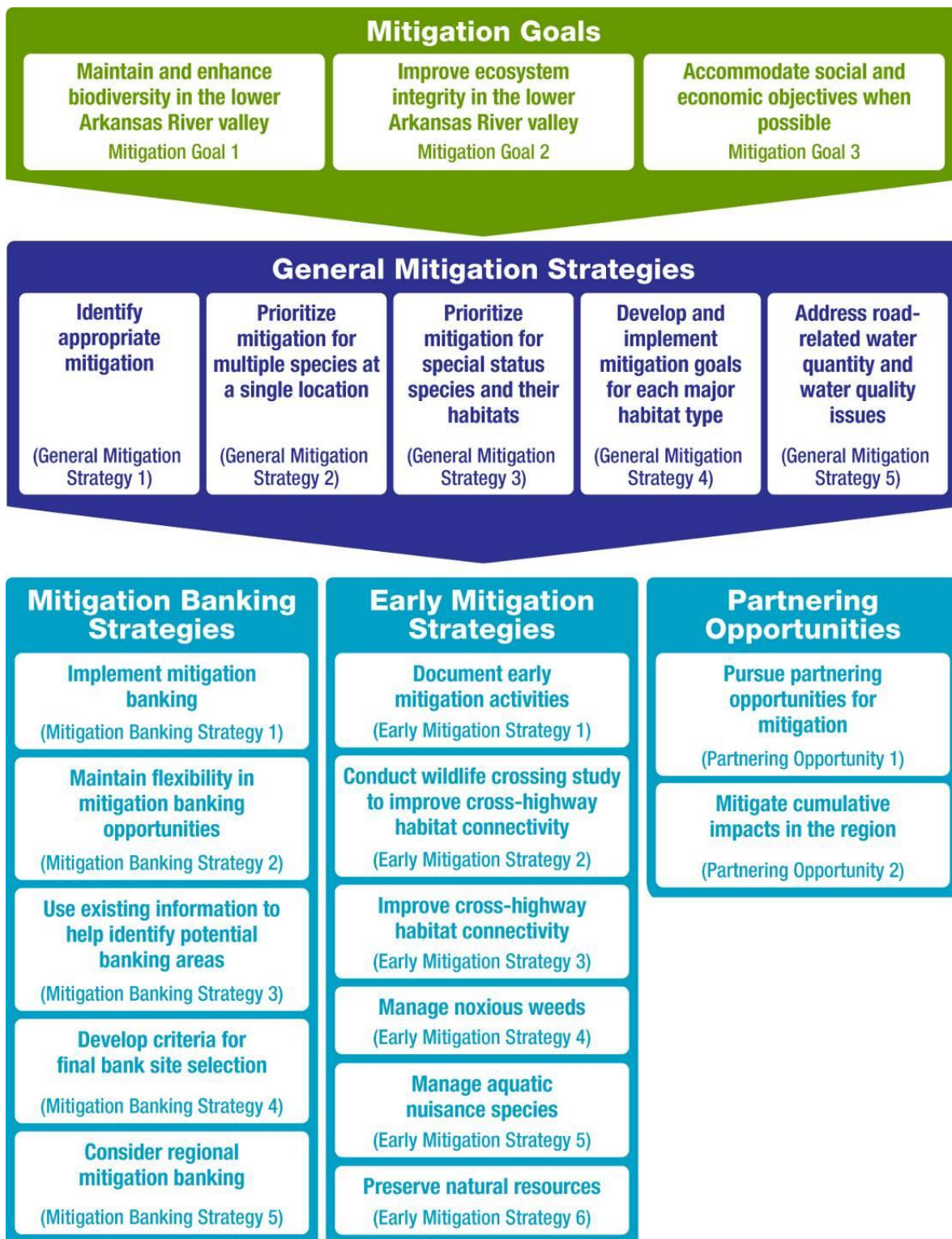


Figure 2-1. Hierarchy of US 50 Tier 1 EIS Mitigation Strategies

2.1. General Mitigation Strategies

General mitigation strategies include overall approaches to mitigating impacts to natural resources.

2.1.1. General Mitigation Strategy 1—Identify appropriate mitigation

CDOT will assess site-specific impacts and determine if the most meaningful compensatory mitigation for the impacted habitat or species should occur on site or at an offsite location. This analysis will be presented to the Agency Working Group for approval. Specific factors that CDOT will assess include:

- Landscape setting of the impacts—It is likely that offsite compensatory mitigation would be most meaningful when impacts occur in highly urban, industrial, commercial, agricultural, or otherwise highly fragmented areas.
- Mitigation opportunities—Site-specific conditions—such as availability of land and water, real estate prices, and land use issues (among other factors)—may preclude onsite mitigation and thereby warrant offsite mitigation.
- Opportunity for genetic exchange—The proximity of nearby unimpacted populations or habitats may provide an argument for either onsite or offsite mitigation, being dependent on the specific species/habitat, location, and other characteristics of the impacted site as well as the offsite mitigation site.
- Limited species/habitat distribution—Onsite mitigation would likely be warranted for species or habitat that is not widely distributed in the surrounding landscape, which is indicative that the impacted site has characteristics that are somehow unique or at least uncommon (e.g., aquatic habitats).
- Limited species mobility—In most cases, unavoidable adverse impacts to species that lack the ability to disperse widely throughout the area should be mitigated on site.
- Site-specific life histories of impacted species—Impacts to species with a life history that requires specific conditions that would be adversely influenced by projected impacts would likely merit onsite mitigation.
- Substantial site use by resident wildlife—Substantial use by resident wildlife may indicate that the impacted habitat is limited in that area. In this type of situation, all else being equal, onsite mitigation would be justified.

Rationale: All mitigation is not equal. In some cases, compensatory mitigation will be most meaningful to the species inhabiting the area if the mitigation is accomplished on site, such as impacts to aquatic habitats. However, in other situations compensatory mitigation will frequently be most meaningful and successful if accomplished at one location where resources can be focused and larger tracts of land can be preserved and restored to natural conditions (e.g., shortgrass prairie, sand sage, and wetland/riparian areas).

2.1.2. General Mitigation Strategy 2—Prioritize mitigation for multiple species at a single location

Prioritize compensatory mitigation for multiple species in a single location over single species mitigation, unless regulatory obligations prevent this course of action. This strategy does not preclude mitigation for species that are unique or uncommon.

Rationale: Compensatory mitigation for multiple species at a single location will result in substantial cost savings and more ecologically significant mitigation projects. Both of these outcomes provide more cost effectiveness.

2.1.3. General Mitigation Strategy 3—Prioritize mitigation for special-status species and their habitat

Prioritize mitigation for special-status species (state and federally listed threatened, endangered, and candidate plants and animals) that will likely be directly or indirectly impacted by US 50 improvements over general wildlife species or vegetation. To a lesser degree, species listed by the Colorado Natural Heritage Program as critically imperiled, imperiled, or vulnerable to extirpation within the state of Colorado (ranked S1, S2, or S3) and not otherwise defined as a sensitive species for the US 50 Tier 1 EIS, but that will be

adversely impacted by proposed improvements, also should be given preference over general wildlife species or vegetation. Figure 2-2 shows the Burrowing Owl, which is listed as threatened by the state of Colorado and is a special-status species with a higher likelihood of being impacted by the Build Alternatives. Mitigation activities also should take into account the significance (e.g., context and intensity) of the impact as it relates to special-status species.



Figure 2-2. Burrowing Owl

Rationale: Special-status species have been identified in the US 50 project area because of their significance to the overall ecosystem, rarity, or vulnerability to extirpation due to development pressures, habitat loss/degradation, and other anthropogenic pressures. To prevent the escalation of critically imperiled, imperiled, and vulnerable species to a state or federal listing status, these species also should receive special consideration when evaluating mitigation. The US 50 Tier 1 EIS identifies these species, although this list is dynamic and species may be added or deleted from this list over time.

2.1.4. General Mitigation Strategy 4—Develop and implement mitigation goals for each major habitat type

Develop, implement, and document compensatory mitigation goals and objectives for each of the four major habitat/ecosystem types impacted by the Build Alternatives during Tier 2 studies, which include shortgrass prairie, sand sage, wetland/riparian areas, and aquatic habitat. The following guidelines should be applied to all four of these habitat types. More specific recommendations for each habitat type are provided as mitigation strategies 4a, 4b, and 4c.

- Landscape setting—Consider existing and projected uses of adjacent lands. Protected private or public lands in minimally disturbed condition that occur adjacent to the proposed mitigation site are preferred to agricultural or other intensive land uses. Mitigation properties that connect or join protected lands would provide ecological benefit, regardless of size. In areas where pesticide, fertilizer, or other chemical use is occurring, the effect of these activities on the mitigation site must be considered. At a minimum, the mitigation site should incorporate a substantial buffer (e.g., >100 meters) between the chemically treated lands and the targeted habitat(s), species populations, or both.
- Degree of habitat fragmentation—Consider the existing and projected degree of habitat fragmentation that occurs on the proposed mitigation site and in the surrounding landscape. Less fragmentation is preferred for a mitigation site. Promoting connectivity is currently one of the top priorities of the U.S. Fish and Wildlife Service (USFWS) in southeastern Colorado. In addition to existing surface uses and other factors, the potential for mineral leasing should not be overlooked in this analysis. This is due to the potential for the site to be a split-estate parcel, where someone owns the surface rights and someone else owns the mineral rights. Accessing minerals on the site at some future date could greatly diminish the area's value as a mitigation site. For this reason, prior to using the site for mitigation purposes, a strong argument showing that the risk of mineral development on a split-estate parcel is very low must be presented to, and approved by, the Agency Working Group.
- Degraded habitat—Assuming that the landscape setting is suitable and the site is minimally fragmented, preference should be given to sites that have been degraded due to overgrazing, non-native species introduction, or other land management practices (e.g., irrigation, etc.), so that site restoration will provide a net benefit to the species targeted for mitigation. Currently occupied degraded habitat or degraded habitat adjacent to habitat occupied by a particular sensitive species would likely be considered more valuable than other areas of degraded habitat. Note that habitat considered to be degraded for one species may be ideal for another. For example, many reptile species prefer patches of bare ground that could be considered degraded for grazing species. This type of tradeoff should be acknowledged and documented when establishing site-specific mitigation goals/objectives.

- Use a reference area to determine quality—Compare and quantify conditions at a potential mitigation site to the conditions found at a reference area to determine the site's potential and its level of departure from “normal” conditions. Reference sites typically are defined as areas that are minimally disturbed by humans, but also could refer to documented and quantified historical conditions of the mitigation site, or the specific habitat types requiring mitigation, prior to human disturbance (e.g., prior to European settlement). Metrics to consider using in the comparison may include, but are not limited to, plant and animal species occurrences, abundance, and compositions; canopy cover; structural diversity; primary production (e.g., above-ground biomass); nutrient cycling; decomposition rates; degree of fragmentation; disturbance regimes; parasitism rates; extent and types of exotic species infestations; animal population abundance; soil types; erosion/deposition; pool-riffle ratios; and types and extent of adjacent land uses. One potential source of reference site information is the Natural Resources Conservation Service ecological site descriptions for the habitats in question.
- Spatial extent—In general, the larger the area (e.g., > 5,000 acres), the more potentially ecologically significant is the restoration. However, the spatial context, fragmentation, and opportunities for restoration/enhancement are more critical considerations than size alone.
- Migratory bird use—Millions of birds utilize and depend on the lower Arkansas River drainage as a stopover point in their annual latitudinal migrations from their winter and summer feeding grounds. All else being equal, potential mitigation sites known to be preferred by multiple species of migratory birds—especially avian species known to have declining populations—should be given priority over other sites.

Rationale: Compensatory mitigation based on habitat type is not only the most logical approach from a species/habitat perspective, but it also provides a consistent method for management and documentation. This strategy is not intended to prevent or detract from ecosystem mitigation that includes all four (or more) of these habitats. Rather, it is the intent of this mitigation strategy to establish specific mitigation goals and objectives for each of the four main habitat types so that each of these ecosystems are represented in the overall mitigation mix, and that the specific compensatory mitigation is quantifiable and commensurate with the level of impact.

General Mitigation Strategy 4a—Shortgrass prairie

The following are important elements to target and include in the selection of a shortgrass prairie mitigation site (in order of priority).

1. Special-status species habitat—Based on current impact projections and information, shortgrass prairie mitigation should focus on mitigating impacts to the following special-status species: black-tailed prairie dog, swift fox, Burrowing Owl, Ferruginous Hawk, Long-Billed Curlew, Mountain Plover, couch's spadefoot toad, and the Texas horned lizard. In addition, recent research has shown that the massasauga snake uses burrows in shortgrass prairie habitat as hibernacula (Mackessy 2005).
2. Ecosystem function/connectivity—Lands used for mitigation would have to either meet agreed-upon standards of a functioning prairie ecosystem or be restorable to a functional state within a reasonable length of time. The specific standards to be met will be determined through future agency negotiation, and they will likely include many of the elements previously listed for habitat mitigation in general and shortgrass prairie specifically.
3. Prairie-wetland complexes—As a component of a mitigation site, prairie-wetland complexes should be targeted because they have been shown to support a higher diversity of mammals and birds than surrounding grasslands (Andrews and Richter 1992).
4. Prairie dog complexes—Due to their overwhelming importance to the prairie ecosystem, black-tailed prairie dog complexes should be targeted for long-term conservation (Grunau et al. 2006). Site selection should consider the spatial context of the site, such as distances to other prairie dog colonies/complexes and current and future land uses. A complex is defined as either a contiguous area of $\geq 5,000$ acres inhabited by prairie dogs, or a collection of smaller colonies within 3.2 miles of one another (important for dispersal), comprising $\geq 5,000$ acres (Grunau et al. 2006). Prairie dog complexes of this size are more likely to support viable populations, as well as communities of the animals associated with them (Grunau et al. 2006). If prairie dog complexes are unavailable for conservation, preference should be given to sites that have finer soils (e.g., silty clay loam) with minimal sand and rocks. These soil types are better suited for burrows, such as those created/used by the black-tailed prairie dog, swift fox, and Burrowing Owl.

5. Rare/unusual habitat types—These habitat types frequently support a different suite of plant and animal species and so can greatly enhance the overall biodiversity of an area.
6. Partnering—Actively identify and pursue opportunities to work with ranchers and provide them with compensatory funding to manage their land (e.g., grazing systems) to improve shortgrass prairie habitat.

General Mitigation Strategy 4b—Sand sage

The following are important elements to target and include in the selection of a sand sage mitigation site (in order of priority).

1. Special-status species habitat—Based on current impact projections and information, sand sage mitigation should focus primarily on the Lesser Prairie Chicken, Ferruginous Hawk, and massasauga snake. To a lesser extent, it also should consider the Texas horned lizard, particularly in areas with sandy soils, populations of harvester ants, and ample bare ground.
2. Lesser Prairie Chicken—Unprotected Lesser Prairie Chicken sites surrounded by the minimum breeding patch size of a two-mile radius (see Toepfer and Davis 2007) should be given first priority for mitigation over other types of habitat for the species, though this should not be done to the exclusion of other habitats required for perpetuating the Lesser Prairie Chicken in southeastern Colorado.
3. Ecosystem function—Lands used for mitigation would have to either meet agreed-upon standards of a functioning sand sage ecosystem, or be restorable to a functional state in a reasonable amount of time. The specific standards to be met will be determined through future agency negotiation, and will likely include many of the elements previously listed for habitat mitigation in general and sand sage specifically.
4. Partnering—Actively identify and pursue opportunities to work with ranchers and provide them with compensatory funding to manage their land (e.g., grazing systems) to improve Lesser Prairie Chicken nesting and brood-rearing habitat.

General Mitigation Strategy 4c—Wetland/riparian areas and aquatic habitat

The following are important elements to target and include in the selection of wetland/riparian and aquatic habitat mitigation sites (in order of priority).

1. Special-status species habitat—Based on projected impacts and information, wetland/ riparian area mitigation should focus primarily on the plains leopard frog and Long-Billed Curlew. Aquatic habitat mitigation should focus primarily on the Arkansas darter, although the southern redbelly dace and suckermouth minnow also should be considered.
2. Minimize wetland/riparian functional loss—Reduce temporal loss of wetland/riparian functions by mitigating for projected impacts ahead of time. Temporal loss of wetland/riparian functions will be most pronounced for forest dominated sites (i.e., cottonwoods) due to the amount of time needed for trees to grow. For this reason, projected impacts to these forested wetland/riparian areas should be mitigated as soon as possible and be prioritized over other wetland types. This approach will improve crediting ratios imposed by the USACE.
3. Wetland functional units—Base mitigation on functional units (functional points multiplied by acreage). All wetland/riparian areas in the US 50 project area were evaluated using a geographical information system (GIS) based wetland functional assessment methodology, scored, and then ranked into one of four functional categories. Wetland functions in Colorado are currently assessed on CDOT projects using the Functional Assessment of Colorado Wetlands (FACWet; Johnson et al. 2009). Wetland/riparian impacts and mitigation site assessment will be completed using FACWet.
4. Tamarisk—If tamarisk (i.e., salt cedar) eradication is completed as wetland/riparian mitigation, regulatory agencies agree that the site must be maintained as tamarisk-free over the long term and that documentation must be provided proving that tamarisk removal will result in improved functionality of the site. Cooperative agreements with local anti-tamarisk groups, such as the Tamarisk Coalition, appear to be at least one effective solution for accomplishing long-term tamarisk free mitigation. The Colorado State Land Board, Colorado Division of Wildlife, Natural Resources Conservation Service, Colorado State Parks, and several other agencies/organizations may have lands where tamarisk removal can be performed, and they may be willing partners in this effort.
5. Selenium—Water quality impairment in the lower Arkansas River watershed is currently a chief concern of the EPA, Region VIII and the Colorado Department of Public Health and Environment (CDPHE).

Selenium is the primary water quality impairment of many of the streams and rivers in the US 50 project area. Wetlands have been shown to be effective at reducing selenium concentrations in water. Using US 50 wetland mitigation to help reduce selenium concentrations found in these streams would accomplish water quality-related goals of (at least) these two agencies. However, there are concerns regarding selenium loading and creating selenium toxicity issues for wildlife and plants within these wetland mitigation areas (Lemly and Ohlendorf 2002). This may be of particular concern for migrating waterfowl and resident amphibians within the US 50 project area. Because of this, it appears to be worthwhile for CDOT and FHWA at least to explore the possibility of using wetlands to reduce selenium concentrations in selenium-impaired waters, such as the Arkansas River, Purgatoire River, Huerfano River, Apishapa River, and Timpas Creek, among others. If dealing with selenium loading to mitigation wetlands is found to be feasible and practicable, wetland mitigation could be implemented to both mitigate for projected wetland impacts and reduce selenium concentrations in impaired waters.

6. Playa lakes—Per guidance from the USACE, mitigation for jurisdictional wetlands should be linked to the waters of the U.S. For this reason, playa lakes may not qualify as mitigation for impacts to jurisdictional wetlands (but may be appropriate mitigation for non-jurisdictional wetlands), though they are recognized as an important component of the prairie ecosystem. The USACE should be consulted early in the process if playa lakes are being considered for jurisdictional wetland mitigation.

2.1.5. General Mitigation Strategy 5—Address road-related water quantity and water quality issues

Water quantity delivery to specific locations within the US 50 project area could be indirectly affected because of increases in impervious cover, changes in flow routing across the landscape, or both. CDOT will address these potential increases or decreases in water quantity caused by improvements associated with the US 50 Tier 1 EIS and subsequent Tier 2 studies by maintaining historic drainage patterns and using best management practices. Examples of best management practices include sedimentation basins, infiltration strips, revegetation, and tamarisk eradication in CDOT right of way. Complete, site-specific best management practices will be developed for each Tier 2 study associated with the US 50 Tier 1 EIS.

Similarly, water quality issues also will be addressed during the development and implementation of Tier 2 studies through the creation of site-specific construction stormwater management plans. These plans are required by the CDPHE for projects that disturb an acre or more of ground during construction. Water quality best management practices can be temporary or permanent, but the majority of them typically are oriented toward water quality issues that may arise during construction when exposed soils are most vulnerable to erosion. Water quality issues of the lower Arkansas River basin, such as the development of total maximum daily loads or watershed restoration actions related to total maximum daily loads, generally are beyond the scope of this US 50 Tier 1 EIS and associated Tier 2 studies. These more-comprehensive water quality issues are addressed through other mechanisms. However, opportunities to help address these issues will be reviewed for their feasibility for implementation within the context of other US 50 mitigation actions.

2.2. Mitigation Banking Strategies

Mitigation banking strategies are specific to wetland or habitat banking. Mitigation strategies related to mitigation banking are discussed below.

2.2.1. Mitigation Banking Strategy 1—Implement mitigation banking

Wetland and habitat/ecosystem mitigation banking will be implemented by CDOT and FHWA to address impacts to habitats and special-status species.

Rationale: All of the general mitigation strategies discussed in Section 2.1, General Mitigation Strategies, of this document can be realized through mitigation banking. In most cases, mitigation banking provides more ecologically significant and cost effective mitigation for impacts than mitigation done in piecemeal fashion. This is because more financial, technical, and management resources can be brought to bear at a single location for preserving larger tracts of land, for performing more intensive and comprehensive restoration interventions, and for performing more detailed monitoring and thorough maintenance actions. Furthermore, mitigation banking is supported by regulatory agencies at both the national and state levels, and the concept

was specifically endorsed by the Agency Working Group at its August 20, 2008, meeting for use on the US 50 Tier 1 EIS contingent on review of specific details of the mitigation banking plan.

2.2.2. Mitigation Banking Strategy 2—Maintain flexibility in mitigation banking opportunities

It was the consensus of the Agency Working Group during the August 20, 2008, meeting that flexibility in creating a mitigation bank (or banks) be maintained as long as possible so that these opportunities can be pursued as they arise. However, maintaining flexibility must be tempered with reasonable judgment. If a solid, significant mitigation banking opportunity surfaces, it should not be passed up or overlooked simply to maintain this flexibility.

Rationale: Locations, partnering opportunities, and funding sources for mitigation banking within the US 50 project area can appear at any time. As such, it is prudent to maintain as much flexibility as possible in mitigation bank planning.

2.2.3. Mitigation Banking Strategy 3—Use existing information to help identify potential banking areas

As much as possible, utilize existing information and data in the initial identification of potential areas for habitat/wetland banking opportunities.

Rationale: A substantial amount of environmental, demographic, and species-specific information is available for southeastern Colorado from a variety of sources, including the Colorado Division of Wildlife, Colorado Natural Heritage Program, The Nature Conservancy, North American Grouse Partnership, and local governments, among other sources. For example, The Nature Conservancy has completed a report titled Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative (Neely et al. 2006), which identifies several conservation areas within the US 50 project area, including Chico Basin (map unit #25), Horse Creek (#26), Indian Lakes (#27), Huerfano Uplands (#28), Lower Purgatoire (#29), and Arkansas River (#36). Each of these sites is tens of thousands of acres in size and has different suites of species targeted for conservation. Building on this information, and perhaps working within the conservation framework they present, is both logical and economical because at least a portion of the preliminary research has been completed and will help to focus the search for a banking site. In addition, there may be partnering opportunities by working with The Nature Conservancy's Shortgrass Prairie Partnership. In addition, *Setting Mitigation in the Watershed Context: Demonstration and Description of Colorado's Watershed Approach to Compensatory Wetland Mitigation* (Colorado Natural Heritage Program and CSU 2013) should be used as a guidance document for choosing mitigation sites that would benefit the larger watershed.

2.2.4. Mitigation Banking Strategy 4—Develop criteria for final bank site selection

The evaluation of sites for final mitigation bank site selection should be based on objective criteria established prior to selecting the site. Evaluation criteria should be scored and based on mitigation strategies 3, 4, 5, 5a-c, and 7, as well as land owner interest, projected cost, partnering opportunities, and other relevant variables. Brown (2006) suggests that one of the site evaluation criteria consider a site's importance based on its contribution to maintaining or increasing connectivity or conservation. In addition, *Setting Mitigation in the Watershed Context: Demonstration and Description of Colorado's Watershed Approach to Compensatory Wetland Mitigation* (Colorado Natural Heritage Program and CSU 2013) should be used as a guidance document for choosing mitigation sites that would benefit the larger watershed. For wetlands and other aquatic resources, compliance with the Compensatory Mitigation Rule of 2008 (or current guidance) will dictate many of the key evaluation criteria. For example, replacement of wetland functions within the same watershed at a location where replacement of those functions is most likely to be successful is a central tenet of the Compensatory Mitigation Rule. The Agency Working Group should approve the draft and final bank site selection evaluation criteria and scoring approach. Field testing of the draft bank site selection evaluation criteria is recommended.

Rationale: Basing the selection of a site for a mitigation bank on objective evaluation criteria that have been approved by the Agency Working Group provides the most legally defensible approach to site selection and helps to ensure that taxpayer money is used wisely. Existing methods and evaluation and scoring criteria used by The Nature Conservancy, the Colorado Natural Heritage Program, or both, may be useful in the development of bank site selection criteria.

2.2.5. Mitigation Banking Strategy 5—Consider regional mitigation banking (i.e., umbrella mitigation bank)

If or when one or several wetland/habitat mitigation bank sites are being developed for the US 50 Tier 1 EIS (including projects resulting from Tier 2 studies), the potential mitigation needs of other CDOT projects (or projects of other agencies in the area) also should be considered. The bank prospectus should include narrative or other materials that disclose this intention for the bank(s) to be used for multiple projects, or create an umbrella mitigation banking instrument.

Mitigation banks with several different types of credits (e.g., wetland credits, species-specific credits, water quality credits, etc.) can have a corresponding number of different service areas. For example, the primary service area of a wetland mitigation bank typically is watershed based, whereas a habitat or ecosystem bank service area generally is based on ecoregions or some other similar form of organizing habitats and biodiversity at the landscape scale. According to Omernik (1987), the primary Level IV ecoregion found within the US 50 project area is the Piedmont Plains and Tablelands (map unit 26e); to a much lesser extent, the Sand Sheets (26k) and the Flat to Rolling Plains (25d) ecoregions also occur. See Chapman *et al.* (2006) for a map of the Level IV ecoregions of Colorado.

Rationale: This type of integrated planning approach for mitigating impacts from multiple projects, at one or several select bank locations, will streamline future permitting, be more cost effective in the long run, and likely result in more “ecologically significant” mitigation. This is because resources can be pooled in the development, maintenance, and monitoring of the site(s). Based on projected future mitigation needs, it may allow CDOT to invest in larger banking sites or more expensive, but higher quality, sites or sites with higher potential for significant mitigation. Typically, regulatory agencies require that this sort of arrangement, where multiple projects will be mitigated at one or more banking sites, be clearly identified at the beginning of the banking process.

2.3. Early Mitigation Strategies

Early mitigation projects can include anything that is done to mitigate impacts to natural resources prior to impacts occurring within a specific segment of the US 50 Tier 1 EIS Build Alternatives.

2.3.1. Early Mitigation Strategy 1—Document early mitigation activities

US 50 early mitigation actions must be documented and approved by the Agency Working Group. It is suggested that the group be convened periodically to review and comment on early mitigation activities proposed by CDOT. The amount of credit awarded for a project would need to be negotiated among group members. Examples of early mitigation activities include, but are not limited to:

- Implementing tamarisk removal/noxious weed control
- Improving safe cross-highway connectivity for fish and wildlife
- Installing signage that detects wildlife and warns motorists about wildlife (i.e., smart signage)
- Building fencing to reduce vehicle-animal collisions
- Developing/improving wildlife and bird viewing areas
- Creating public awareness campaigns about species and their habitats

Rationale: Without a documented review process, it is likely that early mitigation projects would either fail to adequately address mitigation concerns of the Agency Working Group, or would not receive the appropriate amount of credit commensurate to the beneficial impact of the mitigation activity.

2.3.2. Early Mitigation Strategy 2—Conduct wildlife crossing study to improve cross-highway habitat connectivity

CDOT and FHWA, in cooperation with CPW, will implement a wildlife crossing study to identify the best locations within the Build Alternatives for:

- New or improved wildlife crossing structures
- Use of smart signage
- Wildlife fencing to funnel wildlife to existing crossings
- Areas to increase driver sight distances or lines
- Areas where use of concrete jersey barriers would impede wildlife crossings

The agencies also will identify opportunities to minimize use of road salt or palatable browse species that may attract deer, pronghorn, and other wildlife to the road.

Rationale: Areas of existing concentrated animal-vehicle collisions were identified in the US 50 Tier 1 EIS Biological Resources Technical Memorandum. Additional study is needed because:

- Annual average daily traffic volumes are expected to increase over time throughout the project area, likely resulting in higher wildlife mortality and decreasing driver safety.
- Wildlife crossing areas identified in the technical memorandum ranged from 0.5 miles long to more than six miles long, making it difficult to implement mitigation measures.
- Existing wildlife crossing zones along US 50 could shift or become more heavily utilized as agricultural lands are converted by development.

This wildlife crossing study will build on and refine the results in the technical memorandum and identify the best interventions to maintain cross-highway habitat connectivity.

2.3.3. Early Mitigation Strategy 3—Improve cross-highway habitat connectivity

CDOT and FHWA, with the cooperation of CPW and the USFWS, will implement the recommendations of the wildlife crossing study (mitigation strategy 11) to improve cross-highway habitat connectivity and thereby reduce wildlife mortality and improve driver safety.

Rationale: US 50 is already a significant barrier to wildlife, and with increased traffic volumes in the future, it will likely become more so. Implementing preventative measures that balance the needs of wildlife with transportation needs will reduce animal-vehicle collisions, thereby saving taxpayer money, reducing wildlife mortality, and improving driver safety.

2.3.4. Early Mitigation Strategy 4—Manage noxious weeds

CDOT will participate, support, and foster coordinated long-term noxious weed management efforts in the US 50 project area.

Rationale: Noxious weeds have been dubbed the “silent invader” and have degraded millions of acres of land in the western United States. To effectively combat this problem, it has become clear that coordinated efforts across federal, state, and local levels are required. CDOT already controls noxious weeds in their right-of-way zones. Their efforts will be even more effective if they are coordinated with other weed control efforts in the project area, thereby minimizing the ongoing degradation of shortgrass prairie, sand sage, and wetland/riparian habitats by noxious weed invasions. Long-term management of noxious weeds would be necessary to facilitate the restoration of shortgrass prairie, sand sage, and wetland/riparian habitats to a properly functioning native state.

2.3.5. Early Mitigation Strategy 5—Manage aquatic nuisance species

CDOT will participate, support, and foster coordinated efforts to manage aquatic nuisance species in the US 50 project area. Management should include the eradication of aquatic nuisance species populations and prevention of their spread through public education and monitoring.

Rationale: Aquatic nuisance species—such as the zebra mussel, New Zealand mud snail, and quagga mussel—are becoming more prevalent in Colorado. Based on experiences elsewhere in the country, these and other aquatic plant and animal nuisance species can be expected to become a significant issue in the future.

2.3.6. Early Mitigation Strategy 6—Natural resource preservation

Under certain circumstances, CDOT may elect to pursue actions targeted at natural resource preservation, such as acquisition of lands with established, highly functional habitats.

Rationale: This type of activity could be warranted if:

- Participating regulatory agencies support the action and will award CDOT mitigation credits for it
- The preservation action complies with the mitigation goals stated in this document
- The action is cost effective relative to other types of mitigation (e.g., habitat creation, enhancement, restoration, etc.)

In some cases, preservation may be preferable to other forms of mitigation because:

- The habitat is unique
- It supports a special-status species
- It is difficult or impossible to recreate at a different location
- The location is a key component of a more comprehensive mitigation strategy or natural resource management objective for the region being implemented by CPW or the USFWS

2.4. Partnering Opportunities

The following mitigation strategies relate to partnering opportunities.

2.4.1. Partnering Opportunity 1—Pursue partnering opportunities for mitigation

Consult with the Agency Working Group, demonstrating that a reasonable effort has been expended in pursuing financial or in-kind types of partnering opportunities for all types of natural resource mitigation (i.e., avoidance, minimization, and compensatory). In addition to the Agency Working Group, consider discussing partnering opportunities within the US 50 project area with the Council of Resource Agencies (which meets with CDOT quarterly), local governments, and non-governmental organizations.

Rationale: Partnering with federal, state, and local agencies, as well as non-governmental organizations (e.g., The Nature Conservancy, Tamarisk Coalition, etc.), local governments, and others will provide the most benefit to the public and the resources. By requiring documentation and consultation with the Agency Working Group, the group ensures that partnering opportunities are fully explored.

2.4.2. Partnering Opportunity 2—Mitigate cumulative impacts in the region

Natural resources in southeastern Colorado are being cumulatively impacted by a variety of actions, including transportation projects, local development, agriculture, energy development (including wind), and noxious weeds, among other activities. There may be opportunities to team with other agencies or organizations operating in the area to help mitigate these impacts, such as coordinating efforts to:

- Minimize habitat fragmentation
- Restore degraded habitat quality
- Perform compensatory mitigation that links habitats or conserves larger blocks of land
- Increase public awareness about natural terrestrial and aquatic communities/ecosystems and wildlife (e.g., recreational trails, seminars/workshops, advertisements)
- Improve water quality

Though some local development may occur as a result of Tier 2 studies associated with the US 50 Tier 1 EIS (i.e., induced growth), it is beyond the purview of this document to provide mitigation strategies beyond what is proposed here for mitigating cumulative impacts. The EPA should be consulted during the planning phases of any cumulative impact mitigation so that they can provide comments on any collaborative cumulative impact mitigation, and to ensure that all parties receive the appropriate level of credit and acknowledgement.

Rationale: Both CDOT and the FHWA pride themselves on being leaders in environmental compliance and mitigation. Though not specifically required under NEPA, working with other organizations to reduce and minimize cumulative impacts will provide leadership in impact mitigation, improve conditions for wildlife in the area, help CDOT meet their goals for sustainability in transportation and environmental stewardship, and help FHWA meet some of their goals under the Moving Ahead for Progress in the 21st Century Act (MAP-21).

3. Implementation

When the natural resource goals and strategies have been agreed upon by members of the Agency Working Group, the implementation of the mitigation goals and strategies must occur in a consistent, organized fashion. Otherwise, it is likely that confusion or miscommunication will prevent or hamper mitigation efforts associated with the US 50 Tier 1 EIS and related Tier 2 studies. This section provides general guidance on how to implement the natural resource mitigation goals and strategies in the US 50 project area. This framework is shown graphically in Figure 3-1 (on the next page). This section does not prescribe specific mitigation activities that should or could be used during Tier 2 studies. These will be developed and implemented during Tier 2 studies, and should be consistent with the three mitigation goals. Steps 1 through 5 must be accomplished first because they set the stage for all future on-the-ground mitigation projects. Step 6 would involve most of the actual compensatory mitigation that takes place on the ground.

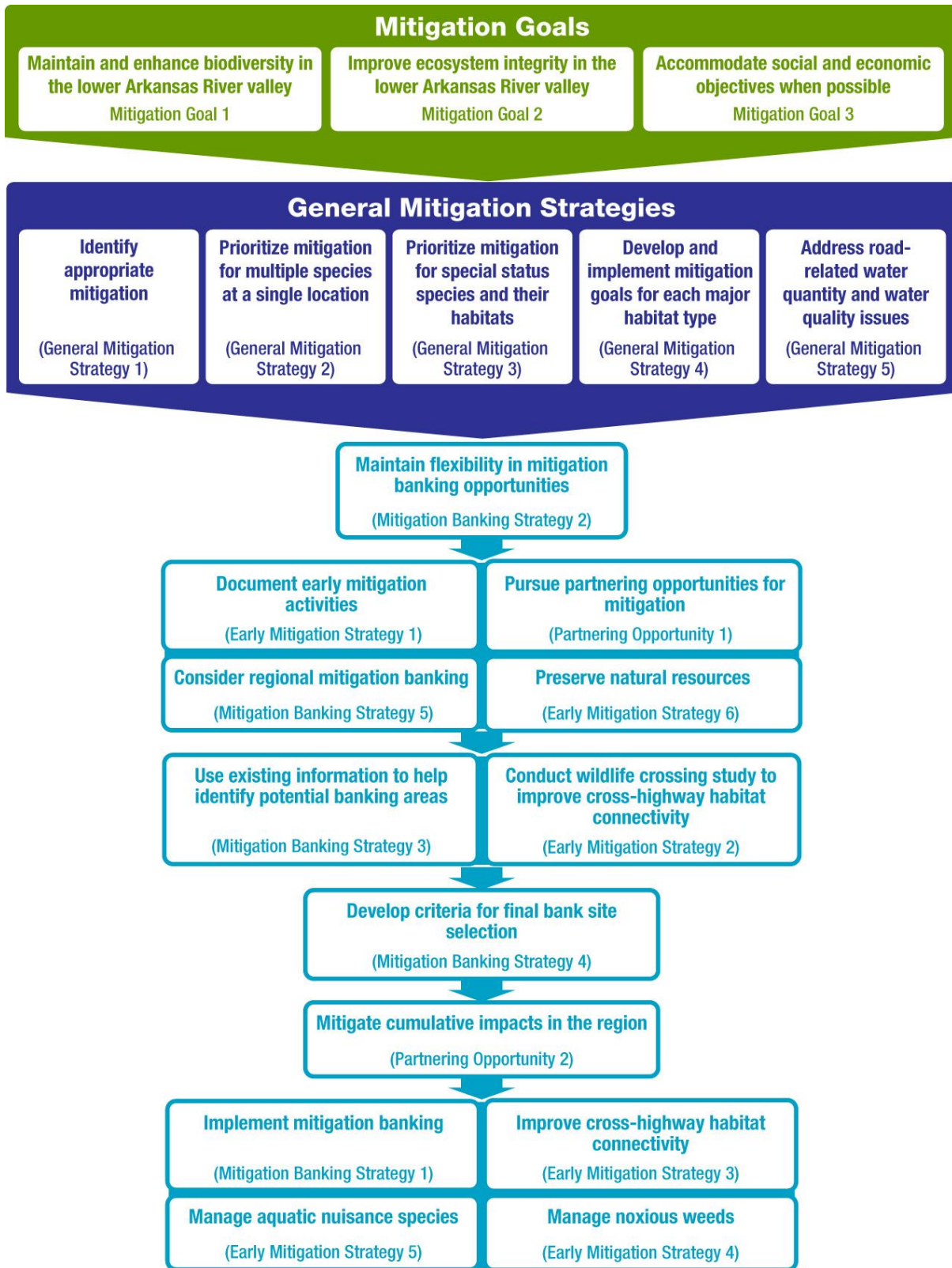


Figure 3-1. Implementing the Natural Resource Mitigation Goals and Strategies

3.1. Implementation Step 1—Develop mitigation goals for each major habitat type

The ideas presented in Section 2.1, General Mitigation Strategies, of this document represent overarching mitigation strategies that set the stage for future actions. Of these, Mitigation Strategy 4—develop and implement mitigation goals for each major habitat—is fundamental to habitat mitigation in the US 50 project area. Therefore, it must be addressed prior to implementing natural resource mitigation for the US 50 Tier 1 EIS and associated Tier 2 studies. It is recommended that the Agency Working Group meet to discuss how to best accomplish the development of habitat-specific mitigation goals. This may be best accomplished by assigning a subcommittee to this task.

3.2. Implementation Step 2—Pursue broader mitigation goals and partnering opportunities

This step would be comprised of several activities in support of mitigation banking strategies, early mitigation strategies, and partnering opportunities. These can and should be performed simultaneously.

- Consider regional mitigation banking. Compile a picture of the mitigation needs for transportation projects in the area (as completely as possible). This will set the stage for the composition and size of a mitigation bank, or collection of banks, that might be needed. This activity implements Mitigation Banking Strategy 5.
- Document early mitigation activities. Establish a systematic approach to documenting early mitigation activities, which is required as a first step prior to implementing early mitigation actions. This activity implements Early Mitigation Strategy 1.
- Pursue partnering opportunities. This will be an ongoing task that will involve appropriate federal, state, and local government and non-profit entities. This activity implements Partnering Opportunity 1.

3.3. Implementation Step 3—Update information to ensure appropriate mitigation

The following subtasks can and should be performed simultaneously.

- Use existing information to help identify potential mitigation banking areas. Identify and prioritize specific areas where existing information indicates that mitigation banking would provide the most return on the investment in terms of providing mitigation for multiple species and habitats at one location. This activity implements Mitigation Banking Strategy 3.
- Conduct a wildlife crossing study. Identify specific sites for maintaining cross-highway linkages and site-specific solutions at those locations. This activity implements Early Mitigation Strategy 2.

3.4. Implementation Step 4—Develop criteria for a mitigation bank

Develop defensible criteria for final bank site selection. The final selection of a banking site will likely include several criteria, involving records searches and at least one field visit. The selection criteria must be standardized so that informed, balanced, unbiased comparisons among potential sites can be made. These selection criteria should be in place as soon as possible so that, when opportunities arise, the evaluation system is in place and ready for use. This activity implements Mitigation Banking Strategy 4.

3.5. Implementation Step 5—Identify and pursue opportunities for cumulative impact mitigation

Mitigate cumulative impacts in the region. This will be an ongoing task and goes hand in hand with Mitigation Strategy 14. Early identification of partners willing to mitigate their cumulative impacts to natural resources

may have dramatic beneficial effects on mitigation banking in the region. This activity implements Partnering Opportunity 2.

3.6. Implementation Step 6—Conduct adaptive management

Implement early action, mitigation banking projects, and onsite mitigation as funding or opportunities become available. Conduct adaptive management to revise impact calculations or mitigation strategies as new regulations or information becomes available.

4. References

- Andrews, R., and R. Righter. *Colorado Birds*. Denver, CO: Denver Museum of Natural History, 1992. Print.
- Bailey, R.G. *Description of the Ecoregions of the United States*. 2nd ed. rev. Miscellaneous Pub. 1391 (rev.). Washington, D.C.: U.S. Department of Agriculture (USDA), U.S. Forest Service (USFS), 1995. Print.
- Brown, J.W. Report No. DOT-VNTSC-FHWA-XX-06. *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects*. Cambridge, MA: USDOT—Research and Innovative Technology Administration, 2006. Print.
- Chapman, S., et al. *Ecoregions of Colorado*. Reston, VA: U.S. Geological Survey (USGS), 2006. Print.
- Colorado Climate Center (CCC). *Climate Information*. Web. Jan. 2007. <<http://ccc.atmos.colostate.edu/climateofcolorado.php>>.
- Colorado Department of Transportation (CDOT). *US 50 Tier 1 EIS Agency Charter Agreement*. Colorado Springs, CO: Colorado Department of Transportation (CDOT) Region 2, 21 Sep. 2005. Print.
- Colorado Division of Wildlife (CDOW) and Colorado Grassland Species Working Group. *Conservation Plan for Grassland Species in Colorado*. Denver, CO: Colorado Division of Wildlife, Nov. 2003. Print. Web. Sep. 2008. <<http://wildlife.state.co.us/WildlifeSpecies/GrasslandSpecies/>>.
- Colorado Natural Heritage Program (CNHP). *Natural Communities* (updated 22 Aug. 2008). Web. Jan. 2009. <<http://www.cnhp.colostate.edu/tracking/communities.html>>.
- Colorado Natural Heritage Program. *Setting Mitigation in the Watershed Context: Demonstration and Description of Colorado's Watershed Approach to Compensatory Wetland Mitigation*. Ft. Collins, CO: Colorado State University, 2013. Web. 27 Jan. 2014. <<http://www.coloradodot.info/programs/environmental/wetlands/setting-mitigation-in-the-watershed-context>>.
- Compensatory Mitigation for Losses of Aquatic Resources; Final Rule*. Compensatory Mitigation Rule of 2008. *Federal Register* 73.70 (10 Apr. 2008):19594-19705. Print.
- Dale, V., S. Archer, M. Chang, and D. Ojima. "Ecological Impacts and Mitigation Strategies for Rural Land Management." *Ecological Applications*, 15.6 (2005): 1879–1892.
- Executive Order 11990, Protection of Wetlands. 24 May 1977.
- Grunau, L., S. Kettler, R. Rondeau, C. Gaughan, and M. Fink. *Prairie Dog Animal Community Management Guidance Template. Appendix X of: Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative* (Neely et al. 2006). Prepared by staff from the Colorado Natural Heritage Program and U.S. Fish and Wildlife Service. 2006. Print.
- Hansen, D., P.J. Duda, A. Zayed, and N. Terry. "Selenium Removal by Constructed Wetlands: Role of Biological Volatilization." *Environmental Science and Technology*, 32.5 (1998): 591–597. Print.
- Haufler, J.B., R.K. Baydack, H. Campa, III, B.J. Kernohan, C. Miller, L.J. O'Neill, and L. Waits. "Performance Measures for Ecosystem Management and Ecological Sustainability." *Wildlife Society Technical Review*. 02.1 (2002): 33 p. Print.
- Interstate Technology and Regulatory Council Wetlands Team. *Technical and Regulatory Guidance Document for Constructed Treatment Wetlands*. Dec. 2003. Web. Jan. 2009. <<http://www.afcee.af.mil/shared/media/document/AFD-071130-014.pdf>>.

- Johnson, B., M. Beardsley, and J. Doran. *Functional Assessment of Colorado Wetlands (FACWet), Version 1.0. Report No. CDOT-2009-4*. Denver, CO: Colorado Department of Transportation (CDOT) Division of Transportation Development (DTD) Applied Research and Innovation Branch. Feb. 2009. Print.
- Koshak, J. (Biological Wildlife Coordinator, Southeast Region, Colorado Division of Wildlife). Consultation regarding future locations of Colorado Division of Wildlife birding trail kiosks within the US 50 project area. 23 Apr. 2009.
- Lemly, A. D. and H. M. Ohlendorf. "Regulatory Implications of Using Constructed Wetlands to Treat Selenium-Laden Wastewater." *Ecotoxicology and Environmental Safety*. 52.1 (2002): 46-56. Print.
- Mackessy, S.P. *Desert Massasauga Rattlesnake (Sistrurus catenatus edwardsii): A Technical Conservation Assessment*. U.S. Department of Agriculture (USDA), U.S. Forest Service (USFS), Rocky Mountain Region. 12 Dec. 2005. Web. Sep. 2008. <<http://www.fs.fed.us/r2/projects/scp/assessments/massasauga.pdf>>.
- Masscheleyn, P.H. and W.H. Patrick. "Biogeochemical Processes Affecting Selenium Cycling in Wetlands." *Environmental Toxicology and Chemistry*. 12 (1993): 2235-2243. Print.
- Natural Diversity Information Source (NDIS). *Species and Habitat Information*. Denver, CO: CPW, 2007. Web. Jan. 2007. <<http://ndis.nrel.colostate.edu/wildlife.asp>>.
- Natural Resources Conservation Service (NRCS). *Land Resources Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin*. U.S. Department of Agriculture (USDA) Handbook 296. 2006. Web. Jan. 2007. <<http://soils.usda.gov/survey/geography/mlra/index.html>>.
- NatureServe. NatureServe Explorer. *An Online Encyclopedia of Life*. Version 7.0. Arlington, VA: NatureServe, 2008. Web. Jan. 2009. <<http://www.natureserve.org/explorer>>.
- NatureServe. NatureServe Explorer. *Ecological System Comprehensive Report—Western Great Plains Shortgrass Prairie*. Arlington, VA: NatureServe. Web. Jan. 2007. <<http://www.natureserve.org/explorer/>>.
- Neely, B., et al. *Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative*. Denver, CO: The Nature Conservancy of Colorado and the Shortgrass Prairie Partnership. 2006. Print.
- New Mexico Lesser Prairie Chicken/Sand Dune Lizard Working Group. *Collaborative Conservation Strategies for the Lesser Prairie-Chicken and Sand Dune Lizard in New Mexico, Findings and Recommendations of the New Mexico LPC/SDL Working Group*. Craig, CO: NWCOS, Aug. 2005. Print.
- Omernik, J.M. "Ecoregions of the Conterminous United States (map supplement)." *Annals of the Association of American Geographers*, 77.1 (1987): 118-125. Print.
- Southwest ReGap (SWReGAP). *Analysis Project Land Cover Datasets*. 2006. Web. Jan. 2007. <<http://earth.gis.usu.edu/swgap>>.
- Toepfer, J.E. and D.M. Davis. "Spatial Needs of Prairie Grouse to Maintain Viable Populations." *A Grassland Conservation Plan for Prairie Grouse*. Vodehnal, W. L., and J. B. Haufler, editors. Fruita, CO: North American Grouse Partnership. 2007. Web. Jan. 2009. <http://www.grousepartners.org/Conservation_Plan-2007.htm>.
- Town of Fowler. *2035 Comprehensive Plan*. Feb. 2009.

Western Regional Climate Center (WRCC). *Climate of Colorado Narrative and State Temperature and Precipitation Data*. 2006. Web. Jan. 2007. <<http://www/wrcc/dri.edu>>.